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THERAPEUTIC DENTISTRY

Textbook

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For the students of medical university.

(INTRODUCTION

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The development of conservative dentistry.

Stomatology (from Greece word stoma-mouth, logos-studying)- is the medical discipline which is occupied with studying of etiology and pathogenesis of tooth s desease, jaws and other organs of mouth, their diagnostics, treatment and prophylactics.

Stomatology as the medical discipline was formed in 20 years of current - century as result of confluence between the dental surgery and maxillofacial surgery.

If maxillofacial surgery was born and developed within the framework of surgery, that dental surgery up to the 17 century wasn't be joined with common medicine. Before this period dental surgery was as the means (facilities) of helping from pains and came in mainly to extraction of teeth. Dental helping was rendered by barbers, bath - house attendants , craftsmen and others.

Dental surgery as a medical speciality was born at the end of 17-beginning ot 18 centuries. In the first place it is joined with labors of great French doctor - P. Fochard. The manufacture workings of artificial crowns, the fillings teeth with silver amalgam and later the using of arsenic acid for pulp necrosis (1836) and invention dentists drill finally established this speciality.

The following step of the development of dental surgery in Russia was the law (1838).In accordingly with its the "dentist" and the right to the independent work were sentenced only after taking and examination in medical academy. But only 1900 year the schooling by the way of studying was forbidden.

In 1829 the women were given the right likewise men to take examinations for receive the title of tooth physician.

In the end of past century the row of events were happened. They rendered the more influence to the forming of this speciality. Thus, in 1881in Petersburg the first dental school in Russia was opened by

Vajinsky. In Moscow the dental school was organized in 1892 by Kovarsky. In this period were appeared the opinions about the necessity transformation of the dental surgery to a speciality with would be taking as a profession only after the receiving of highest education.

The opening of the first privat – senior lecture of odontology in the Moscow University was the more important landmark in this direction.

Senior-lecture s course was headed by Znamensky.

The huge role belongs to professor Sklifosofsky. He was interested in dental surgery and worked the scientific researches of this problem. He is the founder of studying the tooth caries in Russia of epidemiology aspects. The most high spreading of tooth caries of city-dweller was established by him. Sklifosovsky expressed the idea about necessity of leading the sanation mouth and the taking of prophylactic measures.

In 1892 the privat senior - lecture of odontology were opened in the presence of Military-medical Academy (Fedorov heads it) and on the Highest Women Courses in St .Petersburg (prof. Limberg heads it).

Limberg for the first time defended a thesis of odontology on theme: "The contemporary prophylactics and therapy of tooth caries ". Limberg is the founder of planning sanation of pupils.

With full foundation it is might be considered that the first scientists - stomatology as Chemodanov, Znamensky, Nesmeyanov, Limberg were brought up in the faculty surgeon clinic of Sclifosovsky in Moscow, in Military- Medical Academy in the Highest Women Courses in St-Petersburg.

In 1883 in Petersburg the first in Russia scientific society of dentists were organized, but in 1885 the prinring organ “Dentist surgeon Bulletin” was founding. The appearing of the printing organ allowed in the short time united the uncoordinated societies of dentists from other cities. In 1899 the journal “The Odontologycal revue "was founding by the Moscow odontology society. The huge role in the uniting labor of the Russian dentist belongs to the 1st All-Russian odontology congress which took place in Nizhny-Novgorod in 1896.

On the congress except the scientific reports, the questions of training for dental surgery cadres were discussed and the question of forbidding the training specialist by the pupil's way was decided. For the first time the idea about the mouth s sanation of pupils was formulated.

As far as odontology was developing the many voices were headed in favour of point of view that the training of specialists of this profile must be accompany in the universities Thus, in 1910 on the 11 Pirogov s congress the decision about of the necessity founding independent chairs of odontology at the all medical faculties with independent clinics and technical laboratories.

But, the realization of the progressive ideas was possible only after Great October Social Revolution . Thus in November of 1918 the decision about the passing of the dental surgery education to the medical faculties of universities was accepted. In 1918 when the people commissariat of Public health of USSR was created in its structure the dental surgery sub-section was organized and it was be headed by Dauge (1869-1940)-he was Lenin s companion in-arms.

In march of 1920 the chairs of stomatology were organized at the medical faculties of state s universities in accordingly with decision of People commissariat of public health and Public commissariat of education .This measure was the great landmark in the development of this profession. In the 1920 the course of stomatology of Medical faculty MGU in Moscow was reorganized to the chair of stomatology in accordingly with this decision. Professor Vilga managed of this chair. From 1924 till 1926 the chair was headed by prof. Govseev. The future great agents of stomatology worked at this chair: Dubrovin, Lukomsky, Begelman, Verlotsky.

Side by side with organization of chairs at the medical faculties in the first-years of development of the USSR , the institutes were created: in 1919 in Petrograd - the institute of public dental surgery, in Kiev -Odontology Institute . In 1922 in Moscow the State institute of dental surgery (GIZ) was created ,which in 1927 was renamed to Government Institute of Stomatology and Odontology (GISO), then in Moscow medical stomatology institute (MMSI). In 1928 the Odessa s scientific- research institute was opened - the first scientific-research founding in country.

In pre-war the important material base of stomatology training was created . In 1935 stomatology institutes were opened. But the war didn't allow to finish the beginning transformations.

In 1949 the period of training was increased till 5 years in the stomatology institutes. The numbers of institution of higher education is increasing. In this institutes more specialists are training . There is distinguishing peculiarity that the stomatology faculties were opened in the medical institutes, but not in the stomatology institutes .

During of development of this profession in prewar years 3 profiles were determinate already: conservative, surgery and orthopedic stomatology. In 1963 the chair of child -age s stomatology was opened. At the present time the row of the stomatology faculties have course, but in MMSI - the chair of physiotherapy . In accordingly with curriculum of profession "stomatology" , which was affirmed in 1983 by the chair of child - age s stomatology, the course of primary prophylactic was introduced .

The introduction of diploma (subordinatura) and post-diploma training (internship) have the important meaning with the object of quality increasing.

Pre-diploma training envisages the specialization of all stomatology profiles during 10 – semester . This allowed to lead the common sum of hours till 1500 at training of profile disciplines.

The internship envisages the specialization of young specialist during a year in his future working — place .

The guidance for interns is realized by chief of department or by experiencing doctor under the methodic guidance of stomatology faculty s teachers. This measure allowed to increase the quality of training for young specialists. The important meaning in the developments of stomatology in our country belongs to the resolution of Counsel of Minister USSR from 05.11.76. "About measures of further improvement of stomatology helping for people “ In order of minister of public health which was published on the base of that resolution (has the same name), the row of measures were envesaged for extension the net of stomalotogy institution and increase of output (issue) the doctor - stomatology with the object of the row of new stomatology faculties were opened increased

reception (receiving) of earlier - existing . At the present time in our country function 44 stomatology- faculties and 2 stomatology institutes (in Moscow and Poltava) with common reception for first course-8700 persons. The Moscow Medical Stomatology Institute named of Semashko is the heading in USSR on high stomatology.

The conservative stomatology is occupied with studying of causes of beginning and mechanisms, of development teeth s diseases and peri-tooths tissues, mucous diseases, its diagnostics with exploitation of treatments methods and its prophylactics .

The level of conservative stomatology s development in mainly determines the condition of stomatology helping for people. The important meaning belongs to exploitation and introduction of prophylactics basic stomatology diseases .

At the present time the level knowledge of this caries and periodontitis problem's is such as, that we can with success prevention this diseases.

The conservative stomatology now has differentiation and determined specialization. It is distinguished - cariology, endodontology, parodontology, mucous diseases. But they should not be pick out into independent sections.

The scientific directions are in accordingly with this problems. There are many scientific works, which are devoted to caries problem.

It is known that the level of researches depends on scientific achievement and using methods. Thus, in 20-30 years the researches of clinic methods were realized. The determinate of clinical composition of tooth s tissue with using of analytic methods were realized either.

In 40-60 years the possibility of using radio-active isotope and more perfect biochemical methods appeared , that why the biochemical composition of the organic substance of hard (solid) tissues and normal and pathology metabolism s processes were studied. In stomatology the electronic microscope, probe, scanner microscope appeared and this

gave the possibility study of tooth s tissues ultra - structure, including the enamel.

The caries s problem was studied by famous (prominent) scientists: Begelman Lukomsky, Entin, Belikov, Platonov, Sharpenak. The great contribution in the tooth - caries studying dying was made by Fedorov. He created whole direction of studying the metabolism s processes in tooth s hard tissues in the norm and pathology. His pupils – Lisenko, Jijina, Dagaeva, Borovsky, Bubyakina and others - received the row of important data (facts) ,which cardinally changed earlier- existed opinions about hard tissues of tooth and in the first place about enamel.

These facts served as base for exploitation of contemporary approach to the caries s problem.

The parodont diseases s problem is no less important than caries. The huge contribution was introduced by Evdokimov in its studying. Him apart, Entin, Platonov ,Lindenbaum , Novik ,Kurlyandsky, Danilevsky, Ivanov and others were occupied with this problem.

At me present time the row of earlier-existed opinions of ethology and pathogenesis of parodont diseases was re-considered .This allowed to aim an effective ways for their prophylactics .

The researches of endodontia take an important place. These questions were exploited by Lukomsky, Gofung, Shkolyar, Pekker, Platonov, Anishenko , Evdokimov , Ivanov.

Rubin created the direction of using the physical methods for diagnostics and treatment of pulpitis and periodontitis.

The mucous diseases in less – degree were attracted by researchers, but there are determinate achievement in this direction. Lukomsky ,Pekker , Platonov ,Novik and other specialists were occupied with this problem . The huge contribution in the studying of mucous diseases was made (introduced) by professor Pashkov ,who was a head of cutaneous and venereal diseases chair of MMSI.

At the present time the big work is pursued (conduct) because of extension -conducting the prophylactics of stomatology s diseases . This was reflected in the labors of Pakhomova ,Vinogradova ,Leontyeva.

The scientific researches are pursued at all chairs of 44 faculties and 2 institutes. In the earlier USSR the Center of stomatology s scientific - researches institute (CNIIS) was the head of scientific researches . This institute was created in 1962. It was the head of the scient researches in earlier USSR and together with Scientific Soviet of stomatology of Medical Academy coordinated all scientific researches. The history of the dentistry is fit-closing with the working of dentistry societies .

In 1883 in Petrograd the first dentist society of Russia was institutioned. In 1891 the dentist society was founded in Moscow. In 1899 all societies were united in Russian Odontology societies.

After the revolution when the politic and agricultural condition of country was normalizing , already in the end of 1921 the separate odontology societies begin to work. In 1921 the Tatar society was founded , and in 1926 -Novosibirsk odontology society. In the pre-war period Saratov (1933) ,Stavropol(1937), Perm (1939) and Omsk (1940) stomatology societies began their working. The creation of the All-union scientific medical society of stomatologist was the new stage in the history of the working of scientific stomatology societies. This society was organized in May of 1958 on the scientific congress in Leningrad. The finally forming of All-union and republic scientific medical stomatology s societies finished to 1962. The All-union society has more than 60 000 members. The working of stomatology societies is polyhedral. The huge work is pursue to perfect stomatology helping for people, pursue the introducing of new methods of prophylactics and treatment basic stomatology diseases. The results of development of dental surgery in the pre-revolution period were leaded up by 5 All-Russian congress of dentists, which took place in April 1917. The questions which were discussed by the congress, were decided only after revolution. The questions were about necessity radically changing of dentistry by the training specialists on medical faculties and the organization of public dentistry.

In November 1923 in Moscow 1th All- union odontology congress took place. On this and on the following congresses the caries problems and parodont diseases were decided .In 1962 in Moscow 4 All-union congress of dentists took place. This congress was devoted for discussing of condition and perspectives of stomatology s helping development for people. At the same time the problem of caries and its complications were discussed . On the 5 All-union stomatology congress, which took place in 1968 the mainly attention was given questions of stomatology helping for children.

In Leningrad in 1958 6 All-union congress took place. The questions were devoted to perfect stomatology helping for people and condition of parodont problem and were included in their program. In 1981 7 All-union congress of stomatology took place. The questions about organization of dentistry helping, prophylactic problems and disease s treatment were discussed at this congress.

Due to mark that the all unit republics have scientific societies. In according with peculiarity of local conditions, the republic scientific societies conduct huge work for exploitation of new facilities and methods of diagnostics, treatment and prophylactics of stomatology diseases and introducing achievement in practice, searching of the optimal organized form of serving for people.

One of the mainly tasks of stomatology at the present time is general introducing the programs of prophylactics of stomatology diseases . The All-united scientific societies of unite republics have to play important role in the realizing of this programs.

History of Dental Clinic of AMU

Dental Clinic of Azerbaijan Medical University was organized in September, 2002. The foundation of this clinic is connected with the foumdation of of the Faculty of Dentistry in 1954 and up to this day it is the most important and memorizable event. This clinic is the first of Azerbaijan Medical University. All

specialization departments of faculty of Dentistry are placed in this clinic. Along with therapeutic, surgical, prosthodontics, pediatric dentistry departments for students of Dentistry faculty and dentistry department for students of Treatment-Prophylaxis, Pediatric and Medical-Prophylaxis faculties there are therapeutic, surgical, prostodontic, orthodontic, periodontal, implantological branches, physiotherapy and X-Ray rooms and dental laboratories. Having immense opportunities for education and researches the primary function of the clinic is directed to prepare skilled dental professionals and to provide population with top-quality dental survices.

Thereto the four-storeyed building of the clinic has been well-overhauled from the inside and outside and provided with new up-to-date dental equipment produced in Japan, Germany, Turkey, Slovakia, etc.

New fully-equipped training rooms have been put at student's disposal.

The sterilization system has been changed radically into avtoclaving.

All materials and instruments used in the clinic are produced by leading companies of Germany, the USA, France, Russia, etc.

The teaching programs of the departments have neen changed according to Bologne system which was accepted recently in the university.During this period the Dentistry faculty headcount of students has increased from 650 to 1090.

The number of foreign students has risen from 80 to 362. Nowadays the 36% of faculty students are foreigners. Students from about 14 countries –Finland, the USA, Turkey, Afghanistan, Saudi Arabia, the Philippines, Georgia, Iran, Iraq, Pakistan, Jordan, Palestine, Syria come to study in Azerbaijan and this fact points to the presence of democratical environment and tolerance in the country.

After graduation students feel free to continue their education in the country they choose or to start their own practice.

DENTAL CABINET

There are determined norms and requirement for organization of dentistry cabinet in connection with using equipment and volume of work and with using dangerous for health dental materials.

During theirs un- right using they can render un-favourable effect for medical personals health: for example amalgam, which contains mercury.

According for existing condition, dentistry cabinet for one dentist must envelop the area no smaller than 14 m^2. If in the cabinet a few arm-chairs are placed, their area is counted on including adding norm 7 m^2 for each arm-chair.

If there are universal unit near adding arm-chair, area for it increasing till 10 m^2. The height of cabinet must be no smaller than 3 m, but the depth must no be over than 6 m. In connection with using amalgam in the process of filling teeth more attention is given to the trimming of floors, walls and ceilings.

The walls of dentistry cabinet must be smoother, without cracks. The angles and places-of walls floor s and ceilings joinings must be circle- angled without decorations and cornices.

The walls and ceilings are plastered or smoothing with pulvis with adding the 5% solution of sulphur for joining the vapour of mercury to solid substance which doesn't undergo for desolation.Then walls and ceilings are painted with the silicate or oil colour. The floor of cabinet in the beginning is covering with tight cardboard, but linoleum is set above it. The linoleum must cross to wall s height on 10 sm. The places of the leafs of linoleum and the places of tubs existings must be plastered and covered with nitro-colours. This acts are necessary for providing the effective sanitary cleaning which excepts the possibility of the mercurys vapours sorbtion. It is necessary to paint the walls and floors in the dentistry cabinet in light-tones with reflections coefficient no lower than 40.

By request it is possible to use neutral light-grey tone which doesn't prevent for right different of colour of mucous blood, teeth skin and filling materials. The doors and windows in the cabinet are painted with enamels or on colours in white colour. The doors and windows beams must be smooth and easy clearnings.

The dentistry cabinet must have natural illumination. The windows of cabinet should be in direction to the North so that considerable changes of light on the working places will be excepted during summer time and other directions when direct sun rays can act and cabinet can be very hot. In summer in the cabinets which have unright rays directions it is recommended to close windows with curtains, jalousie, tents and other things.

The light coefficient must be 1:4 -1:5 (the relation of windows glass surfaces to area of the floor).

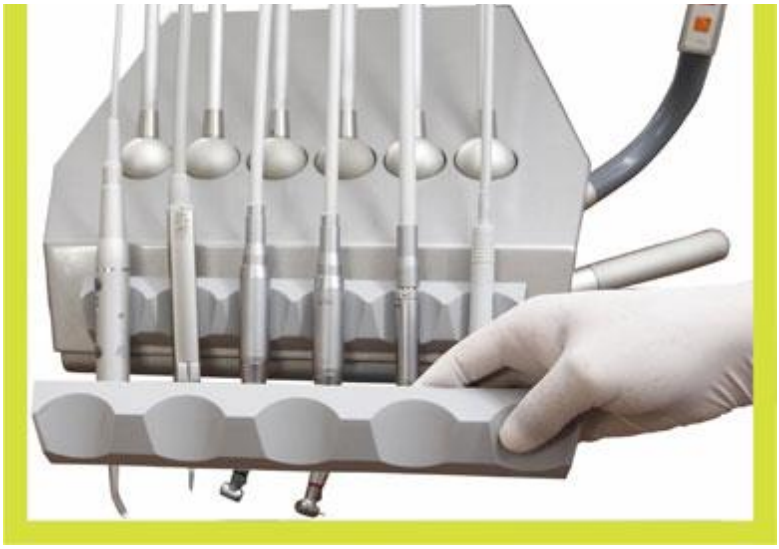
The cabinet must have the common artificial illumination which is provided by halogen lamps and ordinary warm lamps. It is recommended to use halogen lamps with correct colour-transition, or halogen lamp with cold natural light because they don't change the colour –transition.

The lever of cabinets illumination by using of halogen lamp must be 500 lc. The common illumination s lamps are placed so that they will not get to the area of working doctor.

Besides the dentistry cabinets must have the local illumination in reflectors at the dentistry equipments. The illumination which is created by the local reflector mustn't exceed the lever of common illumination more than in 10 time. It is necessary that except the tiring overload of doctor s eyesight. Besides illumination it is necessary to have the drown cupboard in the cabin at for using of amalgam. Amalgam must be prepared in the cupboard. Amalgam s mixer exceps all hand operations for prepare silver amalgam and must be kept in the drown cupboard. The dentistry cabinet must have drown ventilation and window s ventilation. The cabinet s air should be disinfectioned by quarts lamp. This procedure is produced (maked) in the rest period between or after ending of the working day. In

the dentistry cabinet must be working places for doctor, nurse and hospital attendant.

In the doctor s place must be dentistry equipment, arm-chair, the table for drugs and materials, screw chair.



DENTAL INSTRUMENTS

The hand instruments used in the dental operatory may be placed in one of three classifications according to use :

1) Cutting ,including excavators, chisels and lancets

2) Condensing, such as amalgam condensers and instruments used for plastic materials

3) Miscellaneous such as mirrors, explorers, and probes. The cutting instruments are used to cut hard and soft tissues of the mouth. In operating on tooth structure hand instruments are usually placed in two groups : excavators and chisels. Excavators are used for excavation and removal of caries and sharpening of refinement of the internal parts of the cavity. Chisels are used primarily for cutting enamel.

Excavators .Three forms of Excavators are the ordinary hatchet, the hoe and the spoon: they are so named because of their designs .

The ordinary hatchet excavator has the cutting edge of the blade directed in the same plane as that of the long axis of the handle .These instruments are used primarily on anterior teeth in preventing retentive areas and in sharpening internal line angles.

The hoe excavator has the cutting edge of the blade perpendicular to the long axis of the handle . This instrument is used for planning cavity preparation walls and forming line angles. It especially has application in classes III and ЬIВ preparations. These are intended for use on enamel or posterior teeth.

A special type of excavator is the angle former . These instruments are used primarily for sharpening line angles or obtaining retention from in dentin , but they may also be used in placing bevels on enamel margins.

Spoon excavators are used for removal of caries and in many instances are used for carving amalgam or direct wax patterns. The circular edge is known as a discoid , whereas edge is a pointed blade and is termed cleoid.

Chisels are instruments intended to be used primarily for cutting enamel. According to use there are three groups of chisels :

1 .straight

2.enamel hatchets and

3.gingival margin trimmers.

The straight chisel has a straight shank and blade with bevel on only one side.

The enamel chisel is a chisel similar in design to the ordinary hachet except that the blade is larger and is beveled on only one side.

Other cutting instruments such as the knife ,file , and discoid - cleoid instrument are use, for trimming restorative material rather than for cutting tooth structure.

Dental probes.

These are sharp, pointed instruments that are made with a wide selection of curves and bends in their terminal shafts so that the tip may be more easily carried into remote places in the mouth . They are used in conservative dentistry primarily to explore tooth surfaces , to locate cavities and wide pits and fissures and to search the prepared cavity surfaces to ensure that all traces of softened carious tooth substance have been eliminated. There are parodontal probes and button-edge probes.

Dental Mirror. They are used in conservative dentistry to explore tooth surfaces , illuminating the mouth well, to move aside the tongue and cheek. The mouth mirror may have plane or magnifying surfaces.

Pincers or Tweezers.

They are used in conservative dentistry to holding the cotton wool rools and explore tooth's moving , and to treat the cavities with drugs .

Smoothers.

a).one -sided smoother;

b).two- sided smoother;

c).combination with stopper.

They are used in conservative dentistry for putting to cavities the medical , isolated materials and filling materials (contemporary and others).

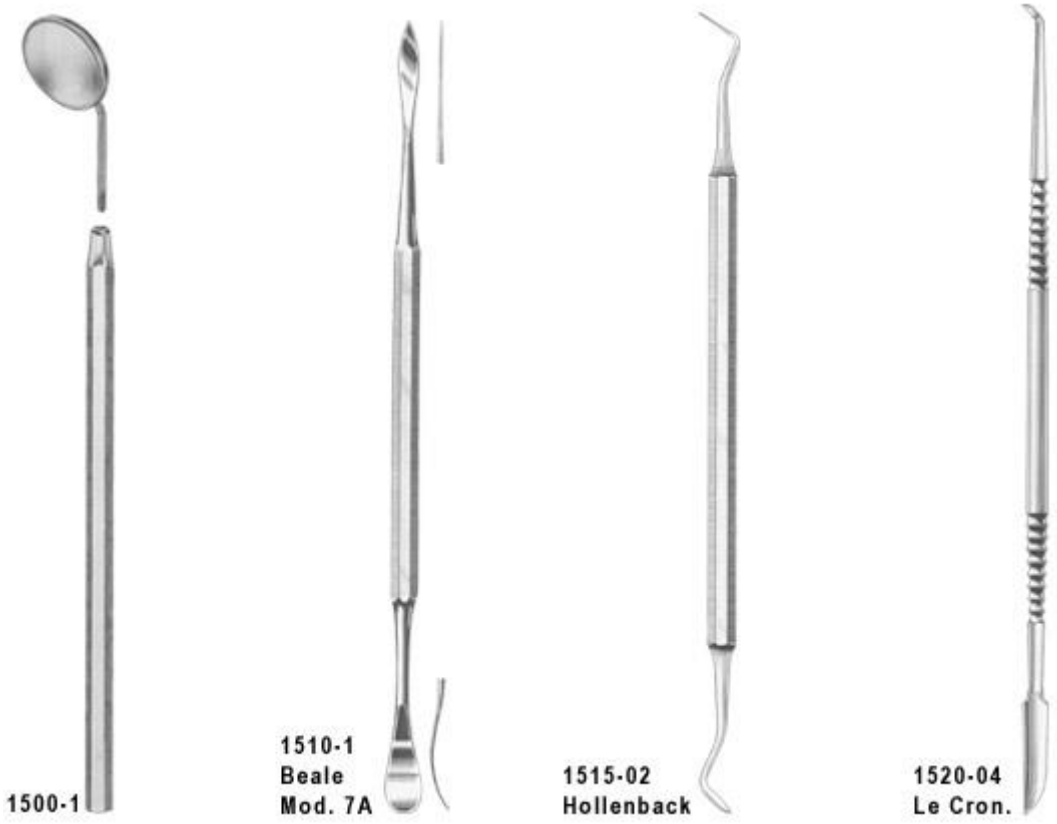
Stopper.

They are used in conservative dentistry for condensing the filling materials.

Spatula.

a).metallic - for mixing the filling materials , for prepare the medical pastes;

b).plastic - for filling materials witch changes their colors when contact with metal.



mirror

Hooks.

a).There are parodontal hooks

b).spheroid hooks

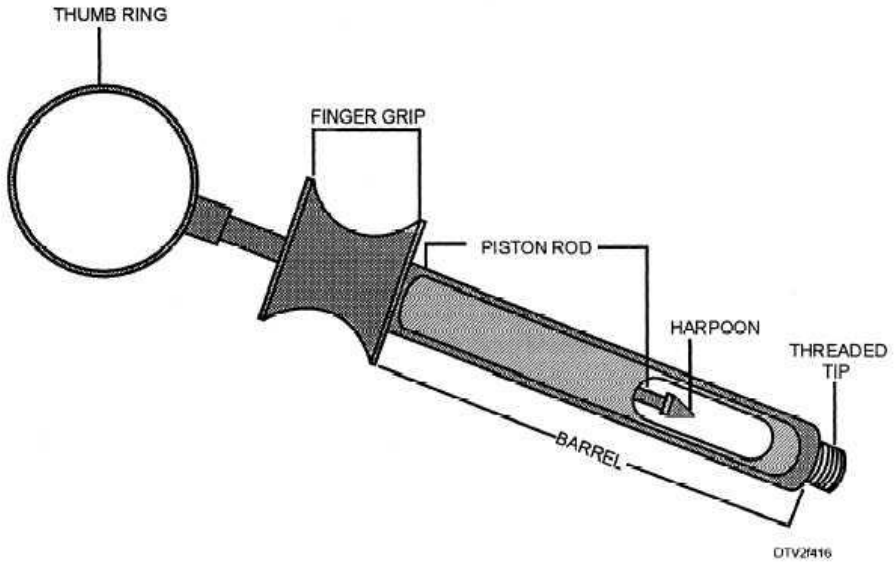
c).for extracting the calculus

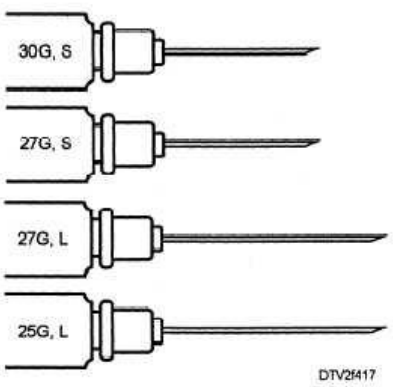
Ultrasonic apparatus. They are used in conservative dentistry for extracting the dental tartar (calculus).

Amalgamtregers.

a).Cylindrical (like stopper) .They are used in conservative dentistry for holding amalgam, for condensing and spread amalgam in cavities .

b).syringe-form amalgam-treger. They are used in conservative dentistry for putting the amalgam in cavities with tensor from syringe piston (Fig17-18).





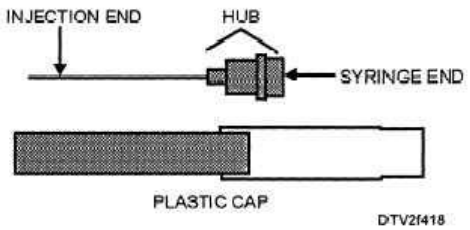


FIG. 17. Different gauges and lengths of aspirating syringe needles.

FIG. 18. Parts of the aspirating syringe needle.

Glasses.

a).with smoother surfaces

b).with uneven surfaces

c).with pits

Trays (chute)

a)reniform tray

b)of four angles non-corrosive trays

They are used in conservative dentistry for keeping , washing and drying the instruments.

Instrument grasps.

A study of how instruments are to be used should accompany the study of instrument design . The evolution of the small handle permits a variety of grasps than can be used in an effective manner.

Fundamentally there are four grasps used with hand instruments :

1 .pen

2.inverted pen

3.palm-and-thumb

4.modified palm -and- thumb

Pen grasp. As name implies it consists of holding the instrument similar to the method of holding a pen ,except the pulps of the thumb and first and second fingers contact the instrument , and the tips of the third or third and fourth fingers are placed on adjoining teeth. The position of the second finger is extremely important for obtaining thrust and also in preventing the instrument from slipping during manipulation.

Inverted Pen grasp. The finger position of the inverted pen grasp are the same as for the pen grasp. The hand however , is rotated so that the working end of the instrument faces the palm of the hand instead of away as in the

pen grasp. This grasp is not used too frequently , but on occasions depending on the area of operation type of instrument used and operator modifications of the inverted pen grasp are used.

Palm - and-thumb grasp is similar to the method of holding a knife when whittling a piece of wood. The handle is placed in the palm of the hand and grasped by the four fingers , while the thumb is free of the instrument and rests on an area other than that being operated on. This grasp is the power grasp. This grasp is used when the thumb must rest at some point distant from the operating site .

Modified palm-and thumb grasp.

When it is feasible to rest the thumb on the same tooth , being operated or on a tooth immediately adjancent the modified palm -and-thumb grasp may be used. The handle of the instrument is held between the pulps of the thumb and the first and second fingers, flic third and fours lingers are about half closed; they contact the handle under the first joint of each finger and press the handle against the distal area of the palm. This grasp allows for much of the power of the palm -and- thumb grasp and at the same time permits more delicate manipulation.

GUARDS.

GUARDS are the finger positions of the hand opposite that using the instrument to steady the parts being operated on and to protect them from injury in case the instrument accidentally slips off the working surface. Guards may also be hand instruments or items placed to protect soft tissue from contact with sharp cutting or abrasive instruments. The usual finger positions acting as guards are the thumb on one side of the tooth being operated on and the first or second finger on the opposite side. Whether the thumb is placed on the facial or lingual surface depends on the location of the operation and the position of the operator. Many different finger positions and locations are used in steadying the parts being operated on and protecting the surrounding tissue. These are dependent on the type of

instrument used ,location of the operation and the positions of the operator and the patient.

THE DENTAL ENGINE

The quickest method of preparing cavities in teeth is by the use of rotating engine instruments powered by a dental engine that is usually controlled by a foot switch. Electric engine.

This is a variable-speed electric motor which drives the handpiece. Instrument speeds of from less than 500 rpm up to 25000 rpm can be obtained and in some cases specially geared engines connected to handpieces with high - speed bearings can be adjusted to develop 100000 rpm. It is now almost entirely superseded by the air-driven engines. The electric engine is seldom used as a source of power in a modern dental operatory but is often used in dental laboratories where low speed and high torque are desirable.

Air Motor.

This engine drive is directly adjust to the handpiece and the motive power is produced by a slow air turbine fed by a simple tube conveying compressing air . This power system is very simple and the handpiece is relatively unrestricted in movement.

Air Turbine.

The motive power is again produced by compressed air passing through a turbine but now the turbine is high-speed one and is actually in the head of handpiece. Very high speeds of 250000 rpm to 300000 rpm can be obtained with system and the handpiece bearings have to be lubricated constantly during use by a fine oil mist produced by dripping oil into the airfeed line.

HANDPIECES.

Dental handpieces and their associated equipment, such as burs and stones, are precision -manufactured instruments used for cutting, grinding, and polishing procedures in the dental operatory as well as in the dental laboratory. These are of various types and are used to hold the engine-driven instrument firmly and transmit the motive power of the engine to it. They may be :

1 .Straight handpieces

2. Right-angled handpieces

3.Contra- angled handpieces

4.Miniature handpieces

5.Air turbine handpieces (always used with a water spray to prevent overheating of the tooth).

BELT-DRIVEN handpieces.

A belt-driven angle handpiece called the Page -Chayes became available in 1955. It was the first angle handpiece to operate successfully at speeds of 100000 rpm and was attached to a conventional dental unit with an electric motor as a source of power. Gears were eliminated by having a small belt run aside the handpiece sheath over belt bearing pulleys in the angle sections. It was a very popular angle handpiece .

Water-turbine handpieces.

In 1953 a hydraulic - driven turbine angle was reported to operate satisfactorily at 60000 rpm and was markered 2 years later. The Turbo- Jet was designed as a compact mobile unit that required no outside or air connections. Only a source of electrically was needed to operate the unit. A soundproof cabinet contained a motor, water pump, water reservoir ,and the necessary plumbing for circulating the water. Water was conveying to and from the handpiece by coaxialtype plastic tubing (tube inside tube). The small inner tube carried water under high pressure to rotate a turbine in the handpiece head , and the larger outer tube returned the water to the reservoir for recirculation. Improved models had both straight and angle handpieces that could operate at speeds up to 10000 rpm. Rotary instruments had a threaded shank to ensure concentricity when attached to the shaft of the

turbine . Changing instruments was time consuming , and carbide burs didn't perform well with water turbine –handpiece

Air Turbine Handpieces.

In the latter part of 1956 the first clinically successful! air - driven turbine handpiece became available with free-running speeds of approximately 300,000 rpm . Early models were attached to a conventional dental unit and consisted of a handpiece , control box, foot control, various connector hoses , and a source of compressed air. When the foot control was activated , compressed air flowed to the control box and was carried bhandpiecey a flexible hose to the back of the handpiece. From there the air was directed to the head of the handpiece through a metal tube and was blown against the blades of a small turbine to produce rotation. Some of the spent air was expelled at the head of the handpiece, while the greater part was exhausted at the back of the handpiece or returned to the control box. Cutting instruments were inserted into the shaft of the turbine and held by friction grip.

Most air turbine angle handpieces have free-running speeds of approximately 300.000 rpm.

The application of the turbine principle to the straight handpieces eliminated the necessity of having an electric engine as part of a standard dental unit. The design of the straight handpieces turbine provided the desirable high torque for low-speed operation. Air-driven handpieces have been and continue to be the most popular type of handpiece equipment because of the overall simplicity of design, ease of control, and patient acceptance.

The speed at which an instrument is rotated is referred to as revolutions per minute (rpm). To clarify and simplify terminology, three speed ranges are generally recognized : low or slow speeds (below 6000 rpm). medium or intermediate speeds (6000 to 100.000 rpm). and high or ultrahigh speeds (above 100,000 rpm).

DENTAL BURS

Each instrument consists of three parts : the shank, the neck and the head. Each of these parts has its own function which influences its design and the materials used for its construction.

The shank is that part of the instrument that fits the handpiece. It serves to accept the rotary motion from the handpiece. The present American Dental Association Specification №23 for dental excavating burs makes provision for 8 classes of instrument shanks. Three of these are in wide spread use. These are the straight handpiece shank, the lalch-tvpe angle handpiece shank and the friction-grip angle handpiece shank.

Straight handpiece instruments are now rarely used for preparing teeth, except for use in certain anterior restorations. However, they are commonly used for finishing and polishing completed restorations .

Handpieces that use the latch-type burs normally(figure 2) have a metal bur tube within which the instrument fit as closely as possible while still permitting easy interchange.The posterior portion of the shank is flattened on one side so that the end of the instrument fits into a D-shaped socked at the bottom of the bur tube , and it is thus that the instrument is rotated. This type of instrument is widely used at low and medium speed ranges for caries, removal and for finishing procedures.

The friction grip shank design was developed for use with high-speed handpieces(figure 1). This design is smaller in overall length than the latch-type instruments, thus providing a further improvement in access to the posterior regions of the mouth. As the name implies, friction -grip instruments were originally designed to be held in the handpiece by friction between the shank and a plastic or metal chuck.

FIG 1. Friction Grip Latch Head for High-Speed Burs

Mikromotor

Most important among these is the division into bladed instruments and abrasive instruments. Carbide burs have heads of cemented carbide in

An inverted cone bur head is a portion of a rather rapidly tapered cone with the apex of cone directed toward the bur shank; the head length is about the same as the diameter .This shape is particularly suitable for providing undercuts in cavity preparations. A pear bur head is a portion of a slightly tapered cone with the small end of the cone directed toward the bur shank. A normal length pear bur head (with the length slightly greater than the width) is advocated for use in Class I cavity preparations for gold foil; a long-length pear bur head (with the length about three times the width) is advocated for cavity preparations for amalgam.

A straight fissure bur head is an elongated cylinder. This shape is advocated by some for amalgam cavity preparations, and modified burs of this design with slightly curved tip angle are available.

A tapered fissure bur head is a portion of a slightly tapered cone with the small end of the cone directed away from the bur shank. This shape is used for inlay and crown preparations where freedom from undercuts is essential for successful - withdrawal of the patterns and final seating of the cast restorations. A tapered fissure bur recommended by Sockwell.Within these 5 basic shapes many possibilities for variation exist.

STERILIZARION AND PREVENTION OF CROSS-INFECTION

All dental treatments must be carried out under conditions which will reduce the dangers of cross-infection by the transmission of pathogenic microorganisms both to and from the patient. Such contamination may occur via the surroundings instruments, materials or the dental team themselves. The DSA must remain alert to this ever-present hazard at all times, for everyone 's health and safety in the dental surgery depend upon her constant and meticulous care in these matters.

STERILIZATION

Sterilization is most important factor in the prevention of cross-infection. Sterile means completely free from all forms of life. Sterilization is the production of sterility by the complete removal or destruction of living micro-organisms and their spores from instruments and other material and may be achieved by heart, chemical or irradiation methods.

PRESTERILIZATION CLEANING.

The DSA must wear thick rubber gloves during this preliminary process to protect herself from accidental infection or scratches. The contaminated instruments should be soaked in a disinfectant solution before cleaning. They are then scrubbed with a detergent and water, and rinsed clean. This must be done thoroughly for any debris retained, such as dried blood , may act as a barrier to the sterilization process.

Alternatively the dirty instruments may be placed immediately into a bath of disinfectant and detergent solution in an ultrasonic cleaner. They are then subjected to high - frequency vibration which breaks up and shakes off even minute particles,very thoroughly , in a few minutes. The detergent must be rinsed off before sterilization.

STERILIZATION BY MOIST HEAT.

Boiling water. When the instruments and utensils are boiled in water (100^0C) for 15 minutes most pathogenic organisms are killed, but this method

door of the autoclave check that the pressure gauge registers zero. The door is then openrd and the prepared packages and containers are loaded into the autoclave, taking care to allow sufficient space for steam to circulate between them. The door is closed firmly, the locking mechanism engaged and the starting button or switch operated to set the automatic cycle in motion. The pressure will rise gradually , slowly if this is the firs', load of the day , but more rapidly when the apparatus has been preheated by previous operating cycle. The pressure should reach 2.2 bar at which time the thermometer should register 134°C and the timer should enable this condition to be maintained for well over the required three minutes .Finally the cycle is completed by the automatic release on the steam pressure, with the condensation of the steam back into water and a reduction of pressure. The door may then be opened safely and the still hot containers and packets removed with a heat resistant glove or special forseps. The open steam-circulation ports on autoclave containers should be closed to prevent contamination from the air. Large hospital and commercial autoclaves of the downward displacement or high vacuum types use chambers from which air can be exhausted (heated by dry steam from an external source).The precise working of different makes of autoclave can vary. A '"drying cycle"" in the programme is valuable because it ensures that the sterile packages contain no moisture thus preserving sterility for a longer period.

The efficiency of the autoclave process can be checked by including with the load an indicator or “teller” which shows a change when the required temperature is reached, for example, Browne's indicator strips, or by temperature monitors with a chart recorder.

Items that have been sterilized in this way may be stored in dry, dust-free conditions in the dental surgery and the containers or packets opened as required at a later date. Items wrapped in paper should be used within 3 months or else resterilized.

Sterilization by dry heat.

Hot-air oven. Cleaned heat-resistant equipment can be sterilized by subjecting in to hot air at a temperature of 160°C for 1 hour. Electrically heated hot-air oven sterilizers have a thermometer a thermostat and timing switch that they can be set to operate under the required conditions.

Instruments are generally put into tape-sealed metal containers before being placed in the oven. The load mast be loosely packed to allow circulation of air. Hot air is very useful for sterilizing sharp instruments and root canal therapy boxes, though in the latter, paper points and cotton wool may be discoloured by the heat. The load should be allowed to cool before it is removed from the oven to avoid contamined air being drawn into contracting packages.

THE CLASSIFICATION OF FILLILNG MATERIALS.

I.TEMPORARY

Artificial dentin, zinc-oxide/eugenol cement, Vinoksol, Ciprospad, Coltosol.

II.CONSTANT:

1 .Cements:

a. zinc-phosphate cement (zinc-phoaphate cementum,visphat cementum)

b. silicate(Silicin)

c. silico-phosphate (Silidont)

d. glass-ionomer cements(ASPA-I, Vitacril, Durelon, Carbo-cement (Japan), carboxy- Adhesor).

2. Amalgams (silver, copper, Hallodent - M)

3. inlays (plastic, china, metallic)

4. On the base of epoxy resin:

a. acril (Noracril-65)

b. epoxy (epodent, epoxydent, dentoxide)

5. Composite:

by the set

chemical (paste-paste - Alphadent, Brilliance, KD, Composite, Alphaplast, Degufill)

powder-liquid -Noracril-100, Acrioxide, Carbodent, Evicrol, Epacril light-cured -Brilliance, Alf, Heliomolar, Charizma, Degufill, Fulfill, Adaptic, Silux

by the size of particles

macrofilled- 10-45 mcm (Evicrol, Noracril -100)

microfilled -0,4-0,8 mcm , 45% of filling (light-cured Helliomolar)

FIGURE1..Constant fillings

III.LININGS

1. medical-Calmecin , Calcin-paste , zinc-oxide eugenol cement, Dycal, Calcidor, Alcaliner, Calcimol (light and chemical of setting)(Fig. 2.)

2. isolated -cement-phosphate, visphate-cement, phosphate cement with silver – Adhesor, artificial dentin, anti-bacterial cement, Fuji-2, Baseline, Chemful, Superior, Chelon fil

IV. For the filling of root canals.

1. Plasticity non-setting (the antiseptic pastes on the base of oil, are prepared ex-tempore, contain ferments, antibiotics)

2.Plasticity setting:

a).Eugenol (on the base of eugenol and zinc-oxide), ex-tempore prepared zinc-oxide + eugenol, Hermetic (Germ.), the paste of Grossman (USA), Endometazone, Esthesone, Propilor, Endomet (France), Evgedent (Russia)

b).On the base of epoxy resin -

Endodont, Intradont, Topsil, Gvayacril, Endospad (Russia), AH-26, AH-Plus (England)

c).On the base of resorcin -formalin:

resorcin- formaline paste, Foredent, SPAD, Bioplast, Forfenan, Paracin

d).On the base of hydroxide calcium:

Biocalex (France), Silapex (USA),

e).On the base of trecresol;

Tempofor ,Cresopaste , Cresofen

3.harden (points)

a). plastic

b). gutta percha points (Figure 3).

c).metallic.

FIGURE 2.Linings

FIGURE 3. Gutta percha points.

AMALGAM

Silver amalgam is an almost universal filling material that can be used in any class of cavity. It is not often used in the front of the mouth for aesthetic reasons.

It is prepared by mixing together amalgam alloy (containing silver and tin with trace of, copper and tins), in a finely powdered for, with clean mercury. Amalgam alloy is nowa available as lathe-cut particles or spherical particles. The latter maxes a more fluid mix of amalgam.

The word amalgam means an alloy of mercury with another metal or metals. This type of alloying is called amalgamation. In dentistry before these metals are combined with mercury to make dental amalgam, they are known as dental amalgam alloys. Before the development of high-copper amalgam alloys contained at least 65 wt% silver, 29 wt% tin and less than 6wt% copper. The high-copper amalgam allays contain between 12 wt% and 30 wt% copper and this higher level of copper has resulted in the elimination of the highly corrodible and weak gamma 2 phase that existed in the low-copper amalgams. Zinc is added to amalgam to enchance its physical properties and prolong the service of amalgam restoration. However, when moisture is incorporated during condensation of a zinc-containing low-copper amalgam a delayed expansion will occur. Although zinc-containing high-copper amalgams do not exhibit this delayed expansion, exclusion of moisture enhances other properties, as well as clinical performance, and isolation to prevent any moisture contaminations is important.

Amalgam is made by mixing mercury with a powder of amalgam alloy. The powder may be of the lathe-cut variety. Which is made by milling an ingot of the alloy, or of the spherical type, which is made by atomizing liquid alloy. The spherical particles usually are not true spheres but take on various rounded shapes. Amalgam alloy may also be composed of a mixture of lathe-cut and spherical particles; this type of amalgam is called an admixed alloy.

Dental amalgam constitutes approximately 75% of all restorative materials used by dentists. It has served as a dental restorative for more than

165 years. Its use has at times peen controversial. The most recent controversy is related to amalgam's release of mercury during chewing. There is considerable evidence of the safety of dental amalgam. To date, there is no confirmed evidence to indicate that the mercury in dental amalgam is related to any disease. The US Public Health Service in 1993 reaffirmed its position that there are no data to compel a change in the current use of dental amalgam.

Any component of amalgam or any other restorative material can elicit an allergic reaction, but hypersensitivity to mercury is extremely rare. Of those who have a true allergy to mercury, fewer than demonstrate clinically observable reactions to mercury in dental amalgam restorations.

The worthy peculiarities:

1) harden
2) plasticity
3) doesn't change the color of tooth
4) doesn't destroy
5) hasn't changed by the saliva and by the contact with mucosa

The undesirable peculiarities:

1) bad adhesia
2) high warm-conducting
3) the changing of volume
4) the present of mercury in amalgam because of toxic effect

FST-43 - amalgam is capsules made in Russia.

Amalgam is destined for the filling of cavity, I, II and V classes. Amalgam has high warm-conducting because there is necessary to use under it the lining of cements (phosphate better glass-ionomer). It is necessary to put isolated lining till dentinoenamel junction. At the present time instead lining the bonding systems are used. The worthy peculiarities of there is the good covering of dentin capsules and this except the leak of dentin liquid. Besides that-the bounding systems, create the favourable conditions for the adhesia amalgam and tooth margin.

The preparation is going appropriated with Black’s classification When cavity is ready it is isolated from saliva, dried and the isolating lining is

putting in. It is necessary that bottom of cavity will be covered very well. After that the first portion of amalgam is put into the cavity and is spreaded to the bottom and walls.

Amalgam is mixed and used in the following manner:

1. The proportion of alloy powder and mercury must be accurately dispensed by weight or other measuring system. Too much mercury causes the amalgam to expand excessively and reduces its flow and strength; too little mercury causes loss of working properties and porosity. A ratio of 1 part of alloy to 1,6 parts of mercury by weight is generally found to be the most suitable though the manufacture's directions should be followed carefully.

2. Amalgam is never mixed by hand because of the danger of mercury poisoning. It is mixed: a) In sealed capsules from the manufactures used in an automatic vibrator; b) In an enclosed amalgamator machine which internally doses out the mercury and alloy into a mixing chamber. The proportions of the mix are adjustable. The machine has to be refilled from stock containers from time to time; c) The alloy and mercury are dispensed by hand into reusable capsules which are than mixed in a vibrator.

In all cases the soft amalgam mix will have a smooth, silvery appearance. Excessive mixing breaks down the crystal structure.

3. Small positions of the amalgam are conveyed to the dried cavity in an amalgam carrier and condensed into place with maximum pressure using serrated amalgam pluggers or a mechanical engine condenser to bring excess mercury to the surface. 4. Subsequent portions of amalgam are added to the first and condensed into place until I the cavity is overfilled.

5. After the filling has hardened the excess material, which contains the surplus mercury, is cut away with carving instruments, any matrix is removed and the restoration is contoured to shape.

6. The restoration is checked for height of bite and general occlusion, adjusted as necessary by further carving and may then smoothed with most cotton wool pellets.

7. Before he is dismissed the patient is warned to avoid heavy pressure or eating upon the restored tooth for at least an hour.

Health and safety note regarding the use mercury

Mercury is poisonous it can be absorbed through mercury the skin and the hands should be washed immediately after handling anything that contaminates them with metallic mercury. At room temperature mercury vaporizes into the air and can be absorbed by inhalation. Eating, drinking, smoking and the application of cosmetics should not be allowed in the dental surgery because of the dangers of absorption by swallowing from mercury-contaminated hands and the environment.

The dental surgery should have efficient ventilation and working surfaces and floors should have hard, smooth surfaces with the minimum of crevices.

TEMPORARY FILLING MATERIALS.

The temporary filling materials are destined for the covering of cavity for the period of 1 – 2 weeks.

After the cavity preparation has been completed it may not be convenient or advisible to fill the tooth permanently at the same sitting in which case the tooth is dressed with a temporary filling.

This must be:

1. non -irritant or have a sedative effect
2. it should be quick-setting
3. firm when set
4. resistant to masticatory pressure
5. able to stabilize the tooth
6. yet easily removed when necessary

Common temporary dressings include stiffly mixed zinc oxide and eugenol paste, accelerated zinc oxide eugenol (with zinc acetate as accelerator), zinc phosphate cement and zinc polycarboxylate cement.

The artificial dentin is the most - wide- spread temporary filling material (zinc-sulphate cement). The powder consists of sulphate and zinc oxide in ratio 3: 1 and 5 and 10% kaolin. The powder of artificial dentin is

mixed by the water on the uneven surface of a glass with metallic spatula. At the beginning powder is added to the water in thus ratio that powder will swallow al water then with small portions it will be got the optimal consistence.

The beginning of "bind" of dentin is going on after 1,5-2 minute, the ending - 3-4 minute. The prepared mass is put in with smoother into the cavity as one whole portion after that it is compressed with wadded - ball and is formed with filling instruments.

The filling has to close-fitting cover all cavity. Due to mark that the filling of artificial dentin doesn't have high stability to the mechanic pressure.

Besides that there is the prepared dentin - paste (dentin mixed with oil). This paste is set by the temperature of body during of 2-3 hours. This paste is forbidden for the isolation of liquid-forms of drugs and in the case, if it is necessary to put the constant filling immediately after dentin.

As a temporary material it is possible to use zinc - oxide with eugenol. This filling is more stability to the masticatory pressure than artificial dentin. This filling may be used for the fill of milk teeth.

CEMENTS

Dental cements have several functions in restorative dentistry. One is to serve as a luting agent to fill the space between a restorations fabricated outside the mouth and the tooth structure. A second function is to serve as a filling material for either permanent or temporary restorations. Cements are also used as a bases for other restorative materials as a previously discussed.

Silicate cement was an early tooth - colored filling material. Although it is no longer used, it is ability to resist secondary caries has made it a model for the development of caries - resisting dental materials. Recurrent or secondary caries was seldom encountered around the silicate cement restouration even then gross disintegration had occurred. Most other restorative materials have not shown such an ability to resist recurrent caries, which is the most common cause for replacement of restorations. This beneficial effect is attributed to the fluoride present in silicate cement

powder; which typically contains approximately 15% fluoride. After placement of the silicate restoration the fluoride ions is released and react with the adjoining tooth structure in much the same manner as a topically applied fluoride solution. The enamel solubility is greatly reduced, this building up its resistance to acid attack and caries. Because of evidence that fluoride ions are slowly released through - out the life of the restoration, the protective mechanism is undoubtedly a continuous one.

Luting cements. Several types of cements may be used as luting agents. Each has inherent advantages and disadvantages. This selection of a particular type of cement is governed by the individual situation presented by the patients.

Zinc phosphate cement. Formerly, zinc phosphate cement was the most widely used luting agent. Composed essentially of phosphoric acid liquid that is mixed with zinc oxide powder, the cement has excellent handling characteristics such as setting time, fluidity and film thickness. Furthermore, this type of cement has a long history of successful application for permanent cementation. It does not have anticarious effect, doesn't adhese to tooth structure, and demonstrated a moderate degree of intraoral solubility.

Because of the phosphoric acid liquid, zinc phosphate cement is an irritant and proper pulp protection by using a cavity varnish or cement base is recommended. In those situations in which experience indicate that sensivity and pulp response are likely to be problems, a cement that is more biologically compatible, such as a polycarboxilate cement, is recommended.

Polycarboxylate cements. Is one of the few dental materials that demonstrated true designer to tooth structure. The powder is primarily zinc oxide, and the liquid is polyacrylic acid or copolymer of that acid. Although the final pH of the set cement is comparable with that of zinc phosphate cement, its biologic properties are excellent. For this reason, polycarboxylate cement is useful as a base or as a luting agent, particularly when the cavity preparation is close to the pulp. In addition, as the cement sets against the tooth structure, a chemical bond is formed between the cement liquid and the calcium in the hydroxyapatite in enamel and dentin.

When the cement is used as a luting agent, several manipulative factors influence the wetting of the tooth by the cement and thereby retention of the restoration. After cavity preparation the enamel and dentin surfaces are covered with a thin layer of tenacious debris, referred to as the smear layer. Also, the preparation may be covered by a thin film of cement, such as zinc oxide - eugenol, if a temporary restoration was placed. Unless this contamination is removed, it may inhibit adhesive bonding of the setting cement to the tooth. One means of removing the smear layer is with 10 - to 15 second swabbing with 10 polyacrylic acid.

As with all types of cement, the powder and liquid should not be dispensed until, rest before the mix is to be made. To slow down the setting reaction and provide longer working time, a chilled slab may be used. The powder and liquid should be mixed rapidly; and mix should be completed within 30 seconds.

The recommended powder / liquid ratio should be used. If the mix is too thick, insufficient acid is present to produce bonding to the tooth. If excess liquid is used, the intraoral solubility increases significantly. When properly prepared, the mix has a glossy appearance and can be extruded into a thin film. It is important that minimal time be involved between completion of the mix and placement of the cement.

When polycarboxylate cement is used with cast restorations, the inside surface of the casting must be cleaned thoroughly. After the casting is cleaned in a pickling bath, the interior should be treated with an air abrasive or a fine stone.

Polycarboxylate cement will not wet a chemically dirty surface. It time, leakage and loss of retention may occur along the cement restoration interface.

Glass Ionomer Cement (GIC)

Another type of cement that is based on polyacrylic acid is the GIC. Because of its biologic kindness and potential for adherences to the calcium in the tooth (as with the polycarboxylate system), the glass ionomer cement is used as a restorative material (type II) for treatment of the eroded area as a luting agent (type I) and as a base and liner material (type III).

The glass ionomer cement is an extension of the zinc polycarboxylate cement. The liquid is polyacrylic acid or other alkenoic acids, such as itaconic or maleic, with tartaric acid added to improve handling properties. The acid has the potential for bonding to calcium in the manner described for polycarboxylate. This primary chemical bond provides retention of the cement to the tooth. As notes larlier, this liquid is considered kind in terms of tissue response. The powder is an aluminosilicate glass similar to a silicate cement powder and displays the same fluoride leaching pattern as silicate cement.

Data from glass ionomer restoration of class V erosion lesions for periods of more than 7 years indicates that GIC shows the same resistance to caries seen with silicates. This one can immediately see the attraction of the GIC system: it has a potential for adherence to tooth structure, is biologically kind, and possesses anticariogenic characteristics. The material is supplied as a powder and liquid, and it also is commonly supplied in a preproportioned, disposable capsule to be mixed in n amalgamator. With type I GIC, the manufactured often freeze - dries the acid and places, it in the powder. The mix is made with distilled water, but the setting reaction is the same. The freeze - dried products have better shelf life and somewhat lower viscosity, which is important for lutting cement.

The mix can be made either on a disposable, moisture- resistant paper pad or on a glass slab. A plastic spatula is preferred to a metal one to minimize contamination of the mix from abraded metal. As like polycarboxylate cement, the polyacrylic acid - based liquid is not dispensed until just before the start of the mix. The glass ionomer cements are mixed in a manner like that used for other polyacrylate cements: Large increments of the powder are rapidly incorporated into the liquid, and the mix should be completed within 40 seconds. In general, the working time usually is not more than 3 minutes from the start of the mix. In no instance sould the materials be used if the mix has lost its gloss or a skin has formed.

After setting, the material is more brittle than a polycarboxylate cement. It can be trimmed and finished in much the same manner as zinc phosphate cement.

Before the patient is dismissed all the accessible margins should be covered with the varnish or protective resin supplied by the manufacturer. This protects the cement from oral fluids and dehydration during the next few hours as the setting reaction continues.

Instances of postoperative sensitivity have been reported when th e GIC is used as a luting agent, particularly in deep preparations with minimal dentin. This is possibly attributable to the low initial pH og the cement and its relatively slow set. To guard against potential irritation in very deep areas calcium hydroxide should be placed. The cut dentin surface can be cleaned mechanically with pumice, but the smear layer should not to be removed. After cleaning, the dentin should be rinsed and dried but not desiccated. A slightly damp surface appears to help minimize sensitivity and does not interfere with the setting reaction. In addition to their use as luting agents for cast restorations, GIC have been employed for bonding orthodontic brackets to acid - etched enamel. GIC have lower cohesive strengths than do the resin type orthodontic adhesives, but the fluoride release from the GIC should minimize the white spotting and decalcification sometimes seen around orthodontic brackets or bands. If orthodontic bands are employed on posterior teeth, the GIC is the luting agent of choice.

Resin- modified glass ionomer cements.

The most recent addition to the cement field is the resin - modified glass ionomer cement. These are also sometimes referred to as hybrid glass ionomers or in the case of type II and III cements as light- cured glass ionomers. Disadvantages of conventional glass ionomers include short working time, slow development of ultimate properties, sensitivity to both moisture exposure and dehydration during setting, and lower cohesive strengths compared with resin cements. These problems have been addressed by the development of resin - modified GIC. Resin monomers or a compomer of acrylic acid and a methacrylate such as hydroxyethyl methacrylate (HEMA) are added to the resin is usually light - activated in the same manner as restorative resin composites. The resin component hardens immediately on exposure to the curing light, resulting in an initial set of the cement. The material then continues to undergo the acid - base

reaction is retarded compared with a conventional GIC, which gives a much longer working time. The rapid set after light exposure fields a material that is much less sensitivity to dehydration or moisture.

Type I resin - modified GIC luting cement are also available, in which case the resin component is either chemically or dual activated. Resin - modified GIC type II restorative materials appear to exhibit the advantages of convectional GIC and have received rapid acceptance. Use of resin - modified GIC luting cements is less well established. Fracture of ceramic crowns cemented with resin- modified GIC has been reported, suggesting concern about their use with ceramic restorations.

Zinc Oxide Eugenol.

The acid base reaction between zinc oxide and eugenol results in a cement than can be used as a both a lutting and restorative material. Because of its low strength and high oral solubility, zinc oxide-eugenol is not recommended as permanent luting cement. However, because of its exceptionally kind biologic behavior, it is often used as a base material, as a temporary luting cement, and as a temporary restorative material.

Resin Cements.

Resin luting cements are derived from the composite resin systems used for restorative materials. They may be viewed as lightly filled composites. The resin matrix systems used like the same used for restorative resins. Although these materials are not new in dentistry, they have only recently become used extensively. Their first major clinical application was in direct bonding of orthodontic attachments to acid - etched enamel where they quickly became the materials of choice.

Similar formulations were developed into the pit and fissure sealants. The resin - bonded bridge like the "Maryland" bridge is another applicationin which resin cements came to the forefront. The demand for esthetic dentistry has resulted in extensive use of both resin and ceramic veneers. Resin cements, like an others, are the cements of choice. Finally, new technology for fabricating all ceramic crowns and inlays has greatly increased the use of these restorations, which are normally cemented, with resin cements. Resin cements have high strength, low film thickness, and

very low oral solubility, and can be bonded to etched enamel, ceramics, resins, and etched or treated metal surfaces.

With the advent of dentin adhesives, resin cements provide the possibility of bonded, indirect restorations.

Resin cements are usually available in different shades for color matching beneath translucent restorations, and opaque cements are made for masking metal substructure. The first resin cements were two component chemically activated curing systems. Visible light - activated, single - component system are now available and are popular when used with translucent restorative materials. Dual - activated materials which have both chemical activators and light activators, are recommended for use beneath thick restorations and where geometry may limit access to the curing light.

Mixing reinforced zinc oxide - eugenol cement

This is not a suitable liming for composite materials

1. Portions of the white powder and yellow liquid are set out on a glass or paper slab, powder to liquid ratio : 4:1
2. With a metal spatula the powder and liquid are mixed together, in 1 minute, to form a stiff paste
3. The paste will set in about 5 minutes
4. Plastic instruments can be dipper into lain powder to prevent the cement from sticking to them.

Mixing zinc polycarboxylate cement

This sticks to both enamel and stainless steel

1.Mix, according to the manufacturer's instructions on a paper slab using a steel spatula, to form a stiff paste

2.The material should be used immediately or it will become "Cobwebby"

3.Clean the spatula at ones with a wet gauze.

4.The material sets in about 5 minute's

Mixing zinc phosphate cement

Portion of the cement powder and liquid are placed on a cold glass mixing slab. The liquid bottle must not be left open to the air for any longer than necessary or the water content will change and this will upset.

Physical characteristics of Composites

There are 2 indicators for the characteristics of composite materials:

1. The mechanism of setting (chemical or light-cured)
2. The size of filler.

The size a filler is the most important indicator (the size of particles and level of filling). In according with it there are differented the following groups:

Macrofilled composites (the size particles-10-45 mkm 60% of filling) of chemical setting: Evicrol, Noracril. This materials have enough harden, but haven't color stability, they are bad polished and irritant for pulp, for example Evicrol.

Microfilled composites (the size of particles-0,4-0,8 mkm 45% of filling) light - cured: Helioprogress, Heliomolar. They are have bad stability for erasing, give big volume engaging, but good polised and less toxity.

Minifilled composites (the size of particles 1-10 mkm 70% of filling) light -curea: Vizifil, Prizmafil. The fillings are good polished and bad stability to erasing.

Hybrids (the size of particles of 0,05-50 mkm, 50% of filling) light-cured:

Pertak, Tetrik. This materials are stability to erasing, good polished, have bad toxity. Among hybrids there are several group of materials with particles 0,5-10 mkm and with 85% of filling; Prisma TPT, Charisma, Gerkulayt. The materials are color - stability, stability to erasing, non toxity.

Compomers include itself the properties of gibrid and glass ionomer. This materials are characterized with chemical joining to tooth's tissues, and medical joints contents of fluor. Fluor gradually is entered into hard tissue.

Dyract is representative of this group. System is composed of 2 components: composite filling material, which is divided into 8 capsules (8 colors) and liquid (primer - adhesive).

Adhesive provides good adhesia of material to dentin and enamel of tooth. Dyract is defined for restoration of defects of III IV classes, wedge defects, erosia of hard tissues, some kinds of hypoplasia of enamel, for the restoration of perygingival wall of II class, for putting of linings and for base under composite restorations.

Adhesive systems-these are the complex of compound liquids. They promote for joining composite materials to tooth tissue: primer, which is joned with dentin and adhesive which provide the joining of composite with enamel and film of primer. There different universal adhesive systems, which are used for fixing composite linings, for restoration.

One major disadvantage of light cured composites must be emphasized polymerization will only occur if the resin is composed to light of sufficient intensity for an adequate length of time.. However, the cure of the portion of the restoration farthest removed from the light is less certain. Normally this portion of the restoration is not accessible for any kind of probing to test its hardness. If the cure is incomplete on the bottom side of the resin compared with the top surface, the physical properties will the reduced and a color shift may occur in time. Likeurise, unpolymerized monomer may increase the potential for pulpal irritation. Microleakage is another likely scenario. To ensure maximum polymerization, the end of the light source should be within 1,0 mm from the surface of the resin. The curing time should be at least 40 seconds, and the depth of resin to be cured should not exceed 2,5 mm. Larger restoration and dark shades of resin require an incremental placement technique. The curing light should be tested regularly to ensure adequate light intensity. Inexpensive meters are available for this purpose and shoud be used regularly.

Posterior Composite Restoration.

The use of composite resin has been generally confined to anterior or nonstress - bearing locations such as Class III, Class V, and Class IV restorations. However, since the introduction of the modern resin composites, attempts have been made to use them as alternatives to dental amalgam for class I and II restorations.

The improved strength, hardness, and modulus of elasticity of come of the newer composite resins, with their low thermal conductivity and superior esthetics, indicate that they might serve as alternatives for amalgam in the restorations of occlusal and proximal surfaces in posterior teeth (Class I and Classs II restorations).

There now exist resin composites, mostly of the small - particle type. Where as dental amalgam is one of the least technique - sensitive restorative materials and one whose microleakage decreases with time, composite resins are the opposite. The microleakage problem with anterior composite restorations was significantly reduced by the development of the acid-etched enamel bonding technique. Another problem with the posterior restorations related to the curing shrinkage pattern. Most composite resins shrink 2% or more during curing light-cured composite hardens first on the surface immediately adjacent to the curing light tip.

Prime and Bond 2,0 (universal adhesive system) provide the adhesia both to enamel, and to dentin. The absolutely new peculiarity is that the primer and adhesive are in one bottle. Before using of this system there is necessary to remove "the smear layer" of dentin by the treatment with acid. This bond system is compatible with all composites on the base BISGMA.

There are analog with other systems : All - Bond2, OptiBond, Syntac and Scothe Bond Plus(FIG 1).


G-BOND
KIT

from gingival margin, that in first time to provide the connecting of material to enamel, remains fairly constant throughout the life of the pulp. Visible light is capable of polymerizing a reasonable thickness of resin (2 mm). It also will cure the resin through a layer of enamel, a particular advantage m the class III restorations. Although, protective glasses arc recommended to shild the operator's eyes from the glare of the intense blue light, visible curing lights do not pose a significant safety risk gingival margin. This places the best stresses from curing shrinkage resin that are least well cured.

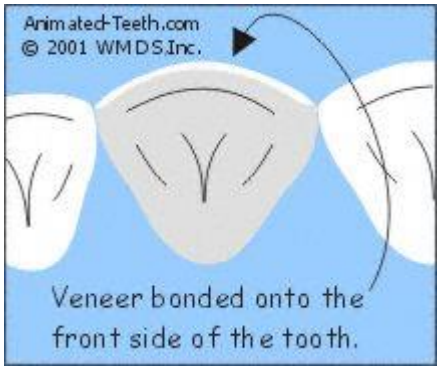
Resin inlays

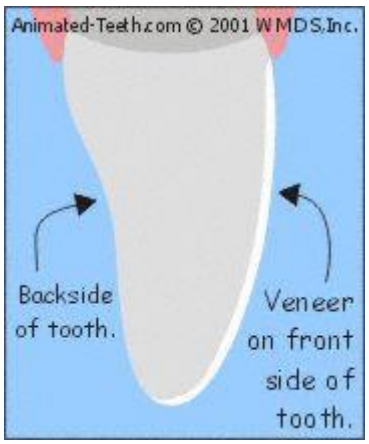
The rest inlay restoration addresses some of the shortcomings of composite resins, particularly the difficulties with placement and light curing previously discussed. The indirect inlay restoration is fabricated in the laboratory on a die poured from an impression of the prepared tooth like wax pattern for a cast restoration. An alternative for the resin inlay is a direct technique. A separating medium is applied to the prepared tooth, and the resin is condensed and light cured. It is then removed from the mouth and subjected to additional curing procedures. Either technique allows better access for light —curing the composite, and the finished restoration can be subjected, to additional curing under intense light, heat, and pressure or some combination. More importantly the polymerization shrinkage occurs outside the mouth. The finished inlay is cemented in the mouth using a resin cement.

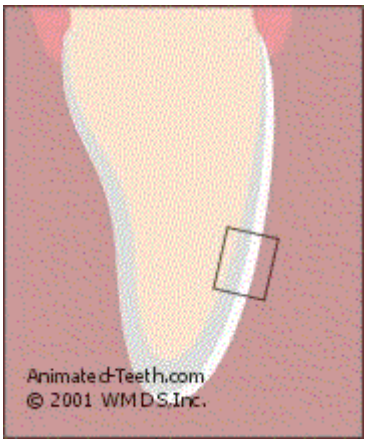
PORCELAIN VENEERS

What are porcelain veneers?

Porcelain veneers, alternatively termed dental veneers or dental porcelain laminates, are wafer-thin shells of porcelain that are bonded onto the front side of teeth so to create a cosmetic improvement for a tooth. Porcelain veneers are routinely used by dentists as a way to make cosmetic changes for teeth that are discolored, worn, chipped, or misaligned.


Animated-Teeth.com
© 2001 WMDS.Inc.
Veneer bonded onto the
front side of the tooth.


Animated-Teeth.com © 2001 WMDS,Inc.
Backside of tooth.
Veneer on front side of tooth.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contaminated by saliva, the saliva film cannot be completely removed by washing. Rather, the surface should be re-etched for 10 seconds, washed, and dried. The acid cleans the enamel to provide better wetting of the resin and creates pores into which the resin flows to produce "tags" that greatly increase retention. The resulting bond should reduse the possibility of marginal stain, which is the invariable results of microleakage.

Bonding Agents

As an adjunct to the acid -etch technique, manufactures formerly supplied enamel - bonding agents. The bonding agents consisted of Bis-GMA resin matrix material diluted with a low -viscosity methacrylate monomer. After acid etching of the enamel, the agent was applied. The composite resin was the immediately inserted, and it in turn bonded to the intermediate layer of resin- bonding agent. It should be emphasized that the resulting bond to tooth structure is strictly mechanical.

The success of the acid etch , enamel-bond technique led to attempts to do the same for bonding to dentin.

For the past 20 years, research has focused on agents that would bond adhesively to dentin. That has led to the introduction of dentin-bonding agents, which are either chemically activated or light cured. They are applied to the dentin before placement of the composite.

Current developments have focused on development of delivery system that simplify the steps involved in using dentin-bonding systems. Acidic primers that are self etching have been introduced. Other system combine the primer and the resin adhesive into one component. Most of the bonding agents currently marketed are sold as universal bond agents to be used with both dentin and enamel. Bond strengths reported for etched enamel usually equal those for the original enamel-bonding agents that have largely disappeared.

DIAGNOSTIC PROCEDURES

The art and science of diagnosis

Diagnosis is the ‘‘determination of the nature of a diseased condition by careful investigation of its symptoms and history’’.The sophisticated technology available to clinicians today can support sound diagnostic procedures. However, technology does not alter the fundamental nature of diagnosis as a process of active listening, precise observation , and genuine curiosity about the source of the presenting signs and symptoms. An accurate diagnosis is the result of the synthesis of scientific knowledge, clinical experience, intuition, and common sense. It is both an art and a science.

A good diagnostician is a clinician who has learned the fundamentals of gathering and interpreting clinical information, testing thoroughly, and asking appropriate questions. Systematic recording of the patient’s responses to the clinician’s tests and inquiries is essential for diagnostic success. The facts about the patient’s medical history and dental history, the details of the presenting signs and symptoms, and careful gathering of test results are the analytic core of clinical diagnosis. A chronically inflamed or diseased pulp is a nonurgent condition that will almost always be identified through conscientious application of this protocol.

There are instances , however, when a patient has intense pain, conflicting signs and symptoms, or inconsistent responses to clinical testing.

Medical history

A recent, well – organized record of medical history is a critical part of the picture of the patient that a clinician always needs to create. Although the only systemic contraindications to

endodontic therapy are uncontrolled diabetes or a very recent myocardial infarction, only the patient's medical history enables the clinician to determine the need for a medical consultation or premedication of the patient. Completion of a preprinted, succinct, comprehensive medical history form is mandatory, and it represents the standard of care.

Some patients require antibiotic prophylaxis before clinical examination because of systemic conditions such as heart valve replacement , a history of rheumatic fever, or advanced acquired immunodeficiency syndrome(AIDS). Ptients taking daily anticoagulant medications such as warfarin(Coumadin) may need a dosage reduction or suspension of the drug before the periodontal examination, wich is integral to a complete endodontic diagnostic workup. Additional barrier protection can be provided to all clinical personnel if the patient's medical history reveals infection with communicable diseases such as hepatitis B or tuberculosis.

An aging population results in an increasing number of patients with continuing diseases processes. Before rendering endodontic therapy , the clinician must know what drugs the patient is using to identify possible adverse drug interactions. Such cases mandate consultation with the treating physician. The permanent patient record should include a summary of any conversations with other treating dentists and with treating physicians and an outline of any care recommendations.

Dental history

Although the medical history provides the clinician with the basic health context in which to evaluate the patient's needs, the dental history offers the mechanism for identifying the patient's chief complaint. The patient's completion of the dental history, also an organized, preprinted form, offers the patient the first opportunity to record his or her experiences in a cogent, meaningful way. A report of this kind gives the patient a voice in

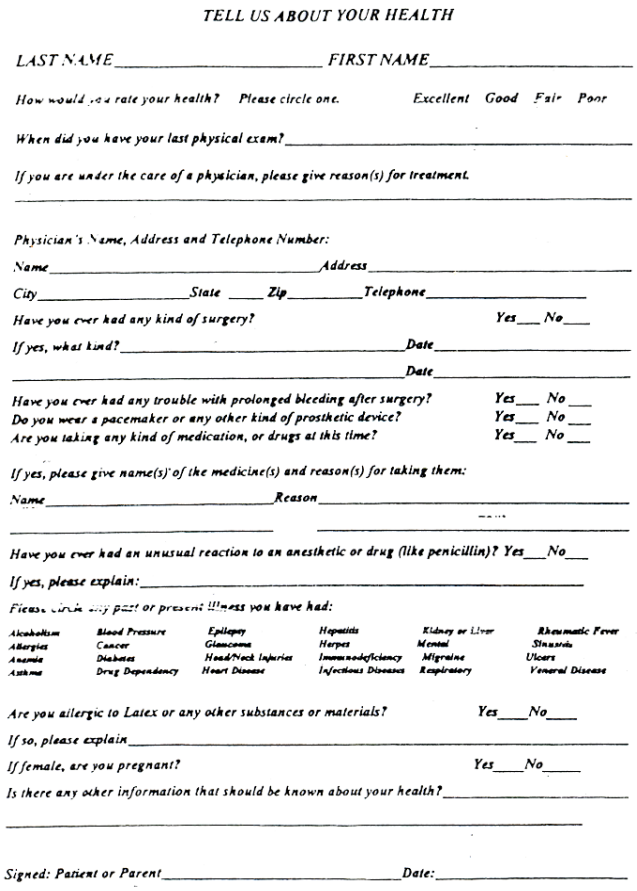
the process of diagnosis, and it affords the clinician initial information about the patient's signs and symptoms, the duration of the problem, and the patient's own experience of what leads to relief or an increase in symptoms. The dental history form accelerates the clinician's determination of the patient's main concerns(Fig 2).

The most effective way for the clinician to reconfirm the patient's descriptions of his or her main concern and to evaluate their accuracy is the use of directed relevant questions that build on those that make up the dental history. It is useful to begin with a general question regarding the chief complaint: ''Can you tell me about your problem?'' This question should be followed by several more specific questions regarding the following:

- inception: ''When did you first notice this?''
- provoking factors: ''Do heat, cold, biting, or chewing cause pain?''
- attenuating factors: ''Does anything relive the pain? Drinking warm or cold liquids? Lying down or sitting up?''
- frequency: ''How often does this pain occur?''
- intensity: ''When you have this pain, is it mild, moderate, or severe?''

Careful, sensitive listening to the patient's responses to these queries allows the clinician to develop a narrative description of the patient's chief complaint.

Systematic patients, most of whom have obvious problems of pain or swelling, should be led



TELL US ABOUT YOUR HEALTH

LAST NAME_____ FIRST NAME_____

How would you rate your health? Please circle one. Excellent Good Fair Poor

When did you have your last physical exam?_____

If you are under the care of a physician, please give reason(s) for treatment.

_____

Physician's Name, Address and Telephone Number:

Name_____Address_____

City_____State ____ Zip_____Telephone_____

Have you ever had any kind of surgery? Yes___ No___

If yes, what kind?_____Date_____

_____Date_____

Have you ever had any trouble with prolonged bleeding after surgery? Yes___ No___

Do you wear a pacemaker or any other kind of prosthetic device? Yes___ No___

Are you taking any kind of medication, or drugs at this time? Yes___ No___

If yes, please give name(s) of the medicine(s) and reason(s) for taking them:

Name_____Reason_____

_____ _____

Have you ever had an unusual reaction to an anesthetic or drug (like penicillin)? Yes___No___

If yes, please explain:_____

Please circle any past or present illness you have had:

Alcoholism	Blood Pressure	Epilepsy	Hepatitis	Kidney or Liver	Rheumatic Fever
Allergies	Cancer	Glaucoma	Herpes	Mental	Sinusitis
Anemia	Diabetes	Head/Neck Injuries	Immunodeficiency	Migraine	Ulcers
Asthma	Drug Dependency	Heart Disease	Infectious Diseases	Respiratory	Venereal Disease

Are you allergic to Latex or any other substances or materials? Yes____No____

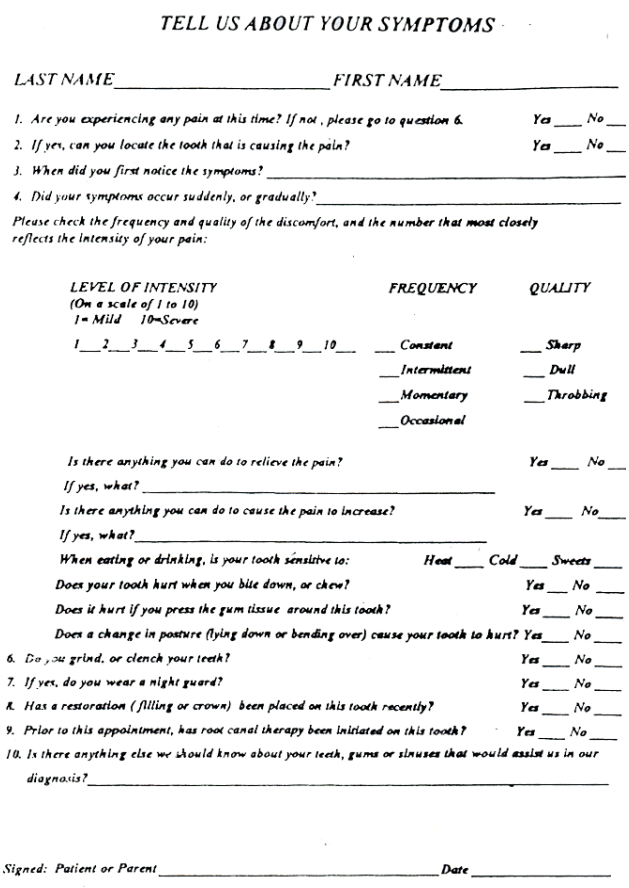
If so, please explain_____

If female, are you pregnant? Yes____No_____

Is there any other information that should be known about your health?_____

_____

Signed: Patient or Parent_____Date:_____



TELL US ABOUT YOUR SYMPTOMS

LAST NAME_____FIRST NAME_____

1. Are you experiencing any pain at this time? If not, please go to question 6. Yes ___ No ___
2. If yes, can you locate the tooth that is causing the pain? Yes ___ No ___
3. When did you first notice the symptoms? _____
4. Did your symptoms occur suddenly, or gradually?_____

Please check the frequency and quality of the discomfort, and the number that most closely reflects the intensity of your pain:

LEVEL OF INTENSITY (On a scale of 1 to 10) 1= Mild 10=Severe	FREQUENCY	QUALITY
1 2 3 4 5 6 7 8 9 10	___ Constant	___ Sharp
	___ Intermittent	___ Dull
	___ Momentary	___ Throbbing
	___ Occasional	

Is there anything you can do to relieve the pain? Yes ___ No ___

If yes, what? _____

Is there anything you can do to cause the pain to increase? Yes ___ No___

If yes, what?_____

When eating or drinking, is your tooth sensitive to: Heat ___ Cold ___ Sweets ___

Does your tooth hurt when you bite down, or chew? Yes ___ No ___

Does it hurt if you press the gum tissue around this tooth? Yes ___ No ___

Does a change in posture (lying down or bending over) cause your tooth to hurt? Yes___ No ___

6. Do you grind, or clench your teeth? Yes ___ No ___
7. If yes, do you wear a night guard? Yes ___ No ___
8. Has a restoration (filling or crown) been placed on this tooth recently? Yes ___ No ___
9. Prior to this appointment, has root canal therapy been initiated on this tooth? Yes ___ No ___
10. Is there anything else we should know about your teeth, gums or sinuses that would assist us in our diagnosis?_____

Signed: Patient or Parent_____Date _____

FIG 2.Succinct,comprehensive medical history form gather information
that may have
relevance to the final diagnosis

FIG 3.Dental history form designed to expedite the gathering of information about the patient's symptoms

additional series of questions that will identify the urgency of the problem. These questions should be phrased to encourage the patient to expand the information already given. These include questions that address the following:

- location: ''Could you point to the tooth that hurts or to the area that you feel is swelling?''

- duration: '' When heat (or cold) causes pain, is the pain momentary, or does it last longer?''

- postural : ''Do you have any pain when you lie down or bend over?''

- stimulated or spontaneous: ''Does the pain ever occur without provocation? ''

- quality : ‘‘What is the nature of the pain? Sharp? Dull? Stabbing? Throbbing?’’

The application of the techniques of active listening to the patient’s verbal responses to all these questions enables the clinician to sort them into the elements of a preliminary diagnosis. When the clinician uses the dental history form(see Fig3), many of the questions included in the preceding list may have already been answered by the patient, thereby allowing the clinician to identify the source more quickly. This important dialogue between the patient and the clinician is the first diagnostic step. It is essential to the development of the patient’s trust in the openness and receptivity of the clinician, and it guides the selection and sequence of the second diagnostic step, clinical examination.

Pain

Frequently dental pain is the result of an inflamed or degenerating pulp. This is the common symptom offered by patients in need of diagnosis. In general, this source of pain is revealed through the dental history, inspection of the tooth, clinical examination, and diagnostic testing. Despite the straightforward nature of this most frequent symptom and its source, the psychobiologic components of pain can make the diagnostic procces challenging. Pain perception is an area especially susceptible to patient misinterpretation. Fear and other psychologic conditioning can lead to a perception of pain that is out of proportion to the stimulus applied. Nevertheless, the majority of patients who have a complaint of pain that is determined to be of odontogenic origin will be diagnosed with irreversible pulpitis, with or without partial necrosis.

The accuracy and precisionof the patient’s description of pain depends on whether the inflammatory state is limited to the pulp tissue. If the inflammation has not reached the periodontal ligament, it may be difficult for the patient to localize the pain.

Because the neural portion of the pulp contains sensory fibers that will transmit only pain, the patient may describe the pain with such terms as sharp, dull, continuous, intermittent, mild, or severe. However , the periodontal ligament also contains proprioceptive sensory fibers.

Pain can also be referred to other areas of the mouth and even to the neck or temple area.It is most common for referred pain to manifest in the adjacent teeth or in the opposing quadrant. It is rare for odontogenic pain to cross the midline of the head. Referred pain may also be ipsilaterally referred to the preauricular area, down the neck, or up to the temple. In these instances a posterior tooth is almost always the source of the referred pain.

Patients may report that their dental pain is exacerbated by lying down or bending over. This change occurs because of the increase in blood pressure to the head , which in turn increases pressure on the inflamed, confined pulp.

In some cases emotional disorders can manifest as dental pain. If no organic cause for the presenting dental pain can be, found, the patient should be referred to a pain clinic or to a physician for medical consultation. Patients with atypical facial pain of nonodontogenic origin may begin their long journey through the many specialties of the health sciences in the dentist's office.

Examination and testing

The extraoral visual examination of the patient should begin while the clinician is taking the patient's history. Speaking with the patient affords the clinician the opportunity to observe the patient's facial features. This external observation should be organized as meticulously as all the other potions of the examination. A consistent step –by – step approach helps the clinician develop diagnostic discipline and good examination habits. A careful, methodical approach also minimizes the possibility that significant information will be overlooked.

In observing the patient during this part of the examination, the dentist should look for facial asymmetry or distentions that might indicate swelling of odontogenic origin or even a systemic ailment. The patient's eyes should be observed for pupillary dilation or constriction, which may be signal systemic disease, premedication, or fear. The patient's skin should be checked for the presence of any lesion. If more than one lesion is found, it should be noted whether the lesions appear randomly or follow one of the branches of the trigeminal nerve. Occasionally facial lesions(e.g., a sinus tract draining through the skin) can be traced to a tooth as the source.

After completing a through extraoral visual examination of the patient, the clinician should proceed with an oral examination. The necessary tools for a comprehensive oral examination include two mouth mirrors, 2x2 – inch gauze, cotton rolls, a saliva ejector, a headlamp, and good magnification . Abnormalities are easier to see in dry oral issue, so this portion of the examination should begin with drying the first quadrant under examination with 2 x 2 – inch gauze. The clinician should look for signs of caries, toothbrush abrasion, darkened teeth, observable swelling, fractured teeth, and defective restorations. In addition, the clinician should be alert for signs of abrasion, attrition, cervical erosion, or developmental defects(e.g., external tubercles, lingual grooves).

As in the extraoral visual examination, a high indexof suspicion will lead the clinician to through, patient – sensitive completion of the oral examination. Any unusual changes in the color or contour of the soft tissues should be noted. For example, the clinician should look carefully for lesions of odontogenic origin, such as sinus tracts or localized redness or swelling involving the attachment apparatus. Generally, sinus tracts indicate necrosis and periapical suppuration that has burrowed its way from the cancellous bone, through the cortical plate and

Because digital percussion is less painful than percussion with the handle of the mouth mirror, the first percussion test should be performed with the clinician's finger. The teeth should be randomly tapped in all directions so that the patient will be unable to anticipate the percussion of the suspect tooth. If the patient is unable to discern a difference in sensation with digital percussion, then the blunt handle of a mouth mirror should be used. Each tooth should be percussed on the facial, occlusal, and lingual sides .

A positive response to percussion indicates not only the presence of inflammation of the periodontal ligament but also the degree of the inflammation. The degree of response is directly proportional to the degree of inflammation. If the pulp inflammation extends beyond the apical foramen, or if the bacterial endotoxin have spilled out beyond the apical foramen, the periodontal ligament will be irritated and an inflammatory response will occur. Rapid orthodontic movement of teeth, a recently placed restoration in hyperocclusion, or a lateral periodontal abscess may also inflame the periodontal ligament. Where chronic periapical inflammation is present, percussion testing often yields a negative result.

Mobility

Tooth mobility is directly proportional to the integrity of the attachment apparatus or to the extend of inflammation of the periodontal ligament resulting from pulpal inflammation or degeneration. The clinician should use two mouth – mirror handles to apply alternating lateral forces in a facial – lingual direction to observe the degree of mobility of the tooth. The degree of depressibility of the tooth within its alveolus should also be tested by pressing thr tooth into its socket and watching for any vertical movement.

First – degree mobility is less than 1mm of horizontal movement. Second – degree mobility is about 1mm of horizontal movement. Third degree is greater than 1mm of horizontal movement accompanied by vertical depressibility.

The pressure exerted by the purulent exudate of an acute apical abscess may cause some transient mobility of a tooth. This mobility is quickly relieved by the establishment of drainage for the exudate. Horizontal root fracture in the coronal half of the tooth, very recent trauma, chronic bruxism, and overzealous orthodontic treatment are also causes of tooth mobility.

Radiographs

Although periapical radiographs cannot be used exclusively for endodontic diagnosis, they are an essential aid to the determination of the source of presenting signs and symptoms. The clinician will need to take any series of films necessary to lead to a full picture of the tooth or teeth involved. These films may include panographs, lateral jaw radiographs, occlusal radiographs, or bite – wing films. Because anatomic aberrations can be misinterpreted, when there is any doubt about the diagnosis, a contralateral exposure of the same type of radiograph is a prudent step. A radiolucency, for example, will not begin to manifest until demineralization extends into the cortical plate of the bone. A contralateral exposure will reveal this condition. Unfortunately, a few clinicans rely exclusively on radiographs in attempting to arrive at a diagnosis; this naivete often leads to misdiagnosis and mistreatment.

A high – quality radiograph requires good technique – proper placement, exposure, and processing. High – quality radiographs provide the foundation for accurate interpretation. However, because a radiograph is a two – dimensional image of a three – dimensional tooth, radiographic strategy should involve the exposure of two films at the same vertical angulation but with a

10 to 15 – degree change in horizontal angulation. This approach enables the clinician to construct a three – dimensional mental model of the anatomic and possible pathologic features. Examination of the dry films with appropriate magnification and background illumination is critical to accurate radiographic interpretation.

The status of the health and integrity of the pulp cannot be determined by radiographic images alone. However, the discovery of deep caries, pulp caps, extensive restorations, pulpotomies, pulp stones, extensive canal calcification,resorption, radioluciences at or near the apex, root fractures, a thickened periodontal ligament, and periodontal disease that has caused bone loss should heighten the clinician's suspicion of inflammatory or degenerative pulp changes.

Radiographic interpretation

The interpretation of high – quality pretreatment periapical radiographs must be conducted in a consistent, orderly way. The crown, the root(s), and the root canal system must all be closely studied. The following questions should guide the clinician's examination of the radiographs:

- Is the lamina dura intact, or is there a loss of the lamina dura?
- Is the bony architecture within normal limits, or is there evidence of demineralization?
- Is the root canal system within normal limits, or does it appear to be resorbing or calcifying?
- What anatomic landmarks could be expected in this area?
- Are these films clear, or are additional films needed?

A sound, correct examination protocol includes the process of answering each of these questions thoroughly and carefully.

It is often helpful to prepare bite – wing films in addition to periapical films in the posterior region. Early caries, the depth of existing restorations, pulp caps, and pulpotomies, or dens invaginitus or dens evaginatus can be more easily identified in bite – wing films. Deep caries or extensive restorations increase the likelihood of pulpal involvement. A single root canal should appear tapering from crown to apex; a sudden change in appearance of the canal from dark to light indicates that the canal has bifurcate or trifurcated. The presense of ‘‘extra’’ roots or canal is much more common than was previously thought. The clinician should always carry the suspicion of the presence of ‘‘extra’’ canals. Three rooted mandibular molars and maxillary premolars and two – rooted mandibular canines and incisors will be found with greater frequency as the clinician’s understanding of anatomy, index of suspicion, and diagnostic sophistication improve.

A necrotic pulp will not cause radiographic changes until the metabolic beakdown products of pulp degeneration or bacterial toxins have begun to demineralize the cortical plate. For this reason significant medullary bone destruction may occur before any radiographic signs start to appear. Toxins and other irritants may exit through a lateral canal, causing periradicular demineralization. Conversely, a lateral canal can also be a portal of entry for harmful toxins in teeth affected by periodontal disease.

Pulp stones and canal calcifications are not necessarily pathologic; they can also be the result of normal aging of the pulp. Consequently, in the absence of any additional signs or any symptoms, the presence of pulp stones or canal calcification should not be interpreted as pulpal disorders requiring endodontic therapy.

When the patient’s dental history records pain with thermal change (usually cold), the clinician should expect a strong

response to thermal testing. In this situation in particular the clinician must explain the necessity of thermal testing to the patient and its value in finding and relieving the source of pain. Before procceding, the clinician should explain the procedure for thermal testing to the patient and should demonstrate the testing on several teeth on the contralateral side. This approach will be both instructive and reassuring to the patient. In addition, the clinician and the patient must agree on a signal through which the patient can indicate immediately that he or she is feeling pain. The most commonly used signals are patient's raised hand or a soft, audible sound.

Reliable responses to pulp vitality testing are critical and depend on the teeth being dry. Before initiating testing, the clinician should isolate the teeth to be tested and dry them with a 2x2 – inch gauze. The area most be kept dry with a saliva ejector. A blast of air should not be used to dry the teeth because room – temperature air can cause thermal shock if the pulp is inflamed. Additionally, air blasts can spray saliva onto the assistant or the dentist.

Cold test

Several methods for cold testing teeth yield interpretable results. These are cold – water bath, ethyl chloride, sticks of ice, and carbon dioxide ice sticks. Although each of these methods delivers cold to the tooth, ethyl chloride and a cold bath are the most frequently used. Although the ethyl chloride method is the most convenient for the clinician, the cold – water bath, which takes more time, will elicit the most accurate patient response. Sticks of ice are seldom used because they mat warm when applied to the tooth and leak onto the gingival, causing a false – positive response. Carbon dioxide dry ice sticks are extremely cold (- 77.7^0C , -108 ^{0}F) and may cause infraction lines enamel or damage to an otherwise healthy pulp.

In the ethyl chloride method ethyl chloride is sprayed liberally onto a cotton pellet. The cotton pellet. The cotton pellet is shaken to remove excess liquid, and the chilled pellet is then applied immediately to the middle third of the facial surface of the crown . The pellet is kept in contact with the crown for 5 seconds or until the patients begins to feel pain.

Thr cold – water bath method requires isolation of the tooth woth a rubber dam.Iced water is sprayed onto the tooth with a plastic syringe for a 5 seconds or until the patient begins to feel pain(Fig.6 and Fig. 7).

Fig.6. Ise crystals forming on a cotton pellet

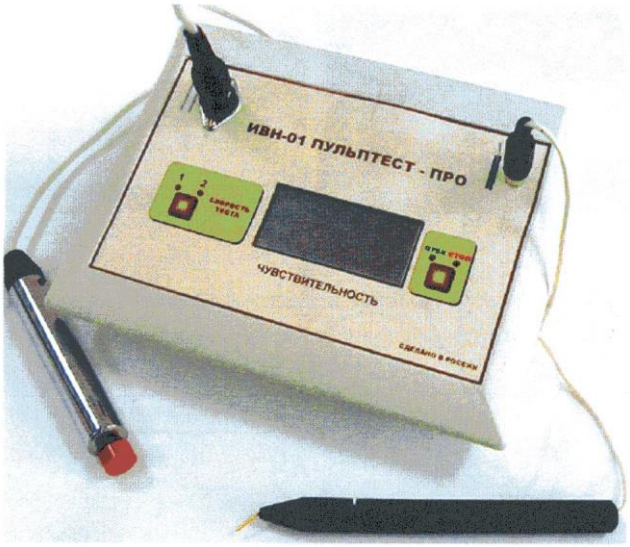
Although the cold – water bath methods of thermal testing are more time – consuming for the clinician, they are clearly superior in their accuracy. The use of water allows the entire crown to be immersed, not just one section of one surface of tooth. Even when the tooth has been restored with a full crown, sufficient contact is made to allow cooling or warming of the pulp. In addition, the cold – and hot – water bath methods prevent excessive temperature change damage to the tooth.

Responses to thermal test

The sensory fibers of the pulp transmit only pain, whether the pulp has been cooled or heated. There are four possible responses to thermal stimulation:

1. No response
2. Mild to moderate degree of awareness of slight pain that subsides within 1 to 2 seconds after the stimulus has been removed
3. Strong, momentary painful response that subsides within 1 to 2 seconds after the stimulus has been removed
4. Moderate to strong painful response that lingers for several seconds or longer after the stimulus has been removed.

If there is no response to thermal testing, a nonvital pulp is indicated. However, no response to thermal testing can also indicate a false – positive response because of excessive calcification, an immature apex, recent trauma, or patient premedication. A momentary mild to moderate response to thermal change is generally considered within normal limits. A painful response that subsides quickly is characteristic of reversible pulpitis. A painful response that lingers after the stimulus is removed is characteristic of irreversible pulpitis.


ИВН-01 ПУЛЬПТЕСТ - ПРО
ЧУВСТВИТЕЛЬНОСТЬ

Electric pulp testing technique

The teeth to be tested must be isolated and dried with 2x2 – inch gauze, and the testing area must be kept dry with a saliva ejector if the testing results are to be valid. The clinician must explain to the patient the diagnostic value and the procedure to be followed.

It is also important that the patient be specifically prepared for the tingling or heat sensation that he or she will fell during the testing. The clinician can provide additional reassurance to the patient by first testing several teeth on the contralateral side. The patient should be instructed to raise a hand when any sensation is felt.

The Analytic Technology Pulp Tester is widely used because digital reading always starts at zero and the rate of flow of the current is easily controlled. First the lip clip should be attached, and the electrode of the pulp tester should be generously coated with a viscous conductor(e.g., toothpaste). The electrode should then be applied to the dry enamel on the middle third of the facial surface of the crown of the tooth being tested. The current flow should be adjusted to increase slowly to allow the patient time to respond before the attendant tingling sensation becomes painful. The electrode should not be applied to any restorations because this could lead to a false reading.

Each tooth should be tested at least two or three times. The average of the several readings should be recorded. The patient's response may vary slightly with each test. However, a significant variation in response suggests a false reading. Generally, thicker enamel will lead to a more delayed response. Thinner enamel of anterior teeth will yield a quicker response than the thicker enamel of posterior teeth. If the patient's medical history reveals that a cardiac pacemaker has been implanted, the use of an electric pulp tester is contraindicated because of potential interference.

Electric pulp tester false readings

Although the electric pulp tester is generally reliable in determining pulp vitality, false readings can occur in certain circumstances. A false – positive reading means that the pulp is necrotic, yet the patient will signal that there is sensation in the tooth. A false – negative reading means that the pulp is vital, yet the patient will be unresponsive to electric pulp tests.

Main reasons for a false – positive response

-Electrode or conductor contact with a metal restoration or the gingiva

-Patient anxiety : Without proper instruction about the reasons and methodology for electric pulp testing, and without preparation for the sensations that occur, a frightened or neurotic patient may raise his or her hand immediately when asked: ‘‘Do you feel anything? ’’

-Liquefaction necrosis may conduct current to the attachment apparatus, leading the patient to raise his or her hand slowly near the highest range of current flow

-Failure to isolate and dry the teeth before testing(saliva acts as a conductor)

Main reasons for a false – negative response

-The patient has been heavily premedicated with analgesics, narcotics, alcohol, or tranquilizers

-Inadequate contact between the electrode or conductor and the enamel plate

-A recently traumatized tooth

-Excessive calcification of the canal

-Recently erupted tooth with an immature apex

-Partial necrosis: Although the pulp is vital in the apical half of the root, the absence of a response to the electric pulp test could appear to suggest that there is total necrosis.

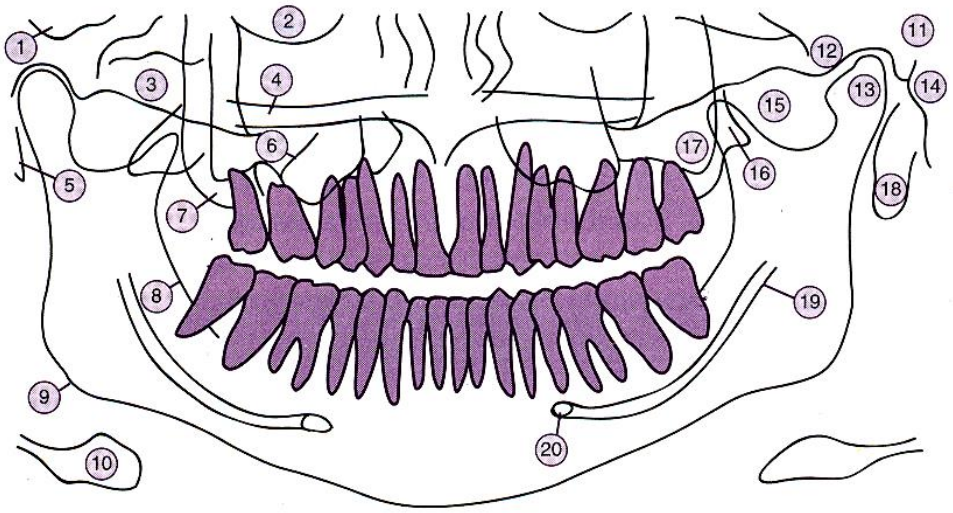
PANORAMIC TOMOGRAPHY

Like any technique, panoramic tomography has its advantages and disadvantage when compared with conventional intraoral techniques. The pantomographic unit is expensive (approximately four times the cost of a regular x – ray tube head). The standard x – ray unit is still necessary even in an office with a panoramic unit. The full – mouth series, composed of periapical and bitewing films, has been and still is the gold standard for routine dental radiography, and any other technique should be judged in comprasion.

Advantages

Size of the Field. Field size is one of the major advantages of the pantomogram. The full – mouth series is not composed of radiographs of the entire mouth but only of the teeth, alveolar ridges, and part of the supporting bone. The pantomogram covers an area that includes all of the mandible from condyle to condyle and the maxillary regions extending superiorly to the maxillary sinus and nasal cavity(Figure 6). Areas of the mandible, such as the condyles, inferior border, angle, ascending ramus, and coronid process, as well as the entire maxillary arch, which are not visualized on intraoral surveys, are seen routinely on pantomograms. Lesions that might be undetected on intraoral suveys may be seen in the field of pantomograms.

A new indication for the use of panoramic films has recently been reported. Some patients who are at risk for cerebrovascular accidents because of the presence of atherosclerotic plaque in their carotid arteries can be identified in the dental office by appropriate evaluation of their panoramic films for calcifications. Most pantomograms will show the area adjacent to or below the intervertebral space between C3 and C4, which is the location of the carotid arteries that might show evidence of calcifications. Pantograms should not be taken solely to screen for carotid artery



1. Middle Cranial Fossa
2. Orbit
3. Zygomatic Arch
4. Palate
5. Styloid Process
6. Septa in Maxillary Sinus
7. Maxillary Tuberosity
8. External Oblique Ridge
9. Angle of Mandible
10. Hyoid Bone
11. Glenoid Fossa
12. Articular Eminence
13. Mandibular Condyle
14. Vertebra
15. Coronoid Process
16. Pterygoid Plates
17. Maxillary Sinus
18. Ear Lobe
19. Mandibular Canal
20. Mental Foramen

is more easily done with pantomographic unit than an intraoral full – mouth series because the technique, though not simple, is not as demanding as intraoral radiography. There are fewer retakes, and quality control is easier to maintain.

Simplicity. Pantomographic procedures, as just mentioned, are relatively simple to perform. With minimal training and strict attention to detail, any member of the dental team can became proficient in taking these films.

Patient Cooperation. Because pantomography is an extraoral procedure, itrequires a minimum of patient cooperation in comparison with intraoral techniques. No film packet is placed in the patient's mouth. The patient is asked to bite on a rod and is only required to sit or stand still for 12 to 22 seconds of exposure. When applicable, most units can be operated without radiation to demonstrate to an apprehensive patient what the procedure will be like. Pantomography practically eliminates problems with intractable gaggers, patients with trismus, and fearful or uncooperative children.

Time. Less time is required for a pantomographic examination than an intraoral survey. The most skilled operator requires at least 15 to 20 minutes to do an intraoral survey; pantomograms can be taken in less than 5 minutes.

Dose. There seems to be general agreement that the radiation dose to the patient is less than or at most equal to that in intraoral radiography, depending on technique and on how and where measurements are made. The panoramic radiograph delivers a bone marrow dose that 20% less than that received from a full – mouth intraoral series. The panoramic dose is about equivalent to that received from four bitewing films. This dose can be reduced even further by using rare earth intensifying screens in the panoramic cassettes. The patient dose is relatively higher in the regions of the centers of rotation. Significant thyroid dose during the panoramic procedure also has been reported.

Disadvantages

Image quality. Tomograms inherently show magnification, geometric distortion, and poor definition. Compared with an intaoral radiograph,the pantogram does not give comparable definition. Besides the tomographic process, other factors that tend to degrade the images as compared with intraoral films are external placement of the films with resulting increased object – film distance, the use of intensifying screens, and faster film with large grain size.

Many diagnostic problems in dentistry require a high degree of radiographic definition. Early detection of such conditions as interproximal caries, disruption of the lamina dura, loss of crestal alveolar bone, and a thickened periodontal membrane all require the maximum of radiographic definition. Because of these facters, pantomographs have very limited value in the diagnosis of periodontal disease and the detection of caries and early periapical lesions. These are common diagnostic problems for practitioners, and the pantomographic technique is lacking in these areas. If a pantomogram is used instead of a full – mouth series, it must be augmented with bitewings and selected periapical films where indicated.

Focal Trough (Image Layer). Areas that lie outside (either in front of or behind) the focal trough may be seen poorly or not at all. The focal trough or plane of acceptable detail is not as wide as either the mandible or maxilla, and only structures or changes that lie within the trough are visualized clearly. Pantomographic units that have adjustable focal troughs have far greater diagnostic capabilities than those that do not, but the cost is greater.

Overlap. Pantomographic units have a tendency to produce overlapping images, particularly in the premolar area.

Superimposition. Often superimposition of the spinal column shows up on the anterior portion of the pantomogram. If the

patient is positioned properly, this should not happen. However, not all patients are perfect, and some have physical problems that make proper positioning difficult. The anterior teeth and periapical bone are the most difficult to interpret on pantomograms.

Distortion. The amount of vertical and horizontal distortion varies from one part of the film to another, resulting in an uneven magnification of the image; structures, spaces, and distances may appear larger than they actually are. This is a critical factor because dentists use panoramic radiographs for bone evaluation and case planning involving implant patients.

Overuse. Overuse is one of the prime concerns regarding patient exposure. The ease and convenience in obtaining the pantomograph might lead to careless substitution for other projections that would yield better results. The pantomogram might be taken instead of one periapical film of an area because it is easier to do.

Cost. Panoramic units are not inexpensive but they are a great aid to practice. Cost vary from about $9000 to $26,000 depending on manufacture and design. It is very desirable to have a pantomographic unit in a dental office and if not to have a pathway for referrals.

DIGITAL RADIOGRAPHY

Before discussing discussing the technique for each type of unit, we first look at the advantages and disadvantages of digital radiography. Any new imaging system should be compared with the existing standard of care, which in this instance is the traditional cellulose acetate film base with the double – coated silver halide emulsion.

Advantages.

Faster image acquisition. In clinical practice this is by far the advantage that is most appealing to dentists because processing time is practically eliminated. Depending on the system used, as we shall see later, the range of time needed before one can view the diagnostic image can vary from instantaneous for one image to about 5 minutes for a full series.

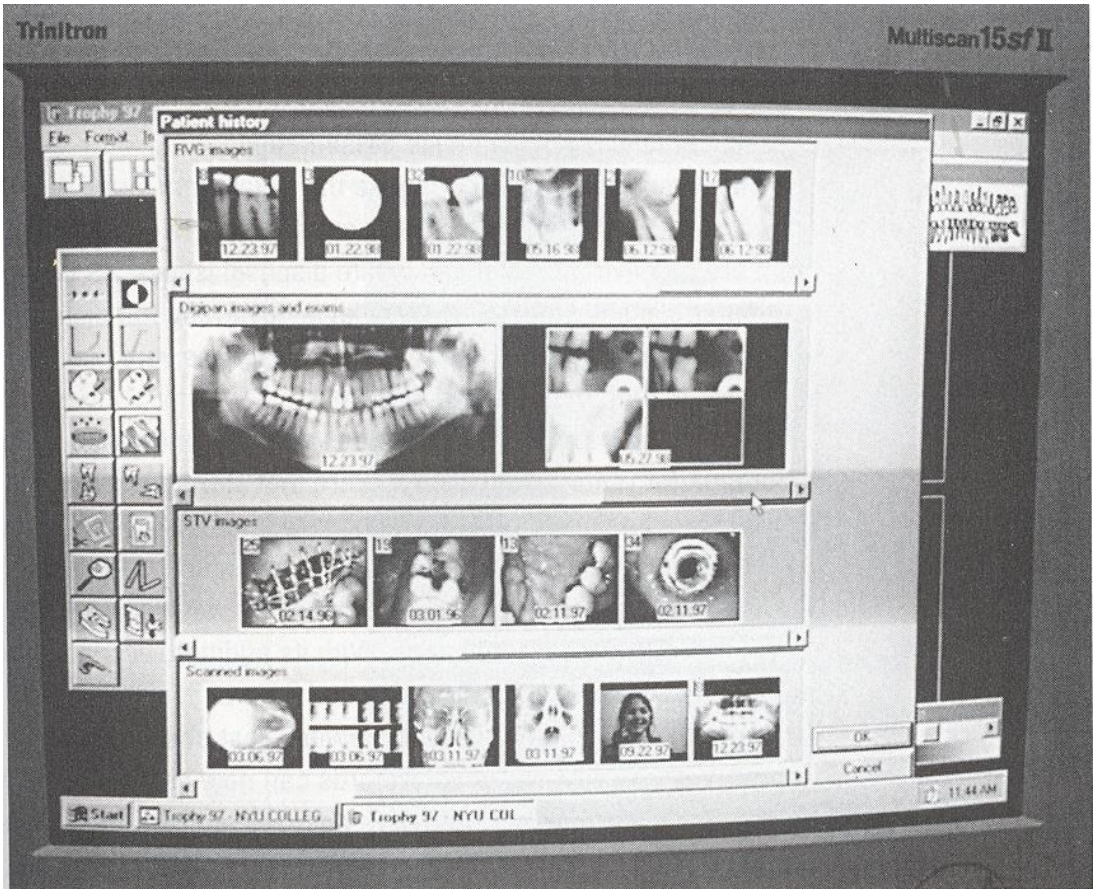


FIG 9.Computer screen showing some of the image adjustment capabilities.

Processing time reduced. Since there is no need for a darkroom, the darkroom – associated errors are eliminated and with them the need for retakes. There is also the time saved in not having to open the film packets and place the film on hangers or feed into an automatic processor. The time spent in processing

and drying is eliminated as is the mounting time because the images are placed on a predesignated mounting template.

Reduction in radiation dose. A great deal of attention has been given in the press, on television, and in the scientific literature to the fact that digital imaging requires much less radiation than film or film – screen combinations. The reduction is about 90% when compared with the dose from D – speed film and about 60% when compared with E- speed film.

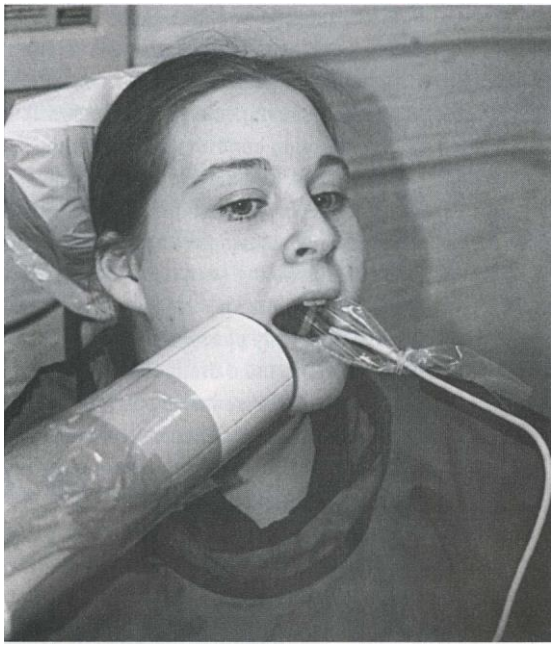


FIG.10 Charged coupling device sensor in patient's mouth.

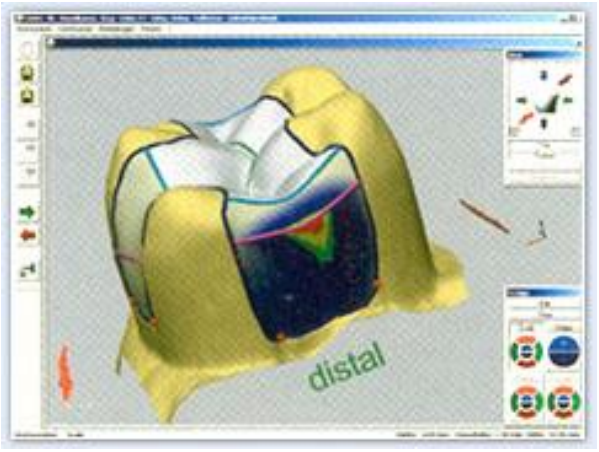
Although these reductions in dose are remarkable and desirable, we should bear in mind that the dental dose using film and a film – screen combination is very small to begin with, and these reductions take place in the fourth decimal place. For example, we consider the reduction of gonadal dose from a full – mouth survey. An acceptable gonadal dose range with E – speed film would be 0. 0003 rem. If one uses a digital system, then the 0.0003 rem would be reduced by 60% to 0.00018 rem. The 60% reduction in this context is not as dramatic as expressing the reduction in percentage.

Image adjustment and manipulation(Figure9). Once acquired, the computer can change the image in many ways. The image can be enlarged, darkened, or lightened or have selected areas magnified, colorized, and reversed. Unlike computed tomography, the viewing plane cannot be changed (sagittal to cross – sectional), and if the image is elongated or the apices are not seen, the computer cannot compensate for these technique errors.

Image storage. Because the images are stored in digital form on a disk, the space required is minimal compared with a mounted full – mouth survey kept in a chart. In all, the available digital systems – stored images can be called up almost instantaneously. Images taken at different times can be placed on the monitor side by side for comparison.

Remote consultation. The digital images can be transmitted to other dental offices or insurance companies if the intended receiver has the hardware to receive the images. Instead of duplication of radiographs and reliance on the mail, the images are sent immediately to another practitioner, thereby saving valuable time and labor.

Hard copies. If teletransmission of the image is not possible, printouts,or hard copies, can be produced immediately, thus eliminating the need for duplication while preserving the integrity of the office records.


distal

Patient education. Patients seem to relate better to a image on a monitor than a radiograph or a series of mounted radiographs on a view box when the dentist is using them as a visual aid for case presentation. The reason may be that we live in a television age, so our patients may be used to the ‘‘screen’’ and close – up views. The ability to look at clinical images or radiographs on the same screen at the same time also helps in case presentation.

Environmentally friendly. Because the silver salts found in film emulsion and processing chemicals are not used in digital imaging, there are no environmental and waste disposal issues. This environmental issue is very important and appealing to both patients and dentists.

Paperless office. Most dental offices and clinics are now using computers for record keeping. Software that started out as a means of billing has been expanded to include treatment records, insurance forms, recall systems, birthday and thank – you notes, and so on. The final piece in the puzzle to make the use of the conventional dental chart obsolete is the digital image. With its addition, every type of information about the patient is now at the tip of one’s fingers on the computer keyboard for immediate viewing. Lost charts and the tedious storage and retrieval of records can now be thing of the past because electronics records rae copyable and storable. These records should be backed up by a duplicate disk that is stored at another location.

Cross – contamination. Computerized images are clean and sterile because they are not touched by the operator’s contaminated gloves in mounting or in removing them from the chart or view box during and operative procedure.

Disadvantages

Sensor placement. The main disadvantage or difficulty in digital radiography is sensor placement in the patient’ s mouth (Figure 10).The sensors are the same size as standard # 0, # 1, and # 2 cdental film but are thicker and more rigid. Even though manufactures have tried to make the sensor more ‘‘user friendly,’’ it may be difficult or impossible to obtain

parallelism between the tooth and sensor in small or crowded mouths in order to follow the right angle(paralleling technique). If one has to use the bisecting technique, this is a distinct disadvantage. It should be noted that the storage phosphor system use a thinner and slightly more adaptable sensor than do the direct digital systems,and some feel that this gives the system a distinct advantage over the CCD – based system.

Definition. As mentioned previously, film provides better detail (12 to 15 line pairs per millimeter) than dose digital images (6 to 10 line pairs per millimeter). Although this may be the case, the human eye in clinical situations cannot usually make this distinction.

Infection control. Some concern has been expressed about cross – contamination because the sensors cannot be autoclaved. With the use of plastic covers that extend outside the mouth or a self – sealing cover that comes with some units, a satisfactory infection control can be obtained.

Cost. The initial cost of a digital system can range from $10,000 to $15,000. Although this may at first seem like a large expense, over time the savings in space, labor, storage, and so on will justify and amortize the start – up costs. Digital panoramic units can cost about $25,000.

Fragility of sensor. The intraoral sensors are really large ‘‘silicon chips,’’ and if dropped or abused, their replacement is costly. The cost of the sensor alone is $2000 to $3000. If one drops a piece of film, 10 to 15 cents is wasted. Care in handling should not be the reason for not using digital radiography but rather should be a reminder to pay attention to detail.

COMPUTED TOMOGRAPHY

Advantages

1. Eliminates the superimposition of images of structures superficial or deep to the area in question (tomography), and this can be done in any plane. Images can be acquired in any plane and the scan can produce images in any plane.

2. A CT scan can distinguish between tissue density that differ grom 1% to 2% where at least 10% is needed for plane films.

3. Images can be reformatted to another plane without the necessity of another scan. Some CT scanners can image the mandible and the maxilla on one scan.

4. Density and contrast can be adjusted using the CT numbers to create a bone or soft tissue window.

5. The enhanced image makes interpretation easier and more accurate.

Disadvantages

1. Increased radiation dose when compared to conventional film. Some of newer cone beam units can reduce radiation by 90 % when compared with older design CT units. Many special software programs have been written for CT scanners that are specific for dental use in implant planning (Figure 13). This software directs the computer in obtaining the desired images in three planes so that the site of the implant fixture can be determined. Not all CT units have implant software, so it is very important to inquire whether the facility has the desired software program before referring a patient to a medical facility or an implant scan. The use of CT scanning in the evaluation and planning of implant sites and evaluation of bone density has become a most common application in dentistry and is rapidly becoming the standard of care for implant planning. The American Academy of Oral and Maxillofacial Radiology in their position paper on the use of x – raysin implants has stated that ‘‘some form of cross –

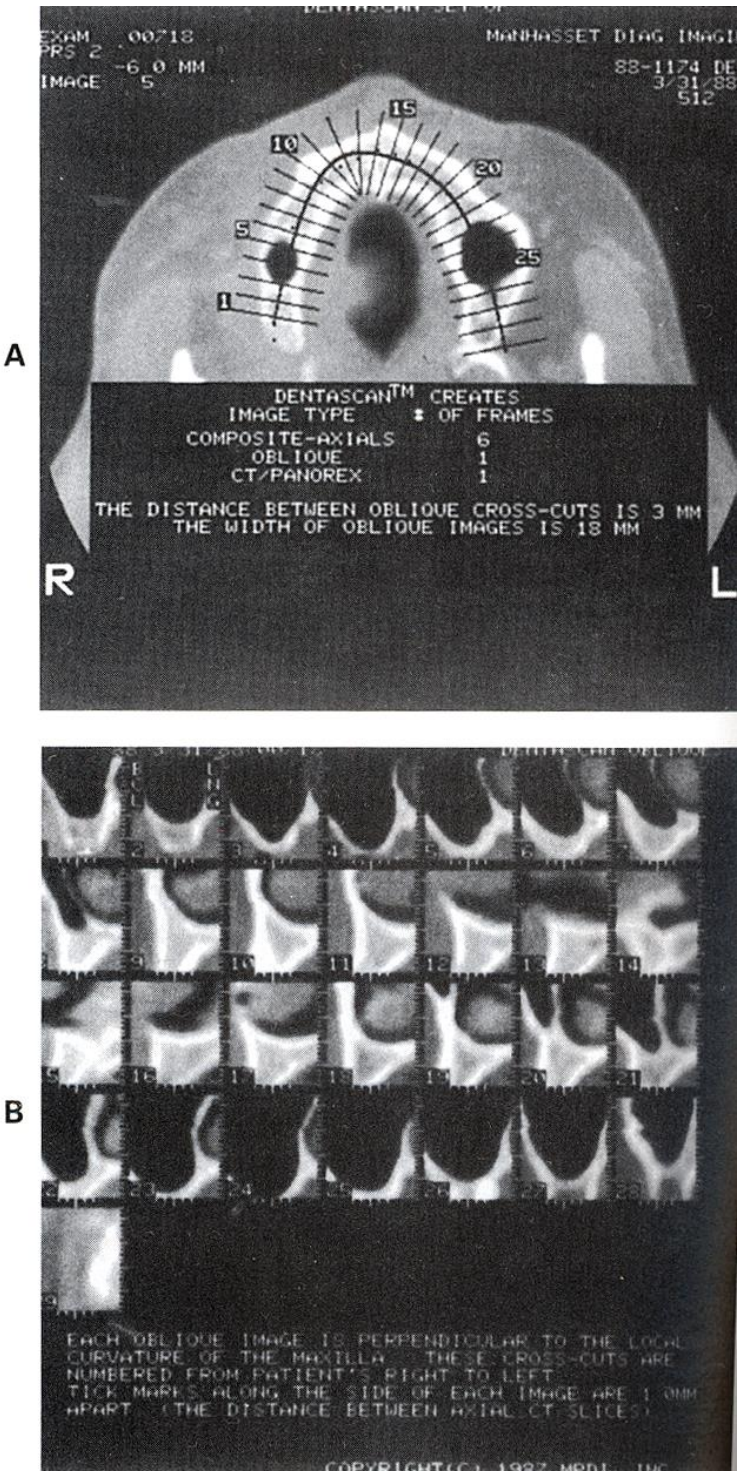


Figure 13. CT scan using software designed specifically for dental implant planning. A, Axial cut with numbered orientation planes that are seen in the corresponding vertical cuts in B.

sectional imaging be used for implant cases,'' and CT is a form of cross – sectional imaging. Never before have we been able to obtain multiple cross – sectional cuts with the speed and accuracy that we do now in implant evaluation.

2. The radiation dose for a CT scan of the head is about 3.4 to 5.5 rad (34 to 55 mGy), whereas a skull film done with a film – screen system has a dose of about 530 rad (5.3 mGy). However, with the film – screen technique, one has to make multiple exposures to obtain the diagnostic information contained in one scan, which also will give a better and more diagnostic image.

3. The cost to the patient for a CT scan depends on the scan but will probably be $400 to $900, in comparison with $200 for a conventional film.

4. Significant artifacts are produced by metallic objects such as metal dental restorations that are in the plane being scanned.

CONVENTIONAL TOMOGRAPHY

Before the wide use of CT scanning, conventional tomography was one of the better ways to examine the condyle radiographically. There are dedicated dental tomographic units available (Figure 14) that produce tomographic images of the TMJ (Figure 15). The images are better than panoramic and in some ways equivalent to a CT scan. Again, however, the articular disc is not seen, but the fossa, neck, and head of the condyle are seen .

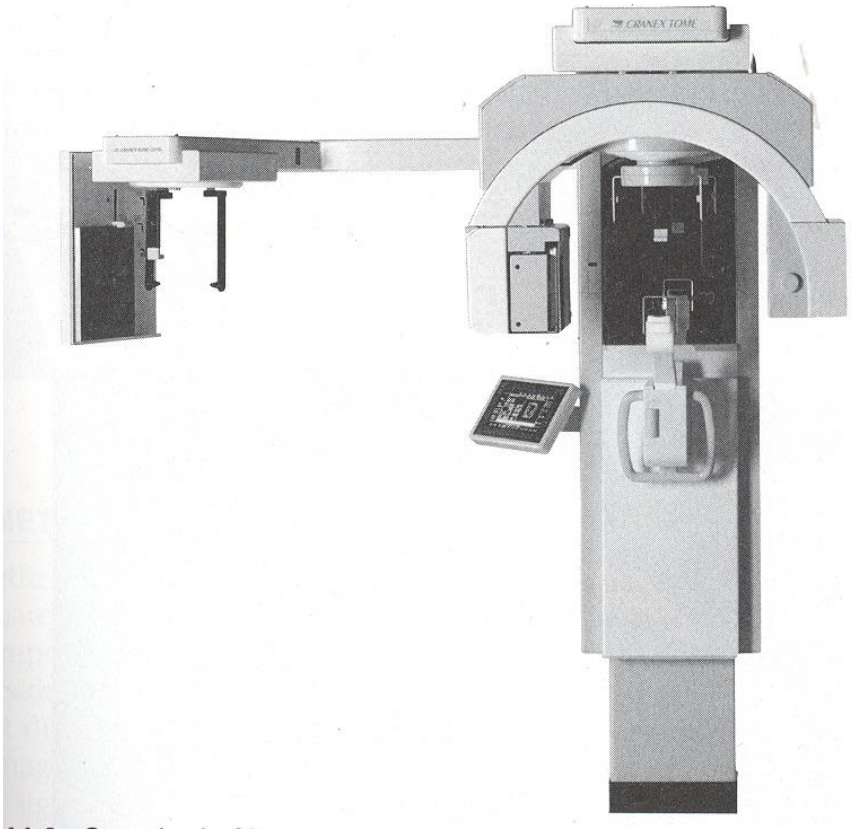


Figure 14. Soredex's CRANEX TOME tomographic unit.(Courtesy Soredex, Helsinki, Finland.)

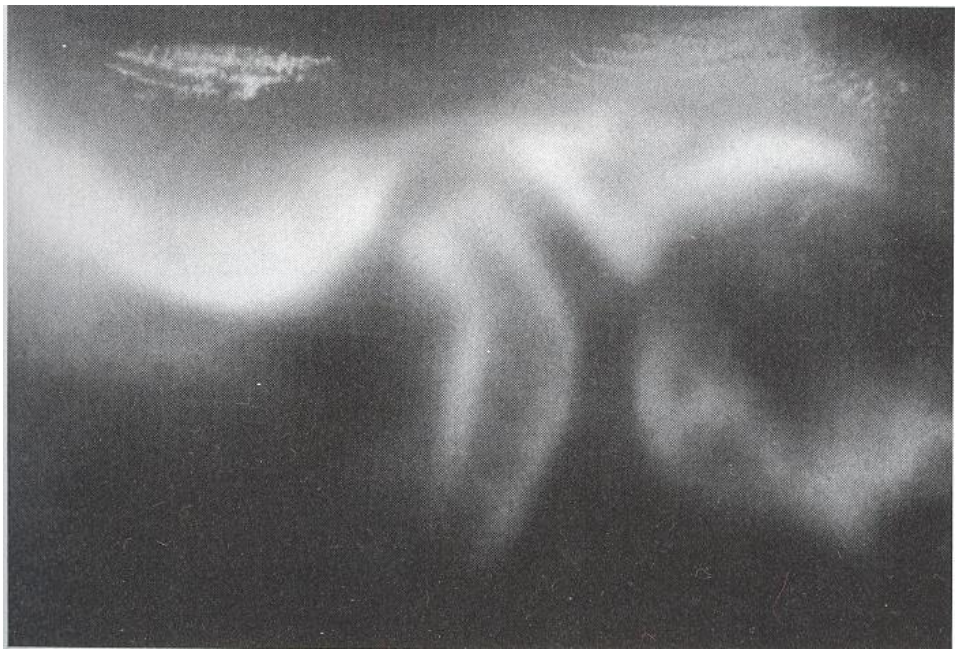
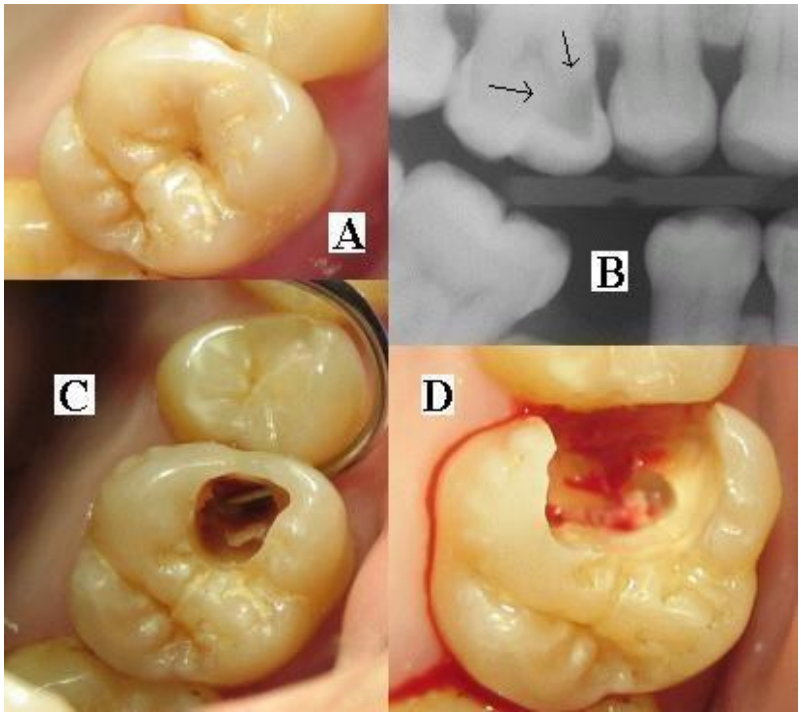


Figure 15. Tomographic view of the TMJ.


A
B
C
D

and most of the mesial half of the crown was either missing or poorly supported.

The importance of dental radiographs in diagnosis and treatment planning should not be underemphasized. It is possible for both tooth decay and periodontal disease to be missed during a clinical exam, and radiographic evaluation of the dental and periodontal tissues is a critical segment of the comprehensive oral examination. The photo montage at right depicts a situation in which extensive decay had been overlooked by a number of dentists prior to radiographic evaluation of the area.

Intraoral radiographic views

Placing the radiographic film or sensor inside the mouth produces an intraoral radiographic view.

Periapical view

The periapical view is taken of both anterior and posterior teeth. The objective of this type of view is to capture the tip of the root on the film. This is often helpful in determining the cause of pain in a specific tooth, because it allows a dentist to visualize the tooth as well as the surrounding bone in their entirety. This view is often used to determine the need for endodontic therapy as well as to visualize the successful progression of endodontic therapy once it is initiated.

The name periapical is derived from the Latin peri, which means "around," and apical, which means "tip."

Bitewing view

The bitewing view is taken to visualize the crowns of the posterior teeth and the height of the alveolar bone in relation to the cementoenamel junctions, which are the demarcation lines on the teeth which separate tooth crown from tooth root. When there is extensive bone loss, the films may be situated with their longer dimension in the vertical axis so as to better visualize their levels in relation to the teeth. Because bitewing views are taken from a more or less perpendicular angle to the buccal surface of the

teeth, they more accurately exhibit the bone levels than do periapical views. Bitewings of the anterior teeth are not taken.

The name bitewing refers to a little tab of paper or plastic situated in the center of the X-ray film, which when bitten on, allows the film to hover so that it captures an even amount of maxillary and mandibular information.

Occlusal view

The occlusal view is not taken very often -- it is indicated when there is a desire to reveal the skeletal or pathologic anatomy of either the floor of the mouth or the palate. The occlusal film, which is about three to four times the size of the film used to take a periapical or bitewing, is inserted into the mouth so as to entirely separate the maxillary and mandibular teeth, and the film is exposed either from under the chin or angled down from the top of the nose. Sometimes, it is placed in the inside of the cheek to confirm the presence of a sialolith in Stenson's duct, which carries saliva from the parotid gland. The occlusal view is not included in the standard full mouth series.

Full mouth series

A full mouth series is a complete set of intraoral X-rays taken of a patients' teeth and adjacent hard tissue. This is often abbreviated as either FMS or FMX. The full mouth series is composed of 18 films:

four bitewings

two molar bitewings (left and right)

two premolar bitewings (left and right)

eight posterior periapicals

two maxillary molar periapicals (left and right)

two maxillary premolar periapicals (left and right)

two mandibular molar periapicals (left and right)

two mandibular premolar periapicals (left and right)

six anterior periapicals

two maxillary canine-lateral incisor periapicals (left and right) two mandibular canine-lateral incisor periapicals (left and right) two central incisor periapicals (maxillary and mandibular).

The Faculty of General Dental Practice of the Royal College of Surgeons of England publication Selection Criteria in Dental Radiography holds that given current evidence full mouth series are to be discouraged due to the large numbers of radiographs involved, many of which will not be necessary for the patients treament. An alternative approach using bitewing screening with selected periapical views is suggested as a method of minimising radiation dose to the patient while maximizing diagnostic yield.

Dental X-ray

Dental X-rays are pictures of the teeth, bones, and soft tissues around them to help find problems with the teeth, mouth, and jaw. X-ray pictures can show cavities, hidden dental structures (such as wisdom teeth), and bone loss that cannot be seen during a visual examination. Dental X-rays may also be done as follow-up after dental treatments.

Types of Dental X-rays ?

Bitewing X-rays show the upper and lower back teeth and how the teeth touch each other in a single view. These X-rays are used to check for decay between the teeth and to show how well the upper and lower teeth line up. They also show bone loss when severe gum disease or a dental infection is present.

Periapical X-rays show the entire tooth, from the exposed crown to the end of the root and the bones that support the tooth. These X-rays are used to find dental problems below the gum line or in the jaw, such as impacted teeth, abscesses, cysts, tumors, and bone changes linked to some diseases.

Occlusal X-rays show the roof or floor of the mouth and are used to find extra teeth, teeth that have not yet broken through the gums, jaw fractures, a cleft in the roof of the mouth (cleft palate), cysts, abscesses, or growths. Occlusal X-rays may also be used to find a foreign object.

Panoramic X-rays show a broad view of the jaws, teeth, sinuses, nasal area, and temporomandibular (jaw) joints. These X-rays do not find cavities. These X-rays do show problems such as impacted teeth, bone abnormalities, cysts, solid growths (tumors), infections, and fractures.

Digital X-rayS is a new method being used in some dental offices. A small sensor unit sends pictures to a computer to be recorded and saved.

Why It Is Done ?

1. Find problems in the mouth such as tooth decay, damage to the bones supporting the teeth, and dental injuries (such as broken tooth roots). Dental X-rays are often done to find these problems early, before any symptoms are present.

2. Find teeth that are not in the right place or do not break through the gum properly. Teeth that are too crowded to break through the gums are called impacted.

3. Find cysts, solid growths (tumors), or abscesses.

4. Check for the location of permanent teeth growing in the jaw in children who still have their primary (or baby) teeth.

5. Plan treatment for large or extensive cavities, root canal surgery, placement of dental implants, and difficult tooth removals.

6. Plan treatment of teeth that are not lined up straight (orthodontic treatment).

Without X-rays, dentists may miss the early stages of decay between teeth.

How To Prepare ?

Before the X-ray test, tell your doctor if you are or might be pregnant. Dental X-rays are only done on your mouth area, but if you are pregnant, routine dental X-rays may be postponed so you do not have any radiation to your baby (fetus). If dental X-rays are absolutely needed, a lead apron will

be placed over your belly to shield your baby from the X-rays. You do not need to do anything before having a dental X-ray.

How It Is Done ?

Dental X-rays are taken in the patient's room..

1. A dental technician will cover you with a heavy lead apron as you sit upright in a chair. This apron shields your body from X-rays. Modern lead aprons have a collar (called a thyroid shield) to shield the thyroid gland from radiation.

2. Everyone else in the room wears a protective apron or stays behind a protective shield.

3. The dental technician will have you bite down on a small piece of cardboard or plastic. The cardboard or plastic holds X-ray film. You may do this several times to get pictures of all your teeth.

4. You may want to rinse your mouth before and after the X-rays.

How It Feels ?

X-rays take only a few minutes and are not painful. Some people may gag on the plastic or cardboard that holds the X-ray film. People often find it easier to relax if they focus on something else (such as an object on the wall) and take slow, deep breaths through their nose during the X-rays.

Dental X-ray Risks ?

Radiation used in dental X-rays is so low that there is very little chance of problems from having the X-rays. Pregnant women may not want to have routine dental X-rays taken until after they give birth. Although there is no proof that a routine dental X-ray could harm a developing baby (fetus), dentists usually suggest you wait to have your X-rays until after the baby is born. Delaying the X-ray for a few months will not result in further harm to teeth in most cases. There are times when the severity of the dental problem requires an X-ray to deal with an urgent concern.

Dental X-ray Results ?

Normal :

No tooth decay is seen, No damage to the bones supporting the teeth is seen, No dental injuries, such as tooth or jaw fractures, are seen, No cysts,

solid growths (tumors), or abscesses are seen, No extra or impacted teeth are seen and no teeth are out of their normal place.

Dental X-ray Results ?

Abnormal :

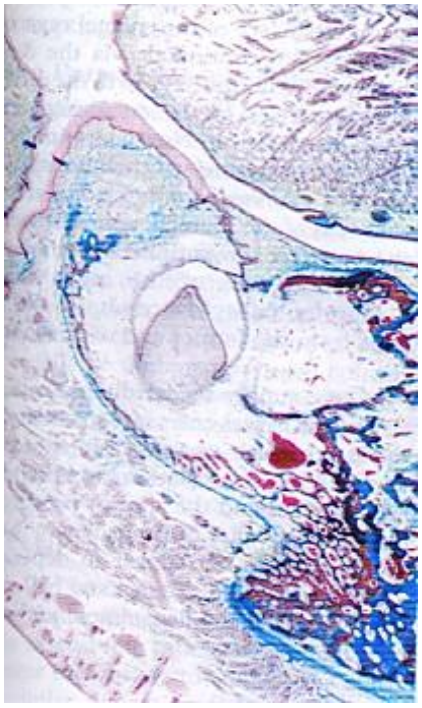
Tooth decay is seen, Damage to the bones supporting the teeth is seen, Dental injuries, such as tooth or jaw fractures, are seen, Cysts, solid growths (tumors), or abscesses are seen, Abnormally placed, extra, or impacted teeth are seen.

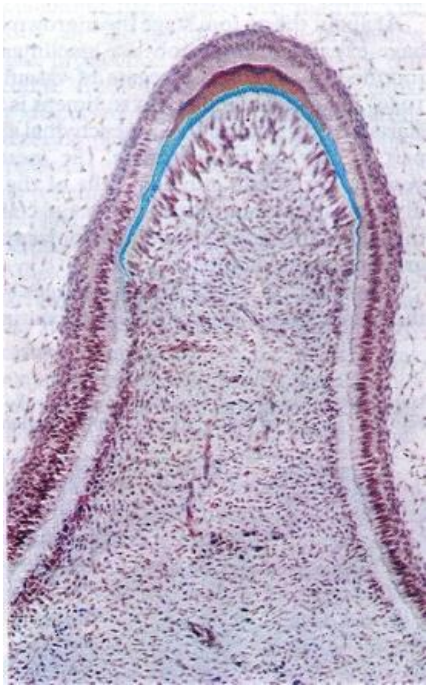
TOOTH DEVELOPMENTS

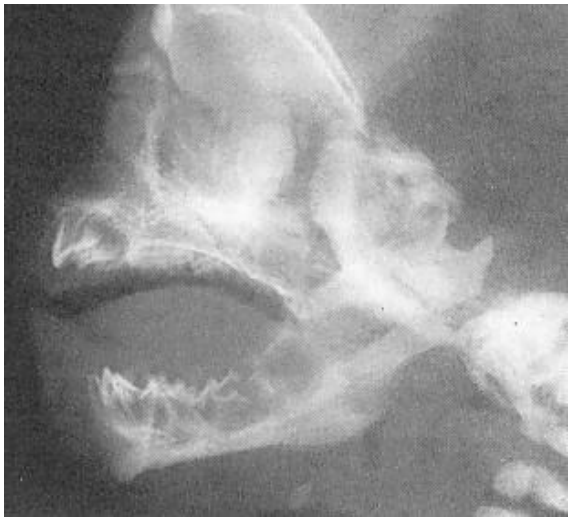
The term dentition is used to describe the natural teeth in the jaw bones. There are two dentition and permanent dentition. Achild's primary dentition develops during the prenatal period and consists of 20 teeth, which erupt and are later shed. As the primary teeth are shed and the jaws and mature, the permanent dentition, consisting of as many as 32 teeth, gradually erupts and replaces the primary dentition.

An overlapping period between the primary and permanent dentition during the preteen years is referred to as the mixed dentition period, when an individual has some teeth from both dentitions.

Tooth development, or odontogenesis takes place is many stages, which occur in a stepwise fashion for both dentitions. Tooth development is a continuous process, and there is no clear – cut beginning or end point between these stages. After initiation of odontogenesis identifiable stages in tooth development include the bud stage, the cap stage, and the bell stage(Fig.21). Odontogenesis then progresses to the apposition stage with the formation and maturation of the hard dental structures, such as enamel, dentin, and cementum.







progression of odontogenesis allows time for the jaws to grow to accommodate the increased number of primary teeth, the larger primary molars, and then finally the overall larger permanent teeth.

The primary dentition develops during both the embryonic and fetal periods. Most of the permanent dentition is formed during the fetal period. Tooth development continues for years after birth, however , especially considering the formation of the permanent second and third molars.Thus tooth have longest developmental period of any set of organs in the body.

INITIATION STAGE OF TOOTH DEVELOPMENT

Odontogenesis of the primary dentition begins between the sixth and seventh week of prenatal development, during the embryonic period. This first stage of tooth development, known as the initiation stage. At the beginning of the sixth week, the embryo's stomodeum, or mouth is lined by ectoderm. The outer portion of the ectoderm gives rise to oral epithelium. The oral epithelium consists of two horseshoe - shaped bands of tissue at the surface of the stomodeum, one for each future jaw or arch. At the same time, deep to the forming oral epithelium, there is a type of mesenchyme originally from the ectoderm, ectomesenchyme, wich is influenced by neural crest cells that have migrated to the area.

During the later portion of the seventh week, the oral epithelium grows deeper into the ectomesenchyme and is induced to produce a layer called the dental lamina.

***D**evelopmental **D**isturbances **D**uring the **I**nitiation **S**tage*

Lack of initiation results in the absence of a single tooth or multiple teeth, which is called anodontia. Anodontia can be associated with the syndrome of eotodermal dysplasia because many portions of the tooth are indirectly or directly of ectodermal origin. It may cause disruption of occlusion and aesthetic problems.

BUD STAGE OF TOOTH DEVELOPMENT

The second stage is called the bud stage and occurs at the beginning of the eighth week of prenatal development for the primary dentition. This stage is named for an extensive proliferation, or growth, of the dental lamina into buds or oval masses penetrating into the ectomesenchyme. At the end of the proliferation process involving the primary dentition's dental lamina, both the future maxillary arch and the future mandibular arch will each have 10 buds.

Each of these buds from the dental lamina, together with the surrounding ectomesenchyme, will develop into a tooth germ and its associated supporting tissues. Thus all the teeth and their associated tissues develop from both ectoderm and the mesenchymal tissue, ectomesenchyme.

Only proliferation of the two tissues occurs during this stage, no structural change occurs in the cells of the dental lamina or ectomesenchyme as later occurs with differentiation and morpogenesis.

***D**evelopmental **D**isturbances **D**uring the **B**ud **S**tage*

Abnormal proliferation can cause a single tooth or complete dentition to be larger or smaller than normal. Abnormally large teeth result in microdentia. Individual teeth can sometimes appear larger than normal as a result of splitting of the enamel organ or fusion of two adjacent tooth germs but this is not true of partial macrodontia.

CAP STAGE OF TOOTH DEVELOPMENT

The third stage of odontogenesis is called the cap stage and occurs for the primary dentition between the ninth and tenth week of prenatal development, during the fetal period. The physiological process of proliferation continues during this stage, but the tooth bud of the dental lamina does not grow into a large sphere surrounded by ectomesenchyme. Instead, there is unequal growth in different parts of the tooth bud, leading to formation of a cap shape attached to the dental lamina.

Thus not only does proliferation characterize this stage, but various levels of differentiation are also active during the cap stage. Additionally

during this stage, a primordium of the tooth develops with a specific form. Therefore the predominant physiological process during the cap stage is one of the morphogenesis.

Inner mass of ectomesenchyme is now called the dental papilla. The dental papilla will produce the future dentin and pulp tissue for the inner portion of the tooth. Note that the dental papilla is originally derived from ectomesenchyme.

At the end of the cap stage, these three embryological structures – the enamel organ, dental papilla, and dental sac – are now considered together to be the tooth germ, the primordium of the tooth.

Permanent teeth formed with primary predecessors are called succedaneous and include the anterior teeth and premolars, wich replace the primary anterior teeth and molars, respectively.

The permanent molars are nonsuccedaneous and have no primary predecessors. These six permanent molars per dental arch develop from a posterior extension of the dental lamina distal to the primary second molar's dental lamina and its associated ectomesenchyme for each quadrant.

***D**evelopmental **D**isturbances **D**uring the **C**ap **S**tage*

Teeth may also have extra cusps, or tubercles that appear as small, round enamel extensions. They are noted mainly on the permanent molars, especially the third molars, but can be found on any tooth in both dentitions. Tubercles may also be present as a lingual extension on the cingulum on permanent maxillary anterior teeth, especially lateral incisors and canines. This disturbance may be due to trauma, pressure, or metabolic disease that affects the enamel organ that forms the crown area.

BELL STAGE OF TOOTH DEVELOPMENT

The fourth stage of odontogenesis is the bell stage, wich occurs for the primary dentition between the eleventh and twelfth week of prenatal development. It is characterized by continuation of the ongoing processes of proliferation, differentiation, and morphogenesis.

During the bell stage, the cells differentiate and become specialized. This process is called histodifferentiation.

-The epithelial cells become ameloblasts, which are the enamel-forming cells.

-The peripheral cells of the dental papilla become odontoblasts, which are the dentin-forming cells.

-The inner cells of the dental sac differentiate into cementoblasts, which are the cementum-forming cells.

As the tooth continues to develop, the dental organ continues to change. It assumes a shape described as resembling a bell. As these developments take place, the dental lamina, which has thus far connected tlie dental organ to the oral epithelium, breaks up.

The basic shape and relative size of each tooth are established during the process of morphodifferentiation.

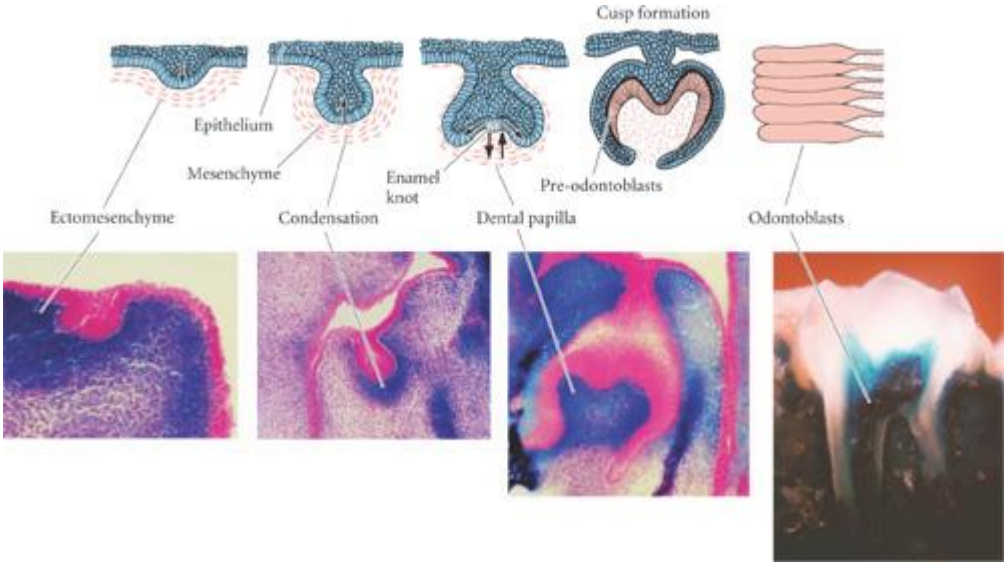
The dentinoenamel and cementodentinal junctions are formed and act as a blueprint for the developing tooth.

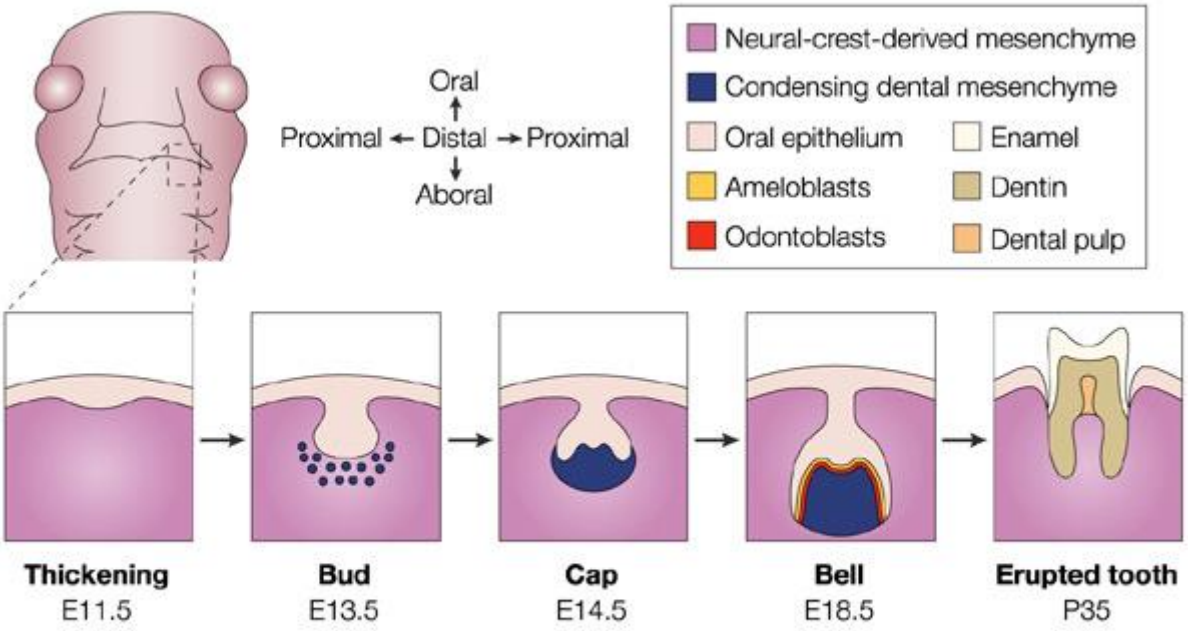
In accordance with this pattern, the ameloblasts deposit enamel and the odontoblasts deposit dentin to give the completed tooth its characteristic shape and size.

This process starts at the top of the tooth and moves downward the future root. The development of the root, or roots, begin after the enamel and dentin formations have reached the future cementoenamel junction.

***D**evelopmental **D**isturbances **D**uring the **B**ell **S**tage*

Disturbances and aberrations ib morphodifferentation will result in abnormal forms and sizes of teeth. Some of the resulting conditions are peg teeth, other types of microdontia, and macrodontia.


Cusp formation
Epithelium
Mesenchyme
Enamel knot
Pre-odontoblasts
Ectomesenchyme
Condensation
Dental papilla
Odontoblasts


Oral
Proximal
Distal
Proximal
Aboral
Neural-crest-derived mesenchyme
Condensing dental mesenchyme
Oral epithelium
Enamel
Ameloblasts
Dentin
Odontoblasts
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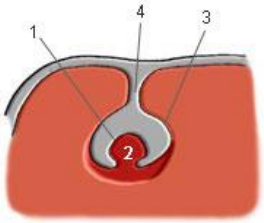
E11.5
Bud
E13.5
Cap
E14.5
Bell
E18.5
Erupted tooth
P35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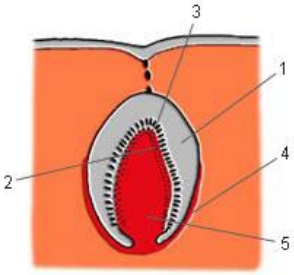
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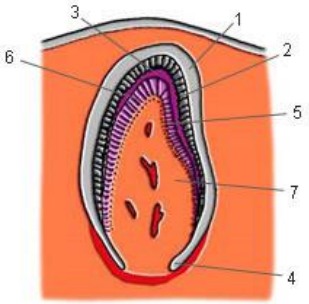
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APPOSITION AND MATURATION STAGES OF TOOTH DEVELOPMENT

The final stages of odontogenesis include apposition, during wich the enamel, dentin, and cementum are secreted in successive layers. These tissues are initially secreted as a matrix, wich is an extracellular substance that is partially calcified yet serves as a framework for later calcification. The other final stage maturation, is reached when the dental tissues subsequently fully mineralize. The time period of these two final stages varies according to the tooth involved but overall involves the same chronology as the initiation of odontogenesis.

During the stage of apposition , many inductions occur between the ectodermal tissue of the enamel organ and mesenchymal tissues of the dental papilla. Necessary for the production of enamel, dentin, and cementum by the proliferation or growth of cellular byproducts.

***D**evelopmental **D**isturbance **D**uring **A**pposition and **M**aturation **S**tage*

Any systemic disturbance or local trauma that injures the ameloblasts during enamel formation can cause an interruption or an arrest in matrix apposition, resulting in enamel hypoplasia. Hypoplasia of the dentin is less common than enamel hypoplasia and occurs only after severe systemic disturbances.

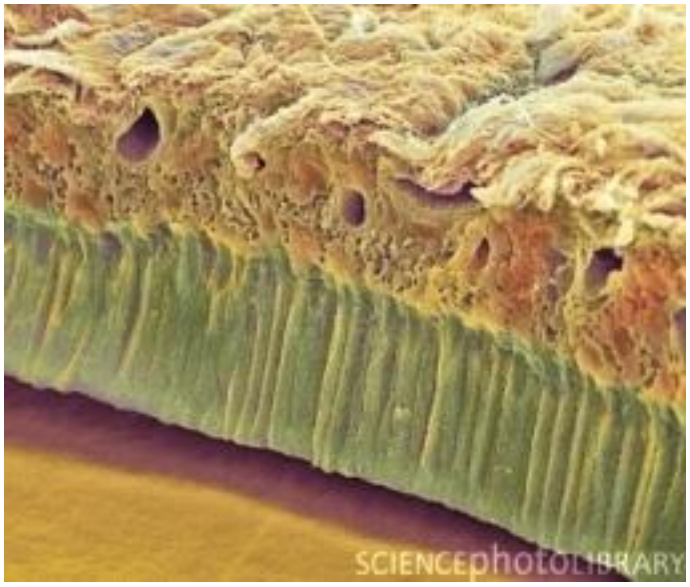
HARD TISSUE FORMATION

Structures of the teeth

The teeth are composed of enamel, dentin, cementum and pulp.

ENAMEL

Enamel is formed by cells called ameloblasts, which originate from the embryonic germ layer known as ectoderm(figure24). Enamel covers the anatomical crown of the tooth and varies in thichness in different areas of a tooth. The enamel is thicker at the incisal and occlusal areas of a tooth and becomes progressively thinner until it terminates at the cementoenamel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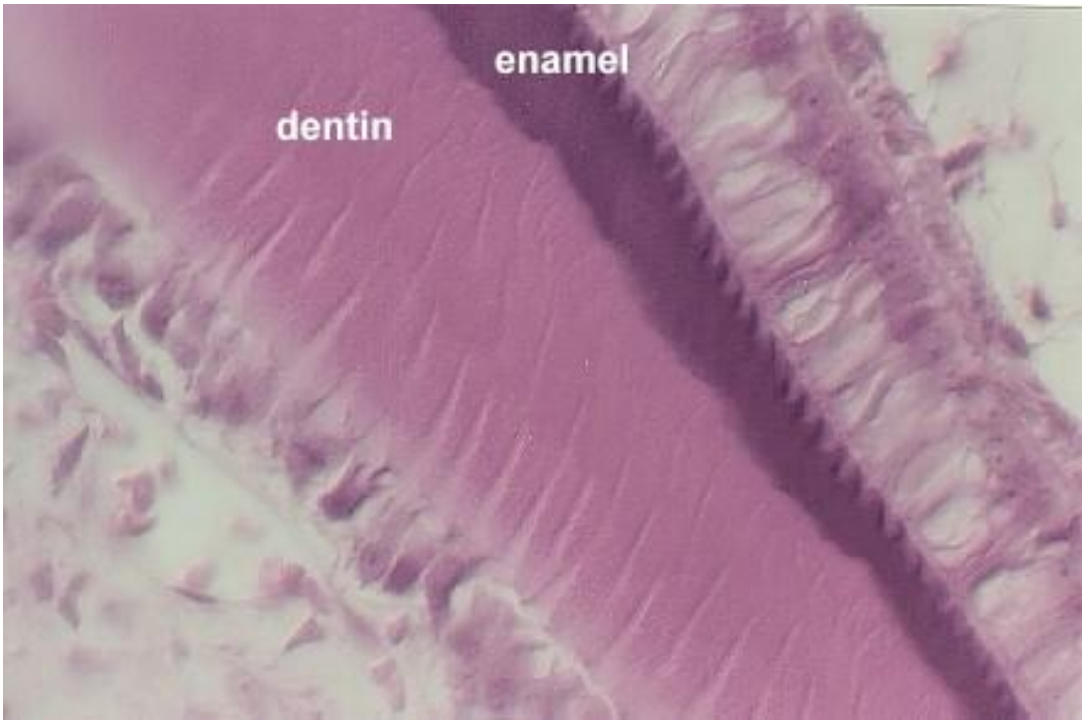
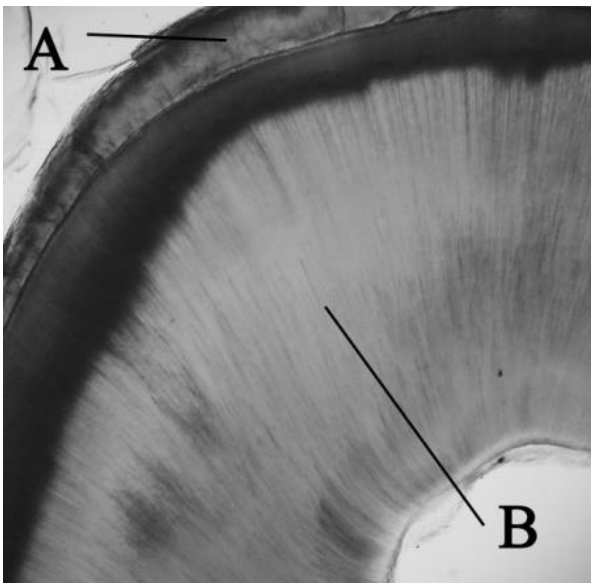

enamel
dentin



Dentinoenamel junction. A. enamel B. dentin

An organic matrix or prism sheath also surrounds individual crystals, and it appears to be an organically it appears to be an organically rich interspace rather than a structural entity.

Enamel rods follow a wavy, spiraling course, producting an alternating arrangement for each group or layer of rods as they change direction in progressing from the dentin toward the enamel surface where they end a few microns short of the tooth surface. Enamel rods rarely run a straight radial course. They initially follow a curving path through one third, of the enamel next to the dentinoenamel junction. Then the rods usually follow a more direct path to the enamel surface of the remaning two thirds. The groups of enamel rods that follow a curving irregular path toward the tooth surface are called gnarled enamel and occur near the cervical regions and the incisal and occlusal areas.

The changes in direction of enamel prisms that minimize change in the axial direction produce an optical appearance called Hunter-Schreger bands. These bands appear to be composed of alternate light and dark zones that have slightly different permeability and organic content.

Enamel tufts are hypomineralized structures that project between adjancent groups of enamel rods from the dentinoenamel junction.

These projections extened into the dentin in the direction of the long axis of the crown and may play a role in the spread of dental caries.

Enamel rods are formed in an incremental pattern by successive apposition of enamel layers. These variations is structure and mineralization are called the incremental lines of Retzius and can be considered as growth rings(fig 26). In transverse sections of a tooth the lines of Retzius appear as concentric circles. When a circle is incomplete at the enamel surface, a series of alternating grooves, which are called the imbrications lines of pickerill are formed. The elevations between the grooves are called perikymata. They are continuons around a tooth and usually lie parallel to the cementoenamel junction.

Enamel lamellae are thin, leaflike faults between enamel rod groups that extened from the enamel surface toward the dentinoenamel junction, sometimes extending into the dentin they contain mostly organic material, which is a weak area predisposing the tooth to entry of bacteria and dental caries. The interface of the enamel and dentin is called the dentinoenamel junction. This interdigitation seems to contribute to a firm attachment between the dentin and enamel. The dentinoenamel junction is also a hypermineralized zone that is about 30 μm thick.

Enamel is incapable of reparing itself once it is destroyed, because the ameloblast cell degenerates following the formation of the enamel rod. The final act of the ameloblast cell is secrtetion of a membrane covering the end of the enamel rod. This layer is referred to as the Nasmyth membrane, and the acellular component is referred to as the primary enamel cuticle. This membrane covers the newly ecupted tooth and is worn away by mastication and cleaning. The membrane is replaced by an organic deposit called a pellicle, which appears to be a precipitate of salivary proteins. Microorganisms invade the pellicle to form bacterial plaque, which is a precursor to dental disease. Although enamel is a very hard and dense structure, it is permeable to certain ions and molecules, permitting partial and complete penetration.

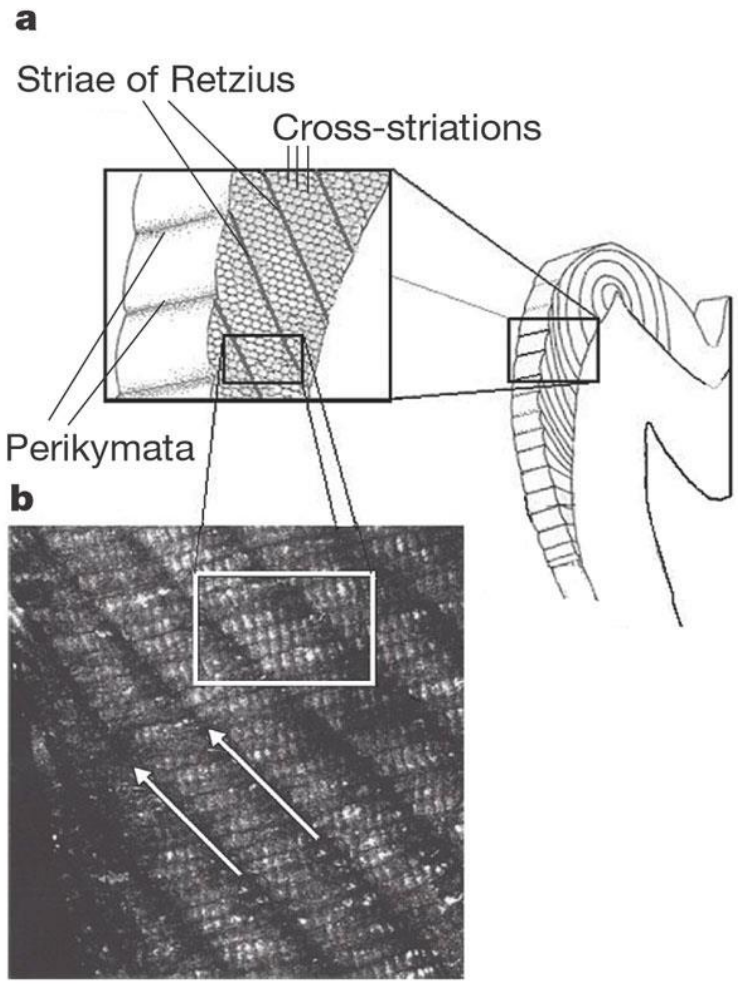


FIG 26. Dental microstructure.

Enamel permeability decreases with age because of changes in the enamel matrix, although basic permeability is maintained. This decrease is referred to as enamel maturation. Enamel is soluble when exposed to an acid medium although the dissolution is not uniform.

a, diagram, and b, a micrograph showing the incremental markings in tooth enamel. Cross-striations occur daily as ameloblast cells secrete enamel. The rate of enamel formation can be estimated by counting the number of cross-striations per millimetre. Perikymata, seen on the external surface of the teeth, are associated with the striae of Retzius (large arrows in b). They provide estimates of the duration of crown formation, as they have a modal periodicity of nine days in apes and humans.

Solibility of enamel increases from the enamel surface to the dentino enamel junction. When fluorides are present during enamel formation or are topically applied to the enamel surface, the solubility of surface enamel is decreased.

DENTIN

The dentin of tooth is hard, yellowish tissue underlying the enamel and cementum making up the major bulk of the inner portion of each tooth. It extends from the pulp cavity outward to the inner surface of enamel (on the crown) or cementum (on the root). Mature dentin is composed of about 70% hydroxyapatite (calcified and inorganic), 18% organic matter (collagen fibers), and 12% water, making it harder than cementum, but softer than enamel. Dentin develops from the *embryonic dental papilla* (mesoderm). The cells that form dentin are called odontoblasts.

The structure of dentin is an arrangement of microscopic channels, called *dentinal tubules*, which radiate outward from the pulp chamber to the exterior cementum or enamel border. The diameter of the dentinal tubules is largest near the pulp (about 2.5 μm) and smallest (about 900 nm) at the junction of dentin and enamel. The *tensile strength* of dentin is approximately 40 MPa, the *compressive strength* of dentin is 266 MPa. The organic phase of dentin consists primarily of collagen.

The maturation of dentin (Dentinogenesis) begins prior to the formation of enamel and is initiated by the *odontoblasts cells*. Unlike enamel dentin continues to form throughout life. These tubules contain *dentinal fluid* and cellular structures - a mixture of albumin, transferrin, tenaskin and proteoglycans. Inorganic material of dentin is mainly hydroxyapatities. And some noncrystalline amorphous calcium phosphate; organic materials - 90% of which is collagen type 1 and the remaining 10% ground substance, which includes dentin-specific proteins; 10% water is absorbed on the surface of the minerals or between the crystals. From the outer surface of the dentin to the area nearest the pulp, these tubules follow an S-shaped path. The *imbrications lines of von Ebner* in dentin are incremental lines or bands (stain darkly) can be likened to the *incremental lines of Retcius* (enamel) run

at right angles to the dentinal tubules. The slender cytoplasm cell processes of odontoblasts (*Tomes fibers*) is a long extension located within the dentinal tubule that extend into the tubules and still attached to the cell body of the odontoblast within the pulp.

Because of presence of the Odontoblastic process dentin is considered living tissue with capability to react to physiologic and pathologic stimuli. The ends of the dentinal tubules are perpendicular to the DEJ and DCJ. Along the tubule walls are small lateral openings called *canaliculi(Fig.1)*. The contour *lines of Owen* appear together as a series of dark bands, demonstrate a disturbance in body metabolism that affects the odontoblasts by altering their formation efforts. Dentin can be categorized according to the time that it was formed within the tooth, by their relationship to the dentinal tubules, by its relationship to the DEJ and pulp.

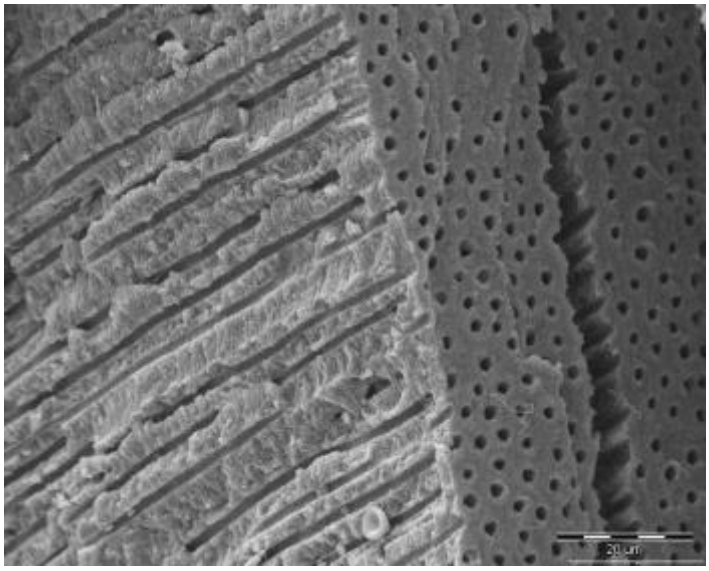


FIG.1. Dentin canaliculus.

Primary dentin is formed in the tooth before completion of apical foramen (form the initial shape of the tooth) and is usually completed 2-3 years after eruption.

Mantle dentin (outermost layer) is closest to enamel, formed by newly differentiated odontoblasts and forms a layer approximately 150 micrometers wide with the collagen fibers perpendicular to the DEJ; unlike primary dentin, mantle lacks phosphor, has loosely packed collagen fibrils and is less mineralized. Mantle dentin is first dentin formed.

Predentin is layer around outer pulpal wall (formed after mantle dentin); it is usually 10-47 micrometer; it is mineralized zone of dentin is immediately next to the cell bodies of the odontoblasts and it is consist of collagen, glycoprotein and proteoglycans.

Secondary dentin is formed after completion of root (apical foramen), it grows much slower than primary dentin and is less mineralized; its growth causes the decrease in the size of the pulp chamber with age; the tubules are more irregular in shape; it forms on all internal aspects of the pulp cavity and its formation continues throughout the life of the tooth.

Tertiary dentin (*reparative dentin*) is formed in response to localized injury, such as caries, attrition, erosion and etc. along the outer pulpal wall; growth factors (TGF) initiate the production of tertiary dentin by secondary (replacement) odontoblasts which differentiate from mesenchymal cells of the pulp. Tertiary dentin is produced at an average of 1.5μm/day, but can be increased to 3.5μm/day. The tubules assume a more irregular course than in secondary dentin. Odontoblasts in the area of the affected tubules might perish because of the injury, but neighboring undifferentiated mesenchymal cells of the pulp move and become odontoblasts; the affected Odontoblastic processes may die with the associated odontoblasts. These areas of dentin are called *dead tracts* (extend from outer dentine surface to the pulp) and it is sealed off by reparative dentin formed by replacement odontoblasts.

Sclerotic dentin is often found in association with the chronic injury and the tooth age. Clinically, this dentin appears dark, smooth, shiny, hard and less sensitive. *Physiologic dentin sclerosis* results from aging; *reactive dentine sclerosis* is result from a mild irritation.

Eburnated dentin - exposed portion of reactive sclerotic dentin is hard, darkened, cleanable surface. The Odontoblastic processes die and leave the dentinal tubules vacant. The tubules become refilled and occluded by mineralized substance; as the demineralization of the hydroxyapatite crystals, calcium and phosphorus are revealed, allowing for the precipitation of more crystals which fall deeper into the dentinal tubule. These crystals form a barrier and slow the advancement of injury. Thus the peritubular

dentin becomes wider, gradually filling the tubules with calcified material, progressing pulpally from the DEJ.

Peritubular dentin lined the wall of each dentinal tubule.

Intertubular dentin is placed between the dentinal tubule (surround the tubule). Peritubular dentin is much more mineralized than intertubular dentin. In the areas of both primary and secondary mineralization which occurred with complete crystalline fusion (maturation) are found (noted on the silver-stained and ground section of mature dentin) as lighter rounded areas are called globular dentin; in contrast, the dark, arclike areas in dentin are called interglobular dentin. Interglobular dentin is slightly less mineralized than globular dentin, and especially evident in coronal dentin and near the DEJ and in certain dental anomalies (dentin displasia). The tubules have a diameter of 2.5 μm near the pulp, 1.2 μm in the middle of the dentin, and 0.9 μm at the DEJ. Their density is 59.000 to 76.000 per square millimeter near the pulp. There are *branching canaliculi systems* that connect to each other. These branches have been categorized by size, with major being 500-1000 μm in diameter, fine being 300-700 μm, and micro being less than300 μm. The major branches-the terminal ends of the tubules; fine branches-diverging from dentinal tubules at 45 degree angles; micro branches-diverge at 90 degree angles. Dentin is necessary for the support of enamel.

CEMENTUM

Cementum is a hard connective tissue that derives from ectomesenchyme.

Embryologically, there are two types of cementum:

Primary cementum: It is acellular and develops slowly as the tooth erupts. It covers the coronal 2/3 of the root and consists of intrinsic and extrinsic fibers. Secondary cementum: It is formed after the tooth is in occlusion and consists of extrinsic and intrinsic (they derive from cementoblasts) fibers. It covers mainly the root surface.

Functions of Cementum

It protects the dentin (occludes the dentinal tubules)

It provides attachment of the periodontal fibers

It reverses tooth resorption

Cementum is composed of 90% collagen I and III and ground substance.

50% of cementum is mineralized with hydroxyapatite. Thin at the CE junction, thicker apically.

CEMENTUM vs. BONE

Cementum simulates bone

1) Organic fibrous framework, ground substance, crystal type, development

2) Lacunae

3) Canaliculi

4) Cellular components

5) Incremental lines (also known as "resting" lines; they are produced by continuous but phasic, deposition of cementum)

Differences between cementum and bone

1) Cementum is not vascularized

2) Cementum has minor ability to remodel

3) Cementum is more resistant to resorption compared to bone

4) Cementum lacks neural component

5) Cementum contains a unique proteoglycan interfibrillar substance

6) 70% of bone is made by inorganic salts (cementum only 46%)

Relation of Cementum to Enamel at the Cementoenamel Junction (CEJ)

"OMG rule"

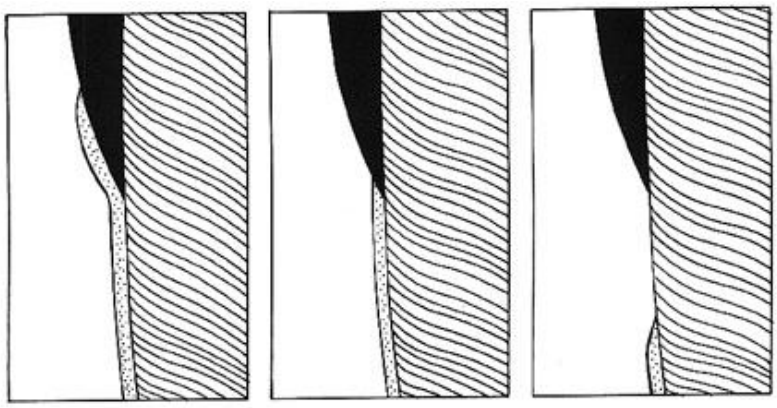


FIGURE 1.

In 60% of the teeth cementum Overlaps enamel
In 30% of the teeth cementum just Meets enamel
In 10% of the teeth there is a small Gap between cementum and enamel.

Classification of Cementum
1. Embryologically
Primary and secondary
2. According to cellular component

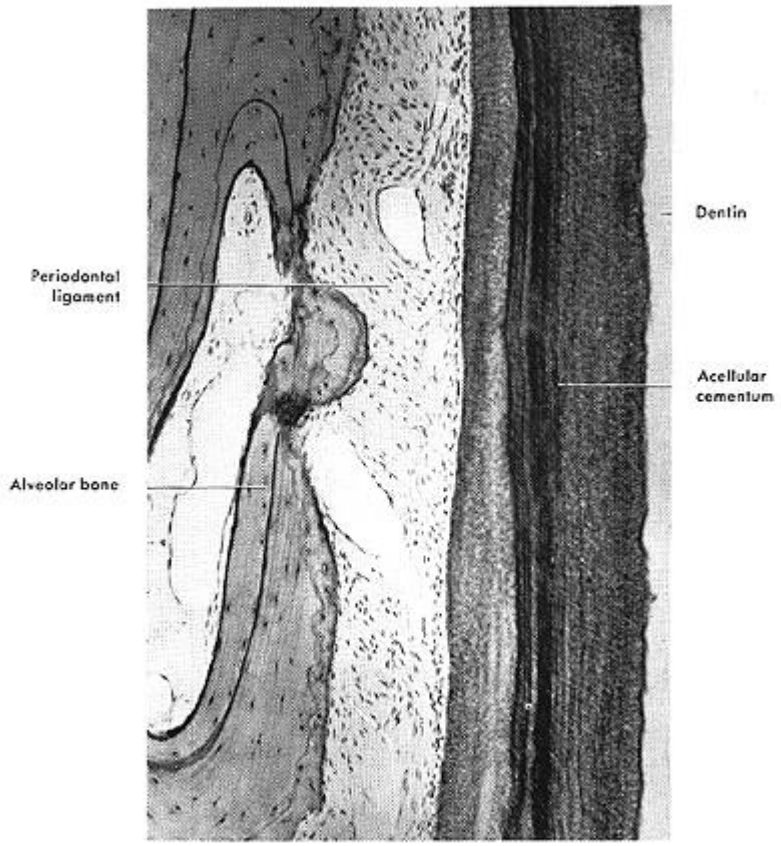


FIGURE 2.

Acellular
Thin
Amorphous
First layer to seal the dentin tubules
Cellular
Thick
Better structure

Apical surface

Layers of cellular and acellular cementum alternate (randomly)

3. Based on the origin of the collagenous matrix

Extrinsic

Intrinsic

Mixed

4. Combined classification

a. Primary acellular intinsic fiber cementum

b. Primary acellualar extrinsic fiber cementum

c. Secondary cellular intrinsic fiber cementum

d. Secondary cellular mixed fiber cementum

e. Acellular afibrillar cementum

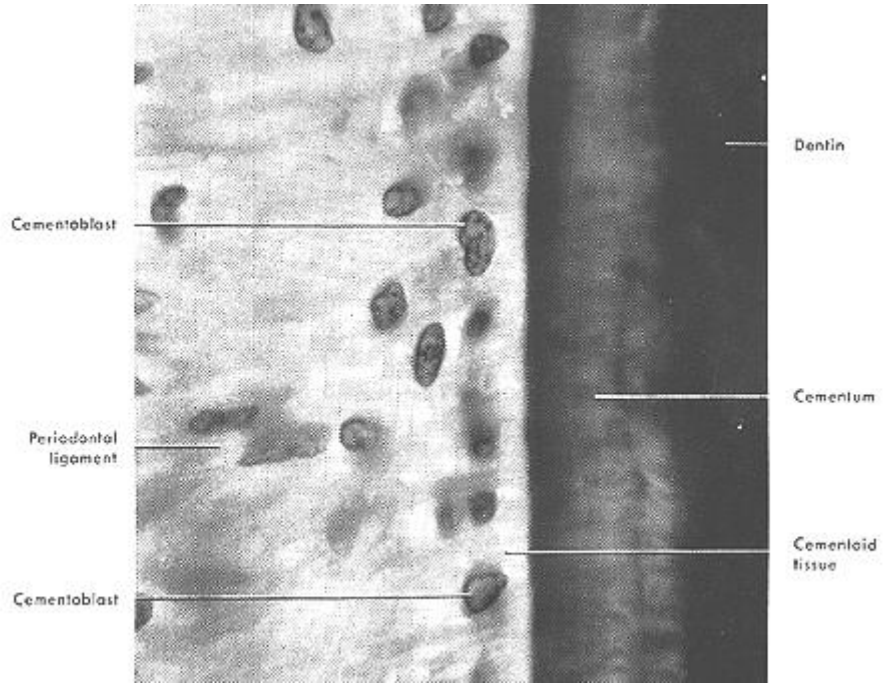
5. Depending on the location and patterning

Intermediate and mixed stratified cementum

Participating Cells

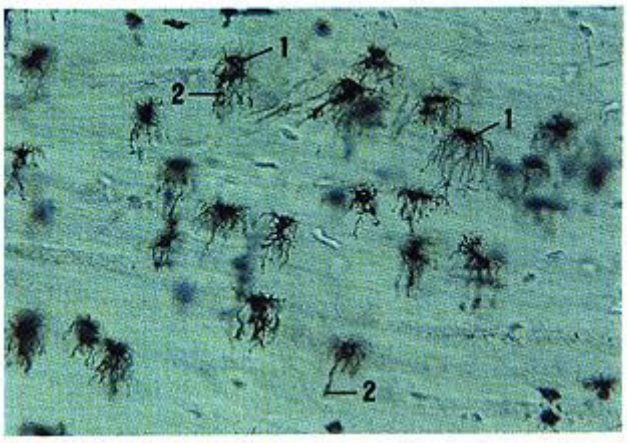
Cementoblasts

FIG3.



Active

Cells are round, plump with basophilic cytoplasm (rough endoplasmic reticulum)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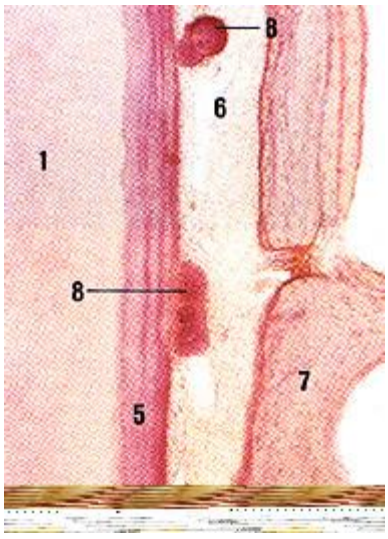
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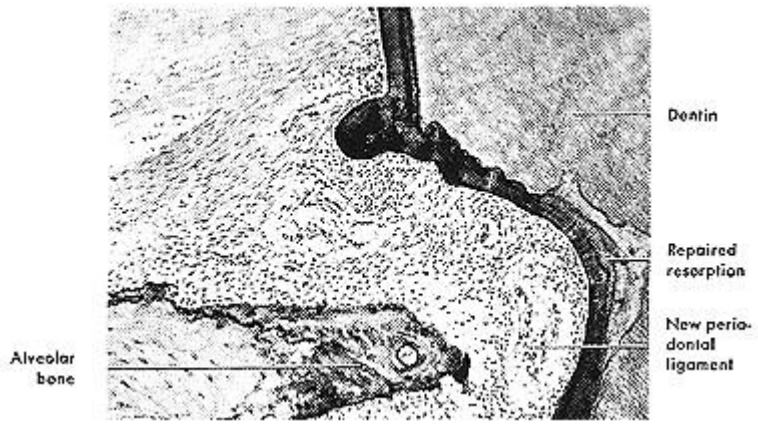
2) With age, the smooth surface of cementum becomes more irregular due to calcification of some ligament fiber bundles. This is referred to as spikes. Behavior of cementum in pathologic conditions

FIGURE 6.



PULP

The pulp is the innermost tissue of the tooth. Pulp appears as a less dense area on radiographs. The pulp of a tooth is a connective tissue with all the components of such a tissue. Embryologically, the pulp forms from the central cells of the dental papilla. Thus pulp has a background similar to that of dentin because both are derived from the dental papilla of thr tooth germ. During odontogenesis, when the dentin forms around the dental papilla, the innermost tissue is considered pulp.

One important consideration. The pulp is involved in the support, maintenance, and continued formation of dentin because the inner layer of the cell bodies of the odontoblasts remain along the outer pulpal wall. Another function of the pulp is sensory because the cell bodies associated with the a afferent axons in the dentinal tubules are located among this layer of odontoblasts. When the dentin or pulp is injured, the only sensation perceived by the brain is pain. Therefore changes is temperature, vibrations, and chemical changes that affect the dentin or pulp are perceived only as painful stimuli.

Pulp also has a nutritional function for the dentin because the dentin contains no blood supply of its own. Dentin depends on the pulp's vascular supply and associated tissue fluids for its nutrition. Nutrition is obtained by

way of the tubules and their connection to the odontoblasts' cell bodies that line the outer pulpal wall.

Finally, the pulp has a protective function because it's involved in the formation of secondary or tertiary dentin, which increases the coverage of the pulp. Inn addition, if the pulp suffers any injury that also involves the odontoblasts, its undifferentiated mesenchymal cells can differentiate into fibroblasts, which then create fibers and intercellular substances, as well as odontoblasts, to create more dentin. The pulp also has white blood cells within its vascular system and tissues; these allow triggering of inflammatory and immune system.

The mass of pulp is contained within in the pulp chamber of the tooth. The shape of the pulp chamber corresponds to the shape of the tooth and is individualized for every tooth. The pulp in the pulp chamber has two main divisions: the coronal pulp and the radicular pulp.

The coronal pulp is located in the crown of the tooth. Smaller extensions of coronal pulp into the cusps of posterior teeth form the pulp horns. These pulp horns are especially prominent for the permanent dentition, under the buccal cusp of premolars and the mesiobuccal buccal cusp of molars. To prevent exposure of the pulpal tissue, these regions must be taken into consideration during cavity preparation. Pulp horns are not found on anterior teeth.

The radicular pulp, or root pulp, is the portion of the pulp located in the root area of the tooth. It is also called the pulp canal by patients. The radicular pulp extends from the cervical portion of the tooth to the apex of the tooth. This portion of the pulp has openings from the pulp through the cementum into the surrounding periodontal ligament. These openings include the apical foramen and possibly accessory canals.

The apical foramen is the opening from the pulp at the apex of the tooth. This opening is surrounded by cementum and allows arteries, veins, lymphatics, and nerves to enter and exit the pulp from the periodontal ligament. This communication between the pulp and the PDL is possible because of the apical foramen. The apical foramen is the last portion of the tooth to form; it forms after the crown erupts into the oral cavity. In

developing teeth, the foramen is large and centrally located. As the tooth matures, the foramen becomes smaller in diameter and is offset in position. The foramen may be located at the anatomical apex of the root but is usually located more slightly occlusally from the apex. If more than one foramen is present on the root, the largest one is designated as the apical foramen and the rest are considered accessory foramina.

Accessory canals may also be associated with the pulp and are extra openings from the pulp to the periodontal ligament. Accessory canals are also called lateral canals because they rae usually located on the lateral portions of the roots of some teeth.

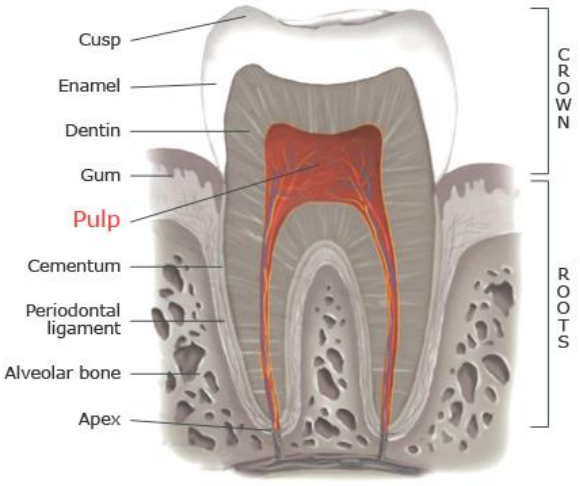
Pulp is connective tissue, it has all the components of such a tissue: intercellular substance, tissue fluid, cells, lymphatics, vascular system, nerves, and fibers.

As in all connective tissues, the fibroblasts are the largest group of cells in the pulp. The odontobalsts are the second largest group of the cells in the pulp, but only their when the pulp is injured by extensive caries, cavity preparation, or traumatic injury, it may undergo inflammation, or pulpitis.

Dental professionals must do their utmost to prevent injury to the pulp during restorative procedures. Such iatrogenic injury to the pulp can result from the heat or vibrations emitted by the handpiece during cavity preparation, causing physical damage. The pulp can also be injured by the restorative materials placed in the cavity preparation. Water – cooled handpieces with rapid rotation, which minimize the stress on the tooth, are now used successfully to reduce the incidence of pulpal damage. Liners are also currently placed over dentin before toxic restorative materials to prevent pulpal damage.

Four zones are evident when pulp tissue is viewed microscopically: the odontoblastic layer, cell – free zone, cell – rich zone, and pulpal core.

The first zone of pulp closest to the dentin is called the odontoblastic layer. This zone lines the outer pulpal wall. It consists of a layer of the cell bodies of odontoblasts, whose odontoblastics processes are located in the dentinal tubules in the adjacent dentin. The odontoblasts are capable of forming secondary or tertiary dentin along the outer pulpal wall. If this


Cusp
Enamel
Dentin
Gum
Pulp
Cementum
Periodontal ligament
Alveolar bone
Apex
CROWN
ROOTS

Thus the pulp becomes more fibrotic with increased age,leading to a reduction in the regenerative capacity of the pulp. Also, the overall pulp cavity can be made smaller by the addition of secondary or tertiary dentin, thus causing pulp recession.

TEETH

Adult teeth (permanent teeth) begin to replace the front milk teeth from the age of about six. For the next six to eight years there is a gradual replacement of milk teeth by adult teeth. This stage is called mixed dentition, as both milk and adult teeth will be from the mouth at the same time. By the age of about 12-14 all adult teeth should have appeared using the exception of wisdom teeth (third molars). At this stage the mouth will contain twenty-eight teeth. These teeth have to last for life as we only get one set.

Your teeth

Incisors - Thin and sharp, used to cut and slice food.

Canines - Sharp and pointed, used to hold and tear food.

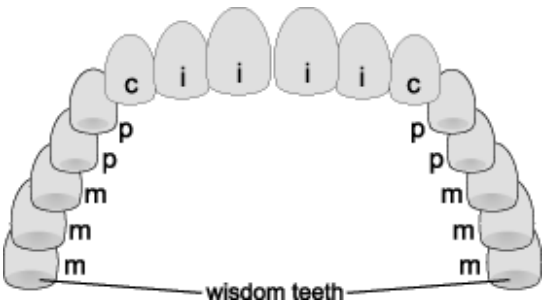
Premolars - Sharp, flat surfaces, to hold and crush food.

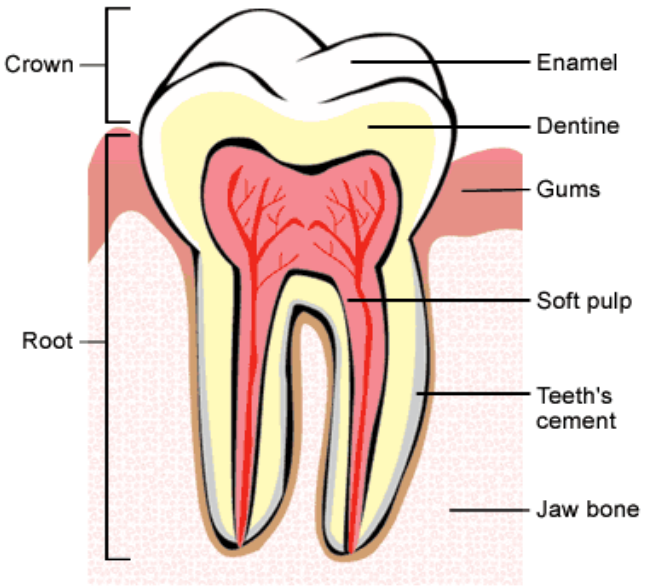
Molars - Broad and flat, used to chew and grind food.

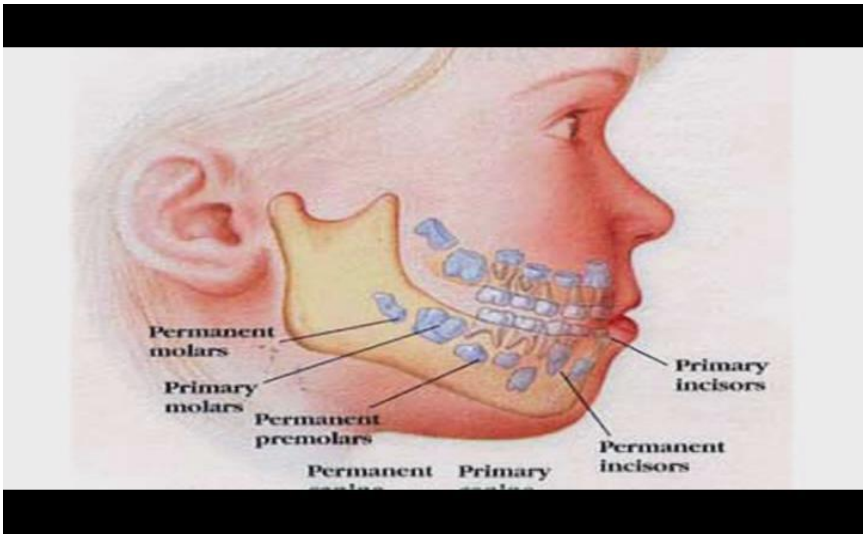
Anatomy of a tooth

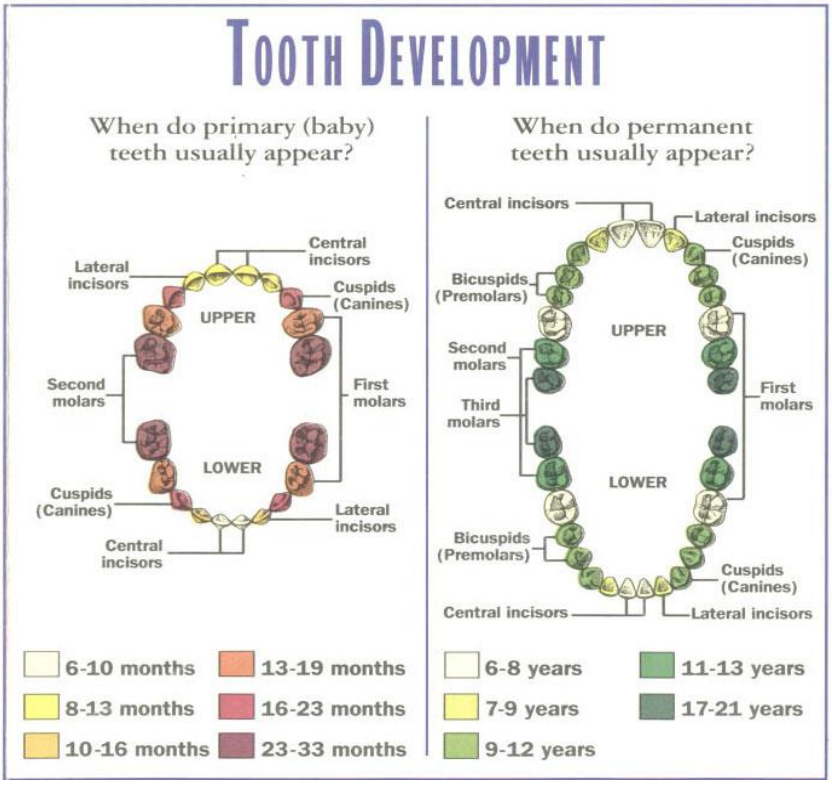
Tooth crown - The visible part of the tooth from the mouth.

Enamel - Enamel is the tough outer coating of the tooth and is the hardest substance from the body.




Crown
Root
Enamel
Dentine
Gums
Soft pulp
Teeth's cement
Jaw bone


Permanent molars
Primary molars
Permanent premolars
Permanent
Primary
Primary incisors
Permanent incisors


TOOTH DEVELOPMENT
When do primary (baby) teeth usually appear?
Central incisors
Lateral incisors
Cuspids (Canines)
UPPER
First molars
Second molars
LOWER
Cuspids (Canines)
Lateral incisors
Central incisors
6-10 months
8-13 months
10-16 months
13-19 months
16-23 months
23-33 months
When do permanent teeth usually appear?
Central incisors
Lateral incisors
Cuspids (Canines)
Bicuspids (Premolars)
UPPER
Second molars
Third molars
First molars
LOWER
Bicuspids (Premolars)
Cuspids (Canines)
Central incisors
Lateral incisors
6-8 years
7-9 years
9-12 years
11-13 years
17-21 years

begin to appear in the oral cavity at the mean age of 6; and the last emerge at a mean age of 28 ± 4 months. The deciduous dentition remains intact (barring loss from dental caries or trauma) until the child is about 6 years of age. At about that time the first succedaneous or permanent teeth begin to emerge into the mouth. The emergence of these teeth begins the transition or mixed dentition period when a mixture of deciduous and succedaneous teeth are present. The transition period lasts from about 6 to 12 years of age, or ends when all the deciduous teeth have been shed. At that time the permanent dentition period begins. Thus the transition from the primary

dentition to the permanent dentition begins with the emergence of the first permanent molars, shedding of the deciduous incisors, and emergence of the permanent incisors. The mixed dentition period is often a difficult time for the young child because of habits, missing teeth, teeth of different colors and hues, crowding of the teeth, and

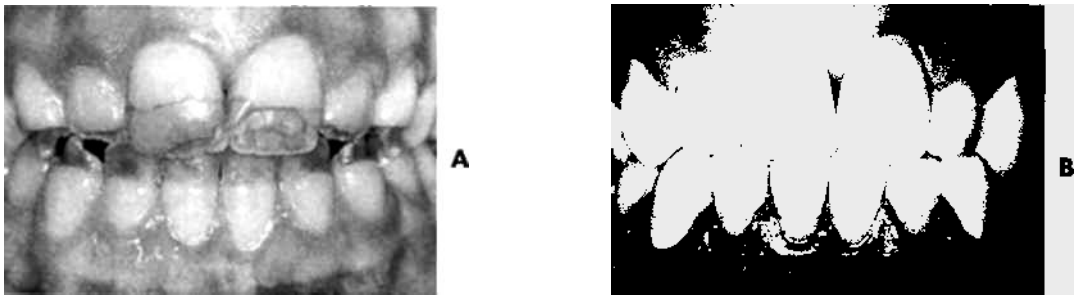


FIG.1-1. A, , Chronological developmental disorder involving all the anterior teeth. B, Illustration of restored teeth just after completion, taking in account esthetics, occlusion, and periodontal health. Note the gingival response is not yet resolved. (From Ash MM, Ramfjord S: Occlusion, **ed 4, Philadelphia, 1995, WB Saunders Company.)**

malposed teeth.

The permanent, or succedaneous, teeth replace the exfoliated

variance. After the shedding of the deciduous canines and molars, emergence of the permanent canines and premolars, and emergence of

the second permanent molars, the permanent dentition is completed (including the roots) at about age 14 to 15, except for the third molars that are completed at age 18 to 25. In effect, the duration of die permanent dentition period is at age 12 or older. The completed permanent dentition consists of 32 teeth if none are congenitally missing, which can be the case.

Nomenclature

The first step in understanding dental anatomy is to learn the nomenclature, or the system of names, used to describe or classify the material included in the subject, (NOTE: When a significant term is used for the first time here, it is emphasized in italics).

The term mandibular refers to the lower jaw, or mandible, and the term maxillary refers to the upper jaw, or maxilla. Where more than one name is used in the literature to describe something, the two most commonly used names are used initially. After that, they may be combined or used separately as consistent with the literature of a particular specialty of dentistry (e.g., primary or deciduous dentition, permanent or succedaneous dentition). A good case may be made for the use of both terms. By dictionary definition, the term primary can mean "constituting or belonging to the first stage in any process." The term deciduous can mean "not permanent, transitory." The same unabridged dictionary refers the reader from the definition of deciduous tooth to milk tooth, which is defined as "one of the temporaiy teeth of a mammal that are replaced by permanent teeth. Also called baby tooth, deciduous tooth."1 The term primary can indicate a first dentition, and the term deciduous can indicate that the first dentition is not permanent but not unimportant. The term succedaneous can be used to describe a successor dentition and does not suggest permanence, whereas the term permanent suggests a permanent dentition, which may not be the case because of dental caries, periodontal diseases, and trauma.

Formulae for Mammalian Teeth

The denomination and number of all mammalian teeth are expressed by formulae that are used to differentiate the human dentitions from that of other species. The denomination of each tooth is often represented by the initial letter in its name (e.g., / for incisor, C for canine, P for premolar, M for molar); each letter is followed by a horizontal line and the number of each type of tooth is placed above the line for the maxilla (upper jaw) and below the line for the mandible (lower jaw). The formulae include one side only with the number of teeth in each jaw being the same for humans.

The dental formula for the primary/deciduous teeth in humans is as follows:

$$I\frac{2}{2}C\frac{1}{1}M\frac{2}{2}=10$$

This formula should be read as: Incisors, two maxillary and two mandibular; canines, one maxillary and one mandibular; molars, two maxillary and two mandibular, or 10 total on one side, right or left (Fig. 1-2, A).

A dental formula for the permanent human dentition is as follows:

$$I\frac{2}{2}C\frac{1}{1}P\frac{2}{2}M\frac{3}{3}=16$$

Premolars have now been added to the formula (two maxillary and two mandibular), and a third molar has been added (one maxillary and one mandibular) (see Fig. 1-2, B).

Systems for scoring key morphological traits of the permanent dentition that are used for anthropological studies are not considered here. Some anthropologists use di1,, di2, dc, dm1, dm2, notations for the deciduous dentition, and I1, I2, C, P1, P2, M1, M2, M3, for the permanent teeth. These notations are generally limited to anthropological tables because of keyboard incompatibility.

Tooth Numbering Systems

In clinical practice, a "shorthand" system of tooth notation is necessary for recording data. Several systems are in use in the world, but only a few are considered here. In 1947 a committee at the American Dental Association (ADA) recommended the symbolic (Zsigmondy/Palmer) system

as the numbering method of choice. However, because of difficulties with keyboard notalion with the symbolic notation system, in 1968 the ADA officially recommended the universal numbering system. Because of some limitations and0 lack of widespread use internationally, recommendations for a change sometimes are made.'1

The universal system of notation for the primary dentition uses uppercase letters for each of the primary teeth. For example, the maxillary teeth, beginning with the right second molar, use the letters A through |; for the mandibular teeth, letters K through T are used, beginning with the left mandibular second molar.

The universal system notation for the entire primary dentition is as follows:

Midsagittal plane

↓

$$\text{Right}\ \frac{ABCDE|FGHIJ}{TSRQP|ONMLK}\ \text{Left}$$

The symbolic system for the permanent dentition was introduced by Adolph Zsigmondy of Vienna in 1861 and then modified for the primary dentition in 1874. Independently, Palmer published also the symbolic system in 1870. The symbolic system is most often referred to as the Palmer notation system in the United States and less commonly as the Zsigmondy/Palmer notation system. In this system the arches are divided into quadrants with the entire primary dentition being notated as follows:

$$\frac{ECDCBA|ABCDE}{EDCBA|ABCDE}$$

Thus for a single tooth such as the maxillary right central incisor the designation is $\underline{A}|$. For the mandibular left central incisor, the notation is

given as |A. This numbering system presents difficulty where an appropriate font is not available for keyboard recording of Zsigmondy/Palmer symbolic notations, (see http://www.dentagraphics.co.uk/info.htm to obtain this font.) For simplification, this symbolic notation is often designated as Palmer's dental notation rather than Zsigmondy/Palmer notation.

In the universal notation system for the permanent dentition, the maxillary teeth are numbered from 1 through 16, beginning with the right third olar. Beginning with the mandibular left third molar, the teeth are numbered 17 through 32. Thus the right maxillary first molar is designated as 3, the axillary left central incisor as 9, and the right mandibular first molar as 30. The Zsigmondy/Palmer notations for the permanent dentition is a four-quadrant symbolic system, in which beginning with the central incisors, the teeth are numbered 1 through 8 (or more) in each arch. For example, the right maxillary first molar is designated as $\underline{6}|$, and the left mandibular central incisor as |1. The Palmer notation for the entire permanent dentition is as follows:

$$\frac{8765432\,1|12345678}{8765432\,1|12345678}$$

Viktor Haderup of Denmark in 1891 devised a variant of the eight-tooth quadrant system in which phis (+) and minus (-) were used to differentiate between upper and lower quadrants, and between right and left quadrants (e.g., +1 = upper left central incisor; 1- = lower right central incisor). Primary teeth were numbered as upper right (05+ to 01+), lower left (-01 to -05). This system is still taught in Denmark.

The universal system is acceptable to computer language, whereas the Palmer notation is generally incompatible with computers and word processing systems. Each tooth in the universal system is designated with a unique number, leading to less confusion than with the Palmer notation.

A two-digit system proposed by Federation Dentaire Internationale (FDI) for both the primary and permanent dentitions has been adopted by the World Health Organization (WHO) and accepted by other organizations such as the International Association for Dental Research (IADR). The FDI system of tooth notation for primary teeth is as follows:

Upper right Upper left

5554535251|6162636465
8584838281|7172737475

Lower right Lower left

Numeral 5 indicates the maxillary right, and 6 indicates the maxillary left side. The second number of the two-digit number is the tooth number for each side. The number 8 indicates the mandibular right, and the number 7 indicates the mandibular left side. The second number of the two-digit system is the tooth number. For example, the number 51 refers to the maxillary right primary central incisor.

The FDI system of tooth notation for permanent teeth is as follows:

Upper right Upper left

18171615141312 11|21222324252627 28
48474645444342 41|31323334353637 38

Lower right Lower left

Thus as in the two-digit FDI system for the primary dentition, the first digit indicates the quadrant (1 to 4) for the permanent dentition and for the primary dentition (5 to 8). The second digit indicates the tooth within a quadrant: 1 to 8 for the permanent teeth and 1 to 5 for the primary teeth. For example, the permanent upper right central incisor is 11 (pronounced one-one, not eleven).

ANATOMY OF TEETH

There the crown (corona dentis), root of tooth (radix dentis, which is placed in the alveolum) and neck of tooth (cervix dentis, which is the intermediate part between the crown and root) where the enamel is graduating and the cementum is beginning. There is the ligamentum circularis around the neck. Inside there are the tooth' cavity (cavitas dentis), which is divided into the crown part (cavitas coronale) and the root canal of tooth or root canal (canalis radicis dentis). Root is graduating in the apex with narrow apical hole (foramen apicis dentis).

Teeth ' crowns have few surfaces. In the groups of anterior teeth there are: Vestibular (facies vestibularis); Lingual (facies lingualis).

Two contact surfaces , one of them is toward to medium line and is referred as medium surfaces (facies medialis) , but other surfaces is directed toward outside and is referred as lateral surface (facies lateralis).The cutting edge (margo incisalis) is formed by the line, which is formed as the result of confluence between the lingual and labial surfaces. In the groups of premolars and molars there are vestibular surfaces (facies vestibularis), lingual (facies lingualis), chewing surface (facies masticatoria). The contact surface are referred as anterior surface (facies anterior), and posterior (facies posterior).Each tooth has anatomy peculiarities , which allow to determine (or to different) its belonging group. There are following peculiarities : crown 'form , cutting edge ' form or chewing surface's form, the amount of teeth. Besides that, there are peculiarities of teeth, which allow to different their belongings to right or left jaw : peculiarities of crown curvature, of margin and of the root

1. peculiarity of crown curvature shows itself that the most convexity of vestibular (buccal) surface is located medial ;
2. peculiality of crown margin shows itself that the medial surface and cutting edge of incisors and canines form the more

acute angle than angle, which is formed by cutting edge and lateral surface ;

3. Peculiarity of root shown itself that the roots of incisors and canines move aside toward the posterior-lateral direction, and premolars and molars - in posterior direction from long axis of root.

INTRODUCTION TO DENTAL ANATOMY

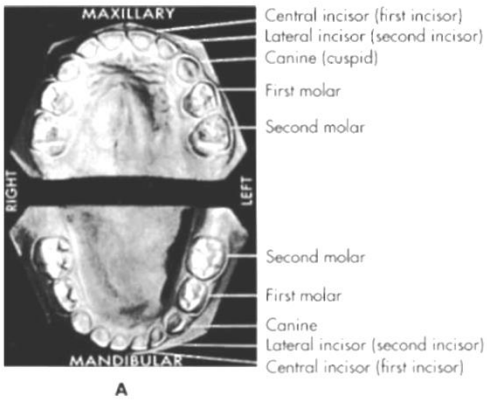
A study of dental anatomy requires learning about the morphology of the various teeth in the human dentitions and knowledge of how the shape, form, structure, color, and function of the teeth relate to each other in the same dental arch and to the teeth in the opposing arch. Thus the study of dental anatomy, physiology, and occlusion provides one of the basic components of the skills needed to practice all phases of dentistry.

The application of dental anatomy to clinical practice can be envisioned in Fig. 1-1, A, where a disturbance of enamel formation has resulted in esthetic, psychological, and periodontal problems that may be corrected by an appropriate restorative dental treatment such as illustrated in Fig. 1-1, B. The practitioner has to have knowledge of the morphology, occlusion, esthetics, phonetics, and functions of these teeth to undertake such treatment.

THE CROWN AND ROOT

Each tooth has a crown and root portion. The crown is covered with enamel, and the root portion is covered with cementum. The crown and root join at the cementoenamel junction (CEJ). This junction, also called the cervical line (Fig. 1-3), is plainly visible on a specimen tooth. The main bulk of the tooth is composed of dentin, which is clear in a cross section of the tooth. This cross section displays a pulp chamber and a pulp canal, which normally contain the pulp tissue.

The pulp chamber is in the crown portion mainly, and the pulp canal is in the root (Fig. 1-4). The spaces are continuous with each other and are spoken of collectively as the pulp cavity.



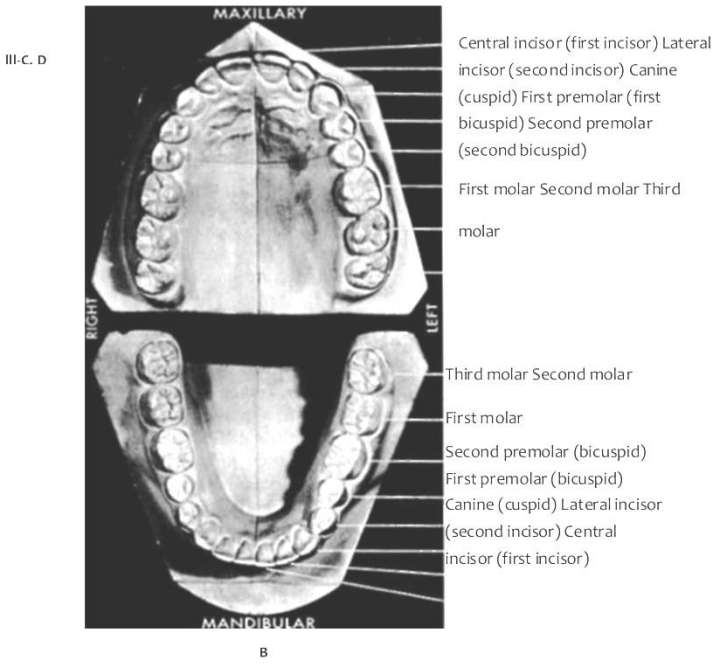


FIG. 1-2 A,Casts of deciduous, or primary, dentition.B, Casts of permanent dentition

IV-A-8, B

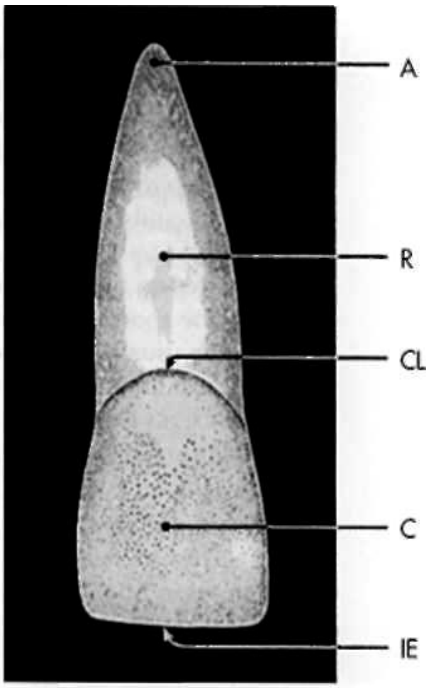


FIG. **1-3** Maxillary central incisor (facial aspect). *A,* Apex of root; *R,* root; *CL,* cervical line; *C,* crown; *IE,* incisal edge.

FIG.1-3 Maxillary central incisor (facial aspect). A, Apex of root; R, root; Cl, cervical line; C, crown; IE, incisal edge.

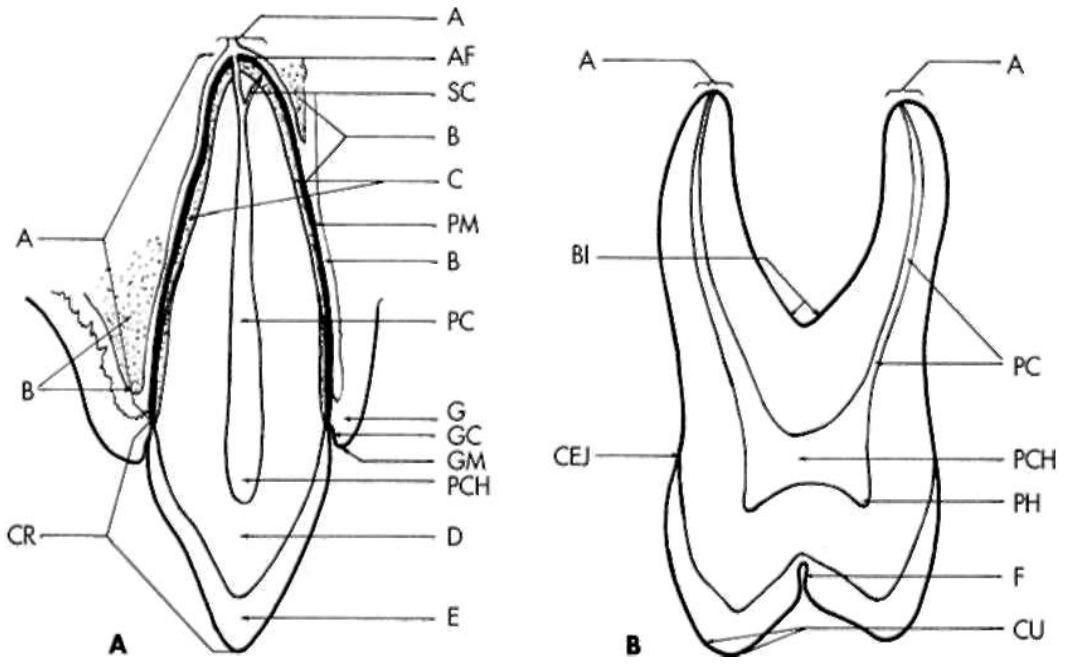


FIG.1-4. Schematic drawing of longitudinal sections of an anterior and a posterior tooth. A,Anterior tooth, A, Apex;AF, apical foramen; SC, supplementary canal; C,cementum;PM,periodontal ligament;B, bone;PC, pulp canal;GC, gingival crevice;GM, gingival margin;PCH, pulp canal;
chamber;D, dentin;E, enamel;CR, crown.B,Posterior tooth.A,Apices;PC, pu lp canal; PCH, pulp chamber;PH, pulp horn;F, fissure;CU,cusp;CEJ, cementoenamel junction; BI, bifurcation of root

The four tooth tissues are enamel, cementum, dentin, and pulp. The first three are known as hard tissues, the last as soft tissue. The pulp tissue furnishes the blood and nerve supply to the tooth. The tissues of the teeth must be considered in relation to the other tissues of the orofacial structures (Figs. 1-5 and 1-6) if the physiology of the teeth is to be understood.

The crown of an incisor tooth may have an incisal ridge or edge, as in the central and lateral incisors; a single cusp, as in the canines; or two or more cusps, as on premolars and molars. Incisal ridges and cusps form the cutting surfaces on tooth crowns.

The root portion of the tooth may be single with one apex or terminal end, as usually found in anterior teeth and some of the premolars, or multiple with a bifurcation or Bifurcation dividing the root portion into two or more extensions or roots with their apices or terminal ends, as found on all molars and in some premolars.

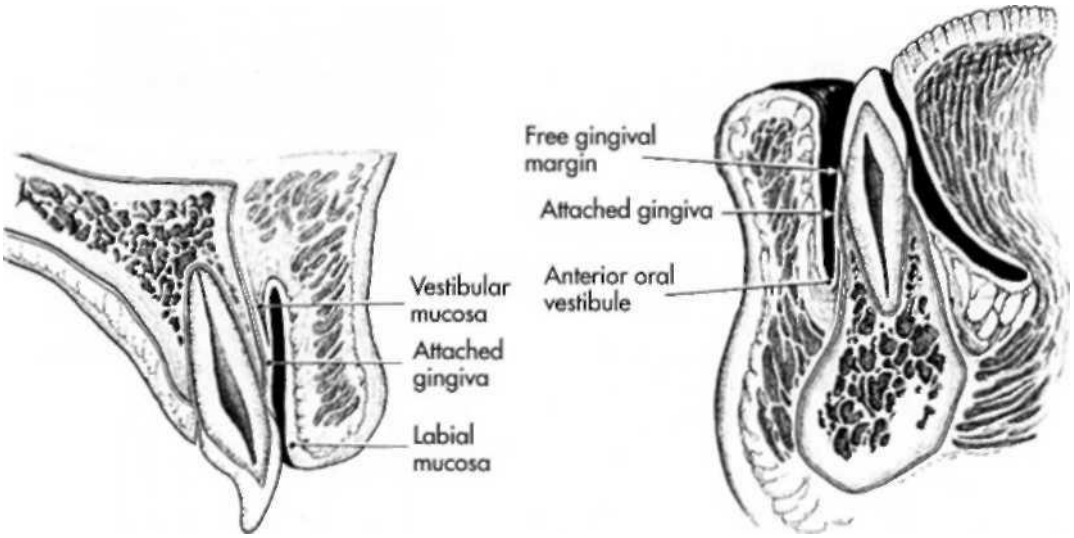


FIG.1-5 Sagittal sections through the maxillary and mandibular molars

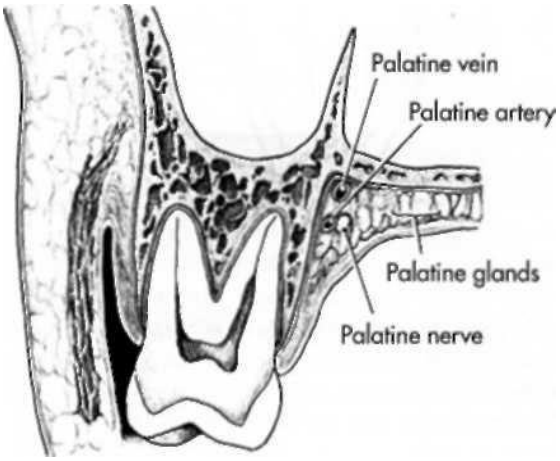


FIG.1-6. Section through the second maxillary molars and adjacent tissues

The root portion of the tooth is firmly fixed in the bony process of the jaw, so that each tooth is held in its position relative to the others in the dental arch. That portion of the jaw serving as support for the tooth is called the alveolar process. The bone of the tooth socket is called the alveolus (plural, alveoli) (Fig. 1-7).

The crown portion is never covered by bone tissue after fully erupted, but it is partly covered at the cervical third in young adults by soft tissue of the mouth known as the gingiva or gingival tissue, or gums. In some persons, all of the enamel and often some cervical cementum may not be covered by the gingiva.

SURFACES AND RIDGES

The crowns of the incisors and canines have four surfaces and a ridge, and the crowns of the premolars and molars have five surfaces. The surfaces are named according to their positions and uses (Fig. 1-8).In the incisors and canines, the surfaces toward the lips are called labial surfaces; in the premolars and molars, those facing the cheek are called buccal surfaces. When labial and buccal surfaces are spoken of collectively, they are called facial surfaces. All surfaces facing toward the tongue are called lingual surfaces. The surfaces of the premolars and molars that come in contact

(occlusion) with those in the opposite jaw during the act of closure are called occlusal surfaces. These are called incisal surfaces with respect to incisors and canines.

The surfaces of the teeth facing toward adjoining teeth in the same dental arch are called proximal or proximate surfaces. The proximal surfaces may be called either mesial or distal. These terms have special reference to the position of the surface relative to the median line of the face. This line is drawn vertically through the center of the face, passing between the central incisors at their point of contact with each other in both the maxilla and the mandible. Those proximal surfaces that, following the curve of the arch, are faced toward the median line are called mesial surfaces, and those most distant from the median line are called distal surfaces.

Four teeth have mesial surfaces that contact each other and are called the maxillary and mandibular central incisors. In all other instances, the mesial surface of one tooth contacts the distal surface of its neighbor, except for the distal surfaces of third molars of permanent teeth and distal surfaces of second

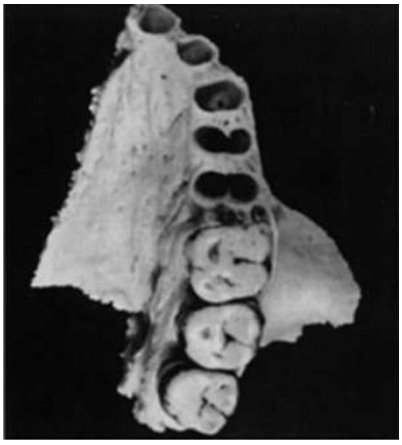


FIG. 1-7 Left maxillary bone showing the alveolar process with three molars in place and the alveoli of the central incisor, lateral incisor, canine, and first and second premolars. Note the opening at the bottom of the canine alveolus, an opening that accommodates the nutrient blood and nerve supply to the tooth in life. Although they do not show up in the photograph, the other alveoli present the same arrangement.

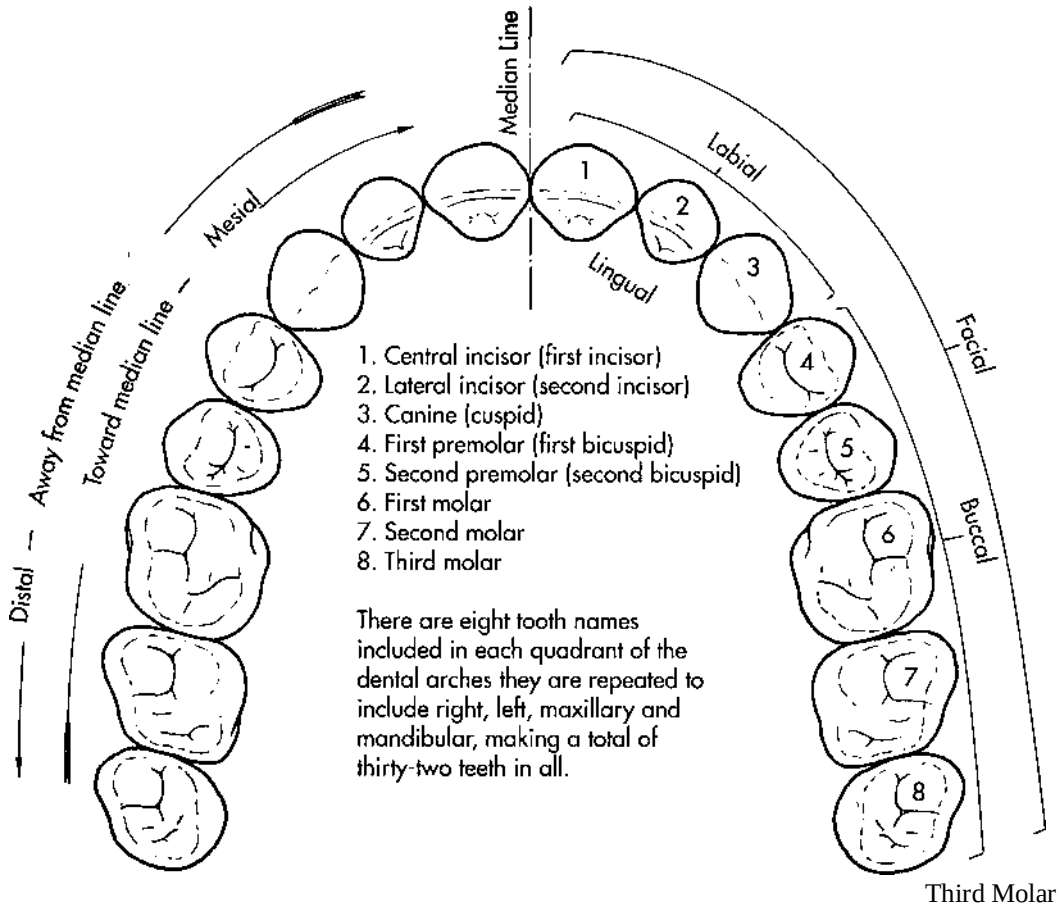


FIG. ***1-8*** Application of nomenclature. Tooth numbers [] to [8 indicating left maxillary teeth. Tooth surfaces related to the tongue (lingual), cheek (buccal), lips (labial), and face (facial), apply to four quadrants and the upper left quadrant. The teeth or their parts or surfaces may be described as being away from the midline (distal) or toward the midline (mesial).

molars in deciduous teeth, which have no teeth distal to them. The area of the mesial or distal surface of a tooth that touches its neighbor in the arch is called the contact area.

Central and lateral incisors and canines as a group are called anterior teeth; premolars and molars as a group are called posterior teeth.

OTHER LANDMARKS

To study an individual tooth intelligently, all landmarks of importance should be recognized by name. Becoming familiar with the following additional terms is necessary**:**

cusp tubercle	oblique ridge
cingulum ridge	fossa
marginal ridge	sulcus
triangular ridge	developmental groove
transverse ridge	supplemental groove pit lobe

A cusp is an elevation or mound on the crown portion of a tooth making up a divisional part of the occlusal surface (Fig. 1-9 see Fig. 1-4).

A tubercle is a smaller elevation on some portion of the crown produced by an extra formation of enamel. Deviations from the typical form are evident.

A cingulum, or girdle, is the lingual lobe of an anterior tooth and makes up the bulk of the cervical third of the lingual surface. Its convexity mesiodistally resembles a girdle encircling the lingual surface at the cervical third (Fig. 1-10).

A ridge is any linear elevation on the surface of a tooth and is named according to its location (e.g., buccal, incisal, or marginal ridge).

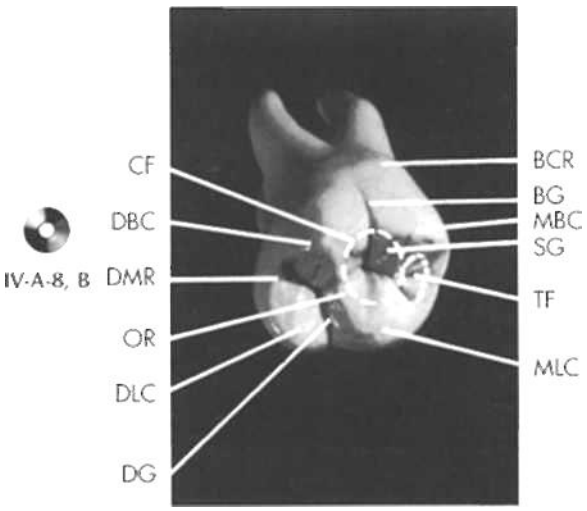


FIG. 1 -9 Some landmarks on the maxillary first molar. BC, Buccal groove; MBC, mesiobuccal cusp; 5G, supplemental groove; TF, triangular fossa; MLC, mesiolingual cusp; DC, developmental groove; DLC, distolingual cusp; OR, oblique ridge; DMR, distal marginal ridge; DSC, distobuccal cusp; CF, central fossa; BCR, buccocervical ridge.

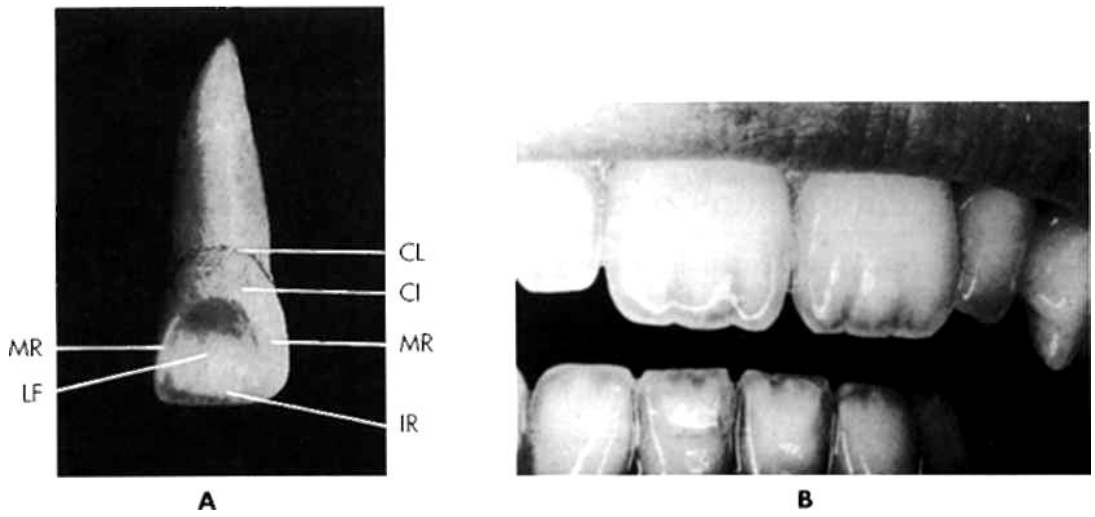


FIG. 1-10 A, Maxillary right central incisor (lingual aspect). CL, Cervical line; CI, cingulum (also called the linguocervical ridge); MR, marginal ridge; IR, incisal ridge; LF, lingual fossa. B, Mamelons on erupting, noncontacting central incisors.

Marginal ridges are those rounded borders of the enamel that form the mesial and distal margins of the occlusal surfaces of premolars and molars and the mesial and distal margins of the lingual surfaces of the incisors and canines (Fig. 1-11; see Fig. 1-10, A).

Triangular ridges descend from the tips of the cusps of molars and premolars toward the central part of the occlusal surfaces. They are so named because the slopes of each side of the ridge are inclined to resemble two sides of a triangle (Fig. 1-12; see Figs. 1-11, B and C). They are named after the cusps to which they belong (e.g., the triangular ridge of the buccal cusp of the maxillary first premolar).

When a buccal and lingual triangular ridge join, they form a transverse ridge. A transverse ridge is the union of two triangular ridges transversely crossing the surface of a posterior tooth (see Fig. 1-11, B and C).

The oblique ridge is a ridge obliquely crossing the occlusal surfaces of maxillary molars and formed by the union of the triangular ridge of the distobuccal cusp and the distal cusp ridge of the mesiolingual cusp (see Fig. 1-9).

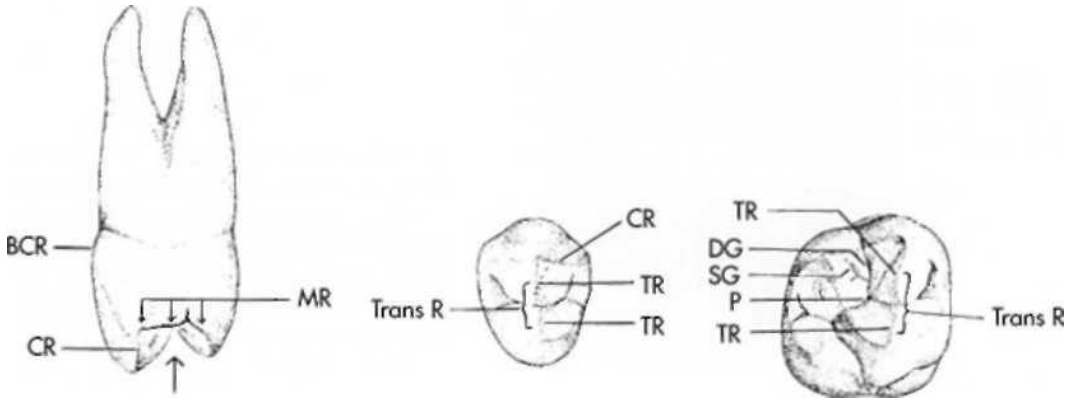


FIG. 1-11 A, ***Mesial view of a maxillary right first premolar. S, Sulcus traversing occlusal surface;*** MR, ***marginal ridge;*** CR, ***cusp ridge;*** BCR, ***buccocervical ridge. B, Occlusal view of maxillary right first premolar;*** CR, ***cusp ridge;*** TR, ***triangular ridges;*** TRANS R, ***transverse ridge, formed by two triangular ridges crossing the tooth transversely.*** C, ***Occlusal view of a maxillary right first molar.*** TR, ***triangular ridge; DC, developmental groove;*** SC, ***supplemental groove;*** P, ***pit formed by junction of developmental grooves;*** TR, ***triangular ridge;*** TRANS R, ***transverse ridge.***

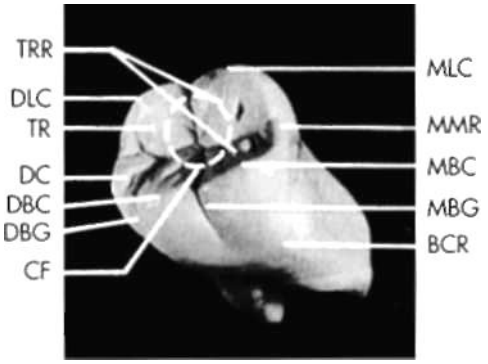


FIG. 1-12 Mandibular right first molar. MLC, ***Mesiolingual cusp;*** MMR, ***mesial marginal ridge;*** MBC, ***mesiobuccal cusp,*** MBC, ***mesiobuccal groove;*** CF, ***central fossa; D8G, distobuccal groove;*** DBC, ***distobuccal cusp; DC, distal cusp;*** TR, ***triangular ridge;DLC,distolingual cusp;*** TRR, ***transverse ridge;*** BCR, ***buccocervical ridge.***

A fossa is an irregular depression or concavity. Lingualfossae are on the lingual surface of incisors (see Fig.1-10). Central fossae are on the occlusal surface of molars. They are formed by the convergence of ridges

terminating at a central point in the bottom of the depression where a junction of grooves occurs (see Fig. 1-12). Triangular fossae are found on molars and premolars on the occlusal surfaces mesial or distal to marginal ridges (see Fig. 1-9). They are sometimes found on the lingual surfaces of maxillary incisors at the edge of the lingual fossae where the marginal ridges and the cingulum meet .

A sulcus is a long depression or valley in the surface of a tooth between ridges and cusps, the inclines of which meet at an angle. A sulcus has a developmental groove at the junction of its inclines. (The term sulcus should not be confused with the term groove.)

A developmental groove is a shallow groove or line between the primary parts of the crown or root. A supplemental groove, less distinct, is also a shallow linear depression on the surface of a tooth, but it is supplemental to a developmental groove and does not mark the junction of primary parts. Buccal and lingual grooves are developmental grooves found on the buccal and lingual surfaces of posterior teeth (see Figs.1-9 and 1-12).

Pits are small pinpoint depressions located at the junction of developmental grooves or at terminals of those grooves. For instance, central pit is a term used to describe a landmark in the central fossa of molars where developmental grooves join (see Fig. 1-11, C).

A lobe is one of the primary sections of formation in the development of the crown. Cusps and mamelons are representadve of lobes. A mamelon is any one of the three rounded protuberances found on the incisal ridges of newly erupted incisor teeth (see Fig. 1-10, B).

The roots of the teeth may be single or muldple. Both maxillary and mandibular anterior teeth have only one root each. Mandibular first and second premolars and the maxillary second premolar are single rooted, but the maxillary first premolar has two roots in most cases—a buccal and lingual. Maxillary molars have three roots—a mesiobuccal, distobuccal, and lingual. Mandibular molars have two roots—a mesial and distal. It must be understood that description in anatomy can never follow a hard-and-fast rule; variations often occur. This is especially true regarding tooth roots (e.g., facial and lingual roots of mandibular canine).

Division into Thirds, Line Angles, and Point Angles

For purposes of description, the crowns and roots of teeth have been divided into thirds and junctions of the crown surfaces are described as line angles and point angles. Actually, no angles, points, or plane surfaces are on the teeth anywhere except where wear (e.g., attrition, abrasion) may have occurred or from accidental fracture. Line and point angles are used only as descriptive terms to indicate a location.

The surfaces of the crown and root portions are divided into thirds, which are named according to their location. Examining the tooth from the labial or buccal aspect, the crown and root may be divided into thirds from the incisal or occlusal surface of the crown to the apex of the root (Fig. 1-13). The crown is divided into an incisal or occlusal third, a middle third, and a cervical third. The root is divided into a cervical third, a middle third, and an apical third.

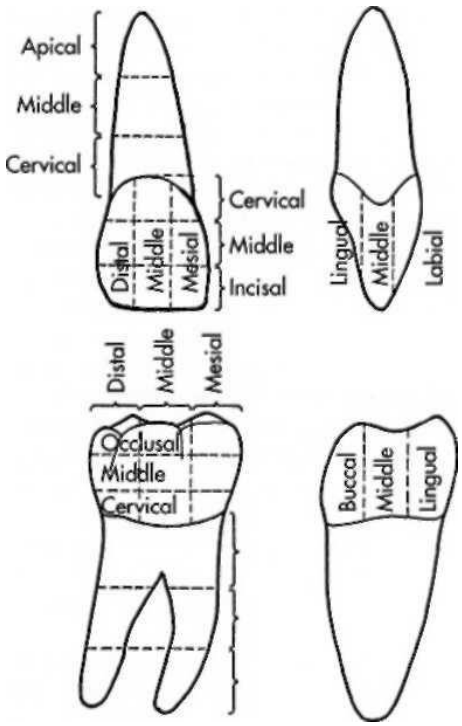


FIG 1-13.Division into thirds.

The crown may be divided into thirds in three directions: inciso- or occlu-socervically, mesiodistally, or labio- or buccolingually. Mesiodistally, it is divided into the mesial, middle, and distal thirds. Labio- or buccolingually, it is divided into labial or buccal, middle, and lingual thirds.

Each of the five surfaces of a crown may be so divided. One middle third and two other thirds are named according to their location (e.g., cervical, occlusal, mesial, lingual).

A line angle is formed by the junction of two surfaces and derives its name from the combination of the two surfaces that join. For instance, on an anterior tooth, the junction of the mesial and labial surfaces is called the mesiolabial line angle.

The line angles of the anterior teeth (Fig. 1-14, A) are as follows:

mesiolabial distolingual
distolabial labioincisal
mesiolingual linguoincisal

Because the mesial and distal incisal angles of anterior teeth are rounded, mesioincisal line angles and distoincisal line angles are usually considered nonexistent. They are spoken of as mesial and distal incisal angles only. The line angles of the posterior teeth (see Fig. 1-14, B) are as follows:

mesiobuccal mesio-occlusal
distobuccal disto-occlusal
mesiolingual bucco-occlusal
distolingual linguo-occlusal

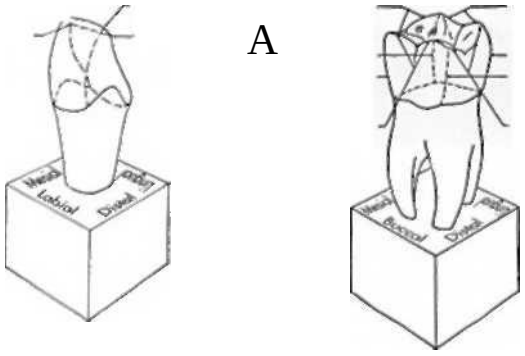


FIG. 1-14 **Line angles.** A, **Anterior teeth.** B, **Posterior teeth.**

A point angle κ formed by the junction of three surfaces. The point angle also derives its name from the combination of the names of the surfaces forming it. For example, the junction of the mesial, buccal, and occlusal surfaces of a molar is called the mesiobuccoocclusal point angle.

The point angles of the anterior teeth (Fig. 1-15, A) are as follows:

Mesiolabioincisal	mesiolinguoincisal
Distolabioincisal	distolinguoincisal

The point angles of the posterior teeth (see Fig. 1-15, B) are as follows:

Mesiobucco-occlusal	mesiolinguo-occlusal
Distobucco-occlusal	distolinguo-occlusal

Tooth Drawing and Carving

The subject of drawing and caning of teeth is being introduced at this point because it has been found through experience that a laboratory course in tooth morphology (dissection, drawing, and carving) should be carried on simultaneously with lectures and reference work on the subject of dental anatomy. Illustrations and instruction in tooth form drawing and carving, however, are not included here.'

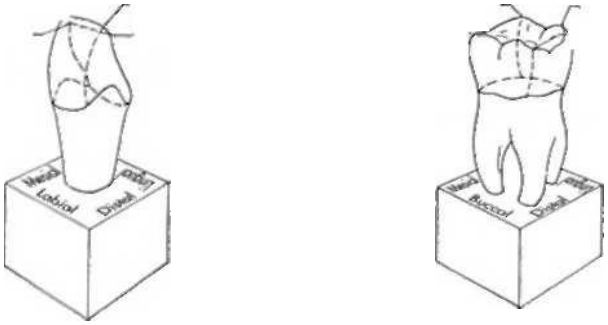


FIG.1-15. Point angles.

The basis for the specifications to be used for carving individual teeth is from a table of average measurements for permanent teeth given by Dr. G. V. Black." However, teeth carved or drawn to these average dimensions cannot be set into place for an ideal occlusion. Therefore for purposes of producing a complete set of articulated teeth carved from Ivorine, minor changes have been made in Dr. Black's table. Also, carving teeth to natural size, calibrated to tenths of a millimeter, is not practical. The only fractions listed in the model table are 0.5 mm and 0.3 mm in a few instances.

Fractions are avoided whenever possible to facilitate familiarity with the table and to avoid confusion.

A table of measurements must be arbitrarily agreed upon so that a reasonable comparison can be made when appraising the dimensions of any single aspect of one tooth in the mouth with that of another. It has been found that the projected table functions well in that way. For instance, if the mesiodistal measurement of the maxillary central incisor is 8.5 mm, the canine is approximately 1 mm narrower in that measurement; if by chance the central incisor is wider or narrower than 8.5 mm, the canine measurement corresponds proportionately.

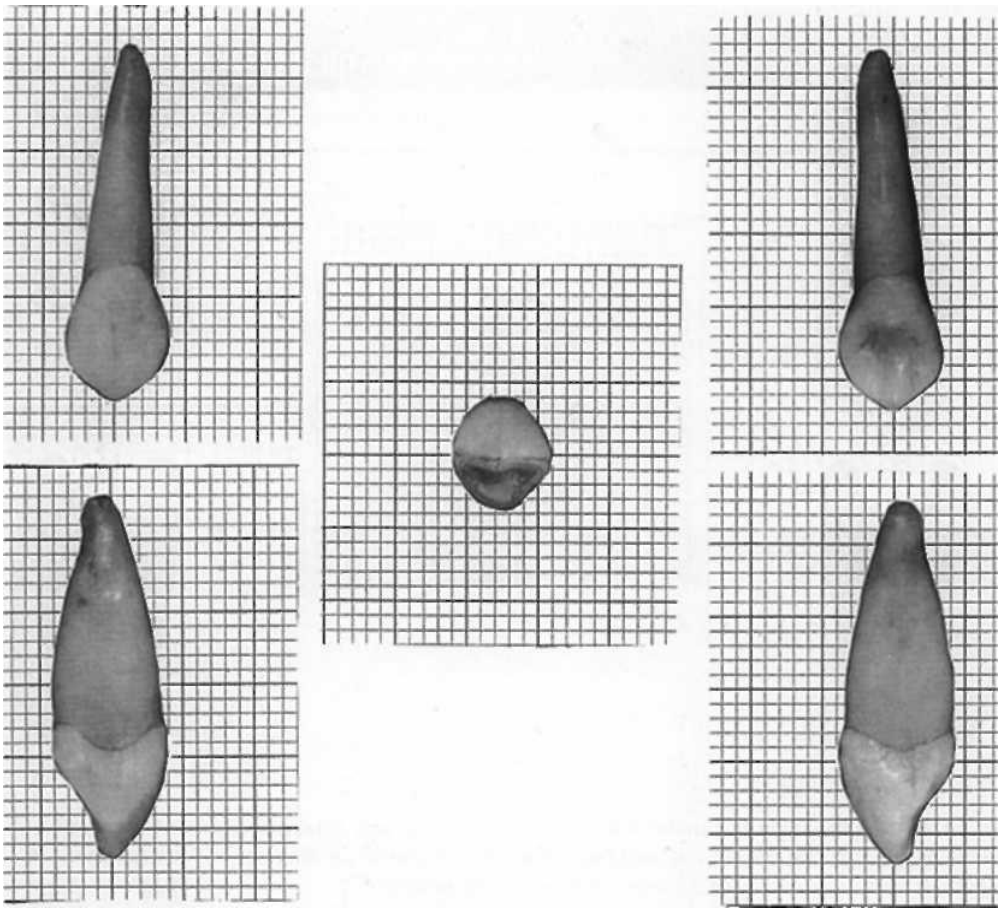


FIG. 1-19 Maxillary left canine. When viewing the mesial and distal aspects, note the curvature or bulge on the crown at the cervical third below the cementoenamel junction. This is called the **cervical ridge,** or the **cervicoenamel ridge.**

Photographs of the five aspects of each tooth (mesial, distal, labial or buccal, lingual, and incisal or occlusal) superimposed on squared millimeter cross-section paper reduces the tooth outlines of each aspect to an accurate

graph, so that it is possible to compare and record the contours (Fig. 1-19 and 1-20).

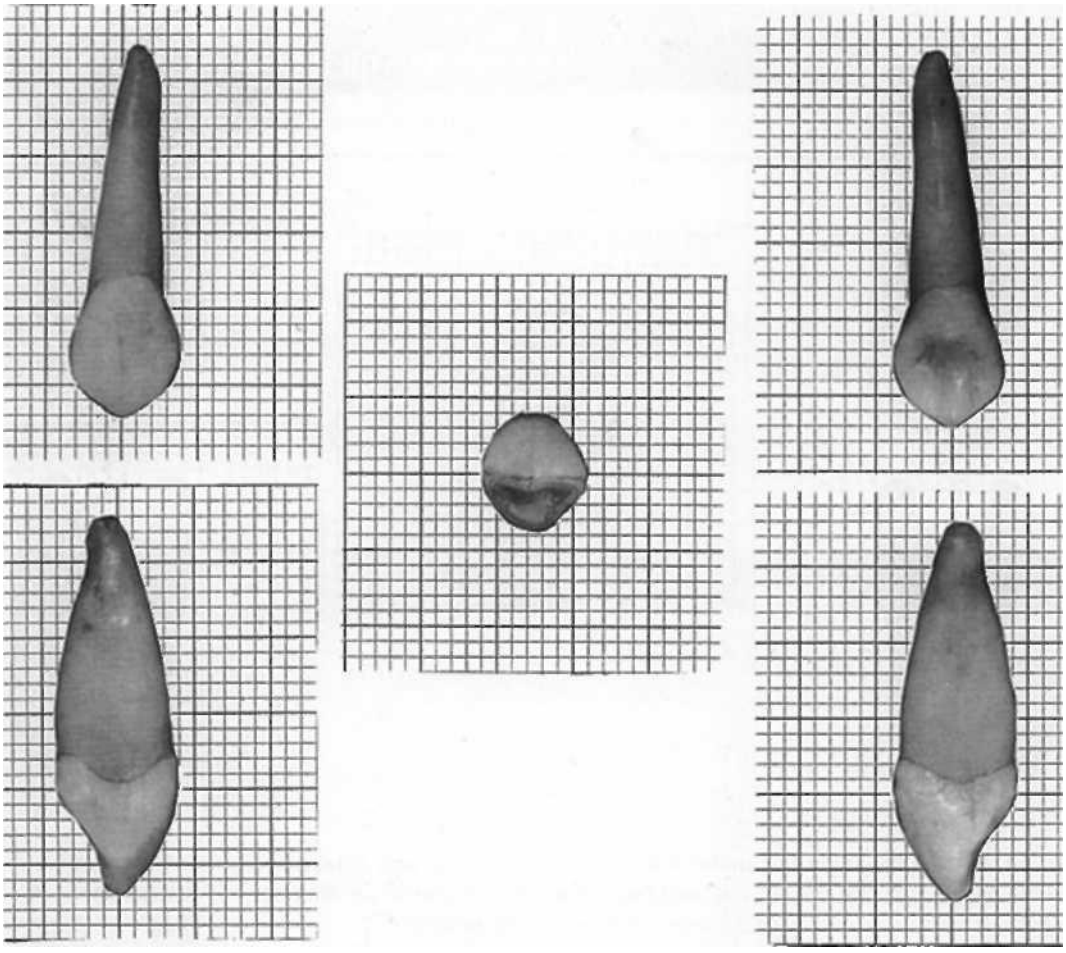


FIG. 1-19 Maxillary left canine. When viewing the mesial and distal aspects, note the **curvature** or bulge on the crown at the cervical third below the cementoenamel junction. This is called the **cervical ridge,** or the **cervicoenamel ridge.**

Close observation of the outlines of the squared backgrounds shows the relationship of crown to root, extent of curvatures at various points, inclination of roots, relative widths of occlusal surfaces, height of marginal ridges, contact areas, and so on.

It should be possible to draw reasonably well an outline of any aspect of any tooth in the mouth. It should be in good proportion without reference to another drawing or three-dimensional model.

For the development of skills in observation and in the restoration of lost tooth form, the following specific criteria are suggested:

1. Become familiar with the table of measurements so that it is possible to make instant comparisons mentally of the proportion of one tooth with another from any aspect.
2. Learn to draw accurate outlines of any aspect of any tooth.
3. Learn to carve with precision any design one can illustrate with line drawings.

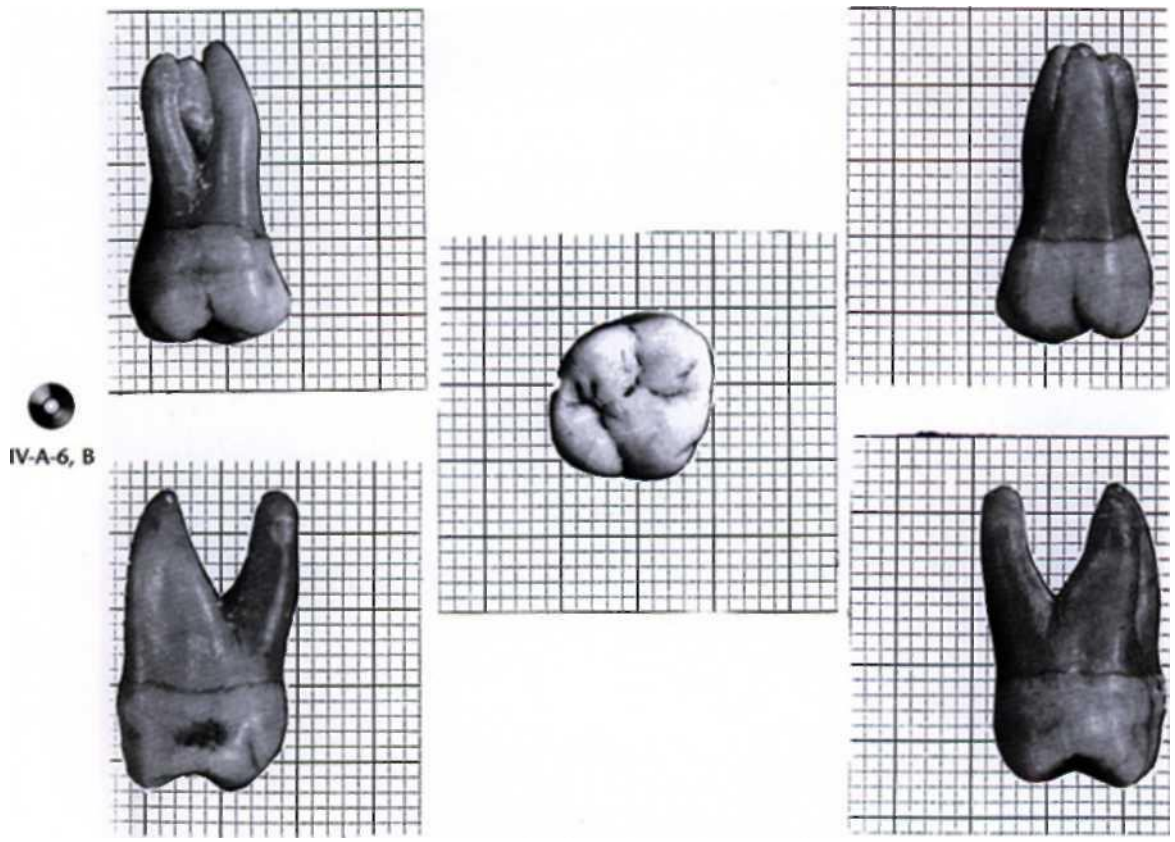


FIG. 1-20 Maxillary right first molar. When viewing the mesial and distal aspects, note the curvature or bulge on the crown at the cervical third below the cementoenamel junction.

2. Clinical Considerations

It must be keep in mind that the dental practitioner sees in a "normal" healthy mouth not only the clinical crowns of the teeth surrounded by the gingival tissues, but also the number, shape, size, position, coloration, and

angulations of the teeth; the outlines of the roots of the teeth; occlusal contacts; evidence of function and parafunction; and phonetics and esthetics. Most of the parts of the teeth that are hidden by the gingiva can be visualized radiographically. It can also be done by using a periodontal probe to locate the depth of normal or pathologically deepened gingival crevices or a dental explorer to sense the surfaces of the teeth within the gingival crevice apical to the free gingival margin as far as the epithelial attachment of the gingiva to the enamel. Additionally, in pathologically deepened crevices, tooth surfaces can be sensed as far as the attachment of the periodontal ligament to the cementum. Perhaps the simplest example of clinical observation is the assignment of dental age or the assessment of dental development by looking into a child's mouth to note the teeth that have emerged through the gingiva. In the absence of other data, however, the number of teeth present are simply counted.

When observations from clinical and radiographic sources of information are coupled with sufficient knowledge of dental morphology and the chronologies of the human dentition, the clinician has the foundation for the diagnosis and management of most disorders involving the size, shape, number, arrangement, esthetics, and development of the teeth and also problems related to the sequence of tooth eruption and occlusal relationships.

The form of every tooth is related to its position and angulation in the dental arch, its contact relations with the teeth in the opposing arch, its proximal contacts with adjacent teeth, and its relationship to the periodontium. An appreciation for the esthetics of tooth form and coloration is a requirement for the successful practitioner.

Malformations

It is necessary to know the chronologies of the primary and permanent dentitions to answer questions about when disturbances in the form, color, arrangement and structure of the teeth might have occurred. Dental anomalies are seen most often with third molars, maxillary lateral incisors, and mandibular second premolars. Abnormally shaped crowns such as peg

laterals and mandibular second premolars with two lingual cusps present restorative and space problems, respectively.

Patients who have a disturbance such as those shown in Fig. 2-2 not only want to know what to do about it, they want to know when or how the problem might have happened. How they came about is the most difficult part of the question. Enamel hypoplasia is a general term referring to all quantitative defects of enamel thickness. They differ from single or multiple pits to small furrows and wide troughs to entirely missing enamel. Hypocalcification or opacities are qualitative defects. The location of defects on tooth crowns provide basic evidence for estimating the time of the development of the defect with an unknown error and potential bias..

In a cleft palate and lip, various associated malformation of the crowns of the teeth of both dentitions occurs. The coronal malformations are not limited to the region of the cleft but involve posterior teeth as well. A number of congenital malformations involving the teeth are evident, with some the result of endogenous factors and others the result of exogenous agents. When a malformation has some particular characteristics (e.g., screwdriver-shaped central incisors) and is consistent with a particular phase of dental development, it may be possible to determine the cause of the disturbance.

FIG. 2-2 A, **Hypoplasia of the enamel.** B, **Defect in tooth structure caused by trauma to the primary predecessor during development of the permanent central incisor.** (A **from Kerr DA, Ash MM, Millard HD:** Oral diagnosis, **ed 5, St. Louis, 1978, Mosby;** B **from Ash MM:** Oral pathology, **ed 6, Philadelphia, 1992, Lea & Febiger.)**

Crown and Root Development

Dental development can be considered to have two components: (1) the formation of crowns and roots and (2) the eruption of the teeth. Of these two, the former seems to be much more resistant to environmental influences; the latter can be affected by caries and tooth loss.

After the crown of the tooth is formed, the root portion begins. At the cervical border of the enamel (the cervix of the crown), cementum starts to form as a root covering of the dentin. The cementumis similar in some ways to bone tissue and covers the root of the tooth in a thin layer. In the absence of a succeeding permanent tooth, the root of the primary tooth may only partially resorb. When root resorption does not follow the usual pattern, the permanent tooth cannot emerge or is otherwise kept out of its normal place. Additionally, the failure of the root to resorb may bring about prolonged retention of the primary tooth. Although mandibular teeth do not begin to move occlusally until crown formation is complete, their eruption rate does not closely correlate with root elongation. After the crown and part of the root are formed, the tooth peneuates the alveolar gingival and makes its entry (emergence) into the mouth.

Further formation of the root is considered to be an active factor in moving the crown toward its final position in the mouth. The process of eruption of the tooth is completed when most of the crown is in evidence and when it has made contact with its antagonist or antagonists in the opposing jaw. The root formation is not finished when the tooth emerges; however, the formation of root dentin and cementum continues after the tooth is in use. Ultimately, the root is completed with a complete covering of cementum. Additional formation of cementum may occur in response to tooth movement or further eruption of the teeth. Also, cementum may be added (repaired) and/or resorbed in response to periodontal trauma from occlusion. The covering of cementum of the permanent teeth is much thicker than that of the primary teeth.

Pulp Chambers and Pulp Canals

A comparison of sections of primary and permanent teeth demonstrates the shape and relative size of pulp chambers and canals (Fig. 3-6) and is noted here:

1.Crown widths in all directions are large in comparison with root trunks and cervices.

2.The enamel is relatively thin and has a consistent depth.

3.The dentin thickness between the pulp chambers and the enamel is limited,

particularly in some areas (lower second primary molar).

4.The pulp horns are high, and the pulp chambers are large .

5.Primary roots are narrow and long when compared with crown width and length.

6.Molar roots of primary teeth flare markedly and thin out rapidly as the apices are approached.

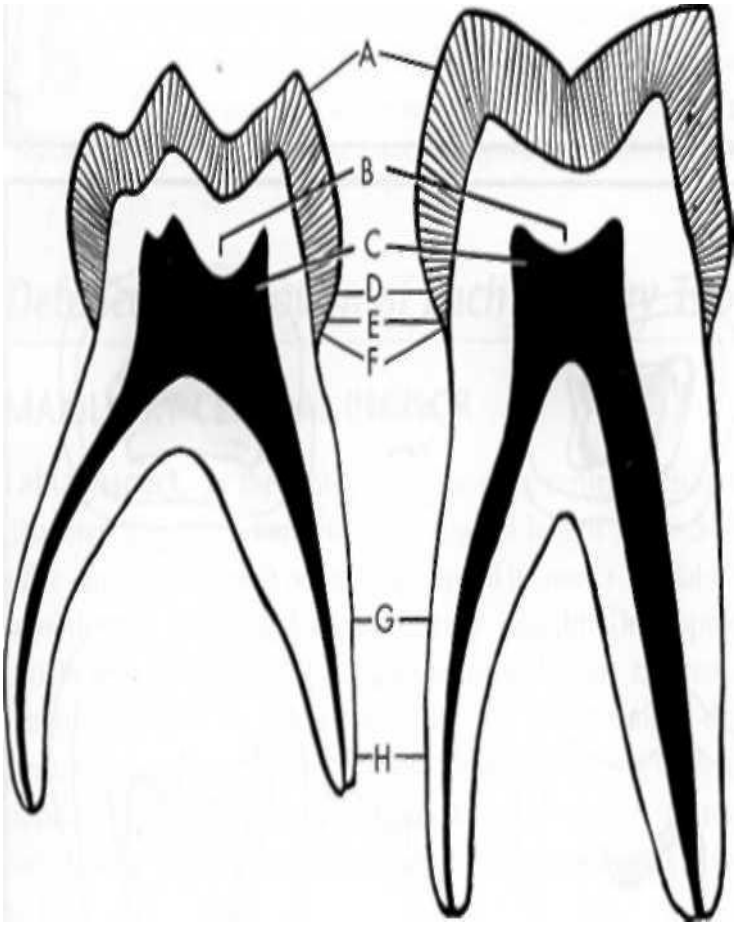
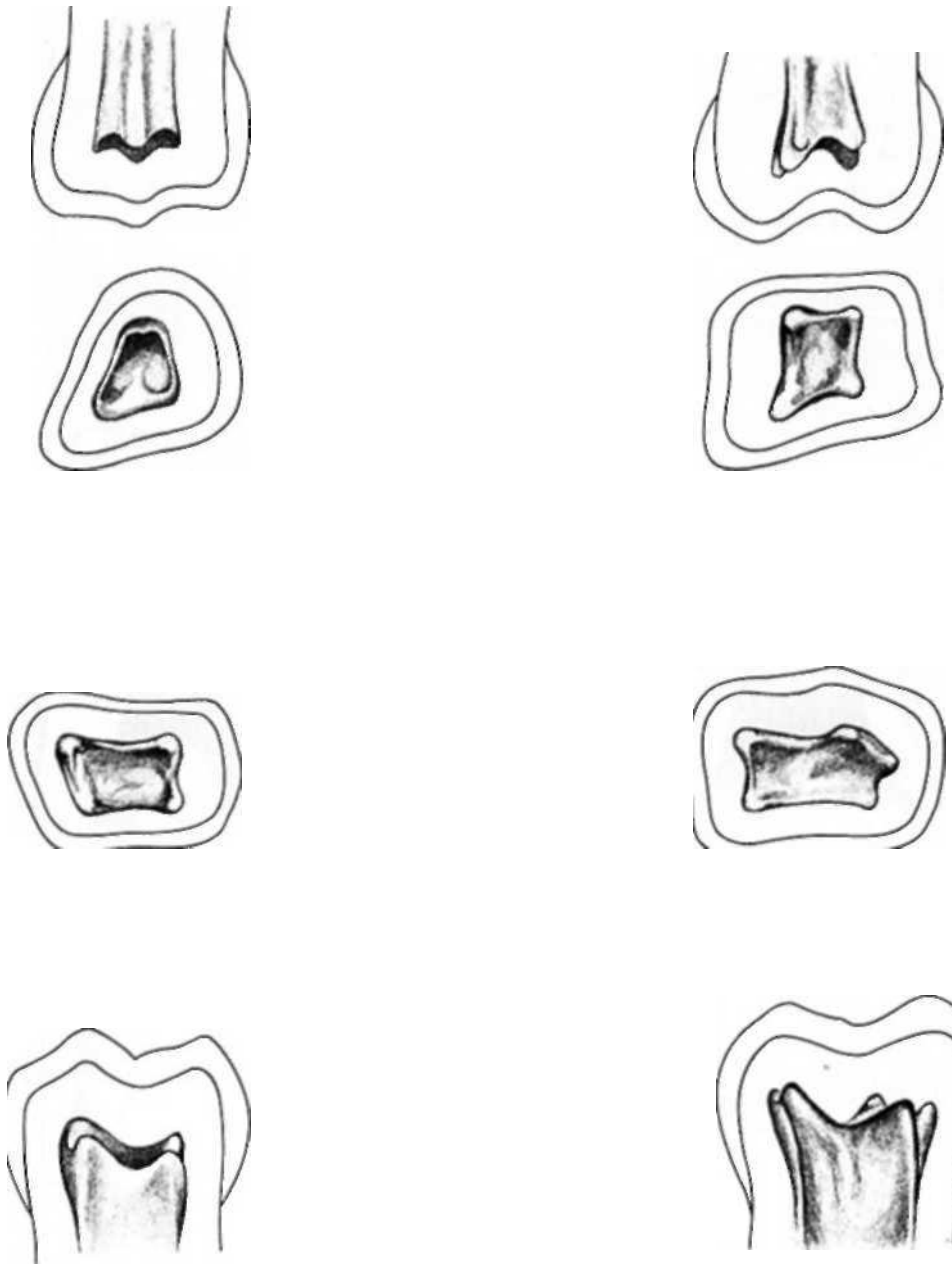


FIG. 3-6 Comparison of maxillary, primary, and permanent second molars, linguobuccal cross section. A, ***The enamel cap of primary molars is thinner and has a more consistent depth. 8, A comparatively greater thickness of dentin is over the pulpal wall at the occlusal fossa of primary molars. C, The pulpal horns are higher in primary molars, especially the mesial horns, and pulp chambers are proportionately larger.*** D, ***The cervical ridges are more pronounced, especially on the buccal aspect of the first primary molars.*** E, ***The enamel rods at the cervix slope occlusally instead of gingivally as in the permanent teeth.*** F, ***The primary molars have a markedly constricted neck compared with the permanent molars. primary teeth are longer and more slender in comparison with crown size than those of the permanent teeth.*** H, ***The roots of the primary molars flare out nearer the cervix than do those of the permanent teeth. (From Finn SB:*** CLINICALPEDODONTICS, ***ed 2, Philadelphia, 1957, WB Saunders Company.)***

UPPER FIRST PRIMARY MOLAR

UPPER SECOND PRIMARY MOLAR



LOWER FIRST PRIMARY MOLAR

LOWER SECOND PRIMARY MOLAR

FIG. 3-7 A ***and*** B, ***Pulp chambers in the primary molars. Note the contours of the pulp horns within them. (Modified from Finn SB:*** **Clinical periodontics,** ***ed 2, Philadelphia, 1957, WB Saunders Company.)***

Studying the comparisons between the deciduous and the permanent dentitions (Figs. 3-8 and 3-9) is of utmost importance. Further variations between the macroscopic form of the deciduous and the permanent teeth follows, with a detailed description of each deciduous tooth.

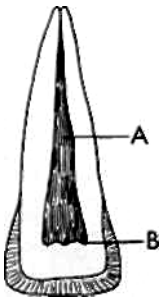


FIG. 3-8 **Permanent central incisor.** A, **Pulp canal; 6, pulp horn. This figure represents a sectioned central incisor of a young person. Although the pulp canal is rather large, it is smaller than the pulp canal shown in Fig. 3-9, and it becomes more constricted apically. Note the dentin space between the pulp horns and the incisal edge of the crown.**

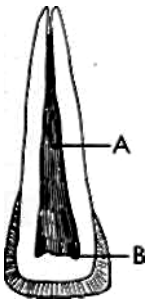


FIG. 3-9 **Primary central incisor.** A, **Pulp canal;** B, **pulp horns. This figure represents a sectioned primary central incisor. The pulp chamber with its horns and the pulp canal are broader than those found in Fig. 3-8. The apical portion of the canal is much less constricted than that of the permanent tooth. Note the narrow dentin space incisally.**

THE CENTRAL INCISORS OF UPPER JAW (dental incisive)

1. Vestibular surface is convex and has 2 no-bright shown fissures directed from the central part of crown toward the cutting edge , and graduate between their cusps.

2. Lingual surface has triangular form and is concave. There are 2 weak-pronounced roller along the crown edges. They confluence on the tooth 'neck and form the pronounced tubercle.

3. Medial and lateral walls are convex , have triangular form.

4. Root is cone-form: the anterior surface is wider than posterior

5. Peculiarity of margin and curvatures are pronounced very well.

6. Peculiarity of root is not pronounced but in whole the root is move aside toward posterior - lateral direction.

7. In 100% cases there is one canal.

LATERAL INCISORS OF UPPER JAW

1 .They are the less in size than central.

2. Vestibular surface is convex.

3. The medium surface when cross to the cutting edge form dulling amrgin.

4. Lateral angle is more rounded.

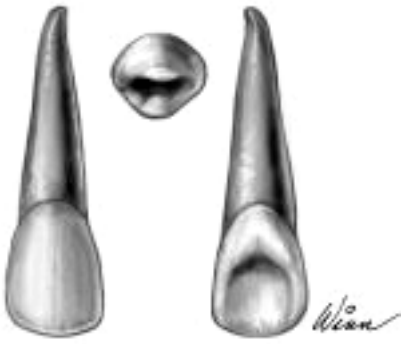
5. Lingual surface is concave and has triangular form and form pronounced lateral rollers. T he confluence on the neck of

tooth and form cusp. In the place of their confluence the hole is created.

6. The root is lateral – squeezed and has lateral fissures.

7. The peculiarity of margin and curvatures is very well pronounced, but the peculiarity of root is less pronounced.

8. In 100% cases there is one canal.



THE CENTRAL INCISORS OF LOWER JAW

1. They are more less in size than incisors of upper jaw.

2. Crowns are stretched in vertical direction.

3. Labial surface is a little convex.

4. Lingual surface is concave in vertical direction.

5. The lateral rollers don't pronounced, so cusp is absence

6. The crowns of central incisors are narrow than lateral.

7. Lateral surfaces are steep, but lateral surfaces of lateral incisors are directed from cutting edge toward the neck in that way so crown is wider on the cutting edge than on the neck.

8. The root is lateral squeezed .

9. All peculiarities are less pronounced.

10. Almost in all cases there is the sulcus on the lateral surfaces of the root which permit to determine this tooth to right or left belongings.

11. Canals are narrow.

12.In 70% cases there is 1 canal, in 30 % -2 canals.

LATERAL INCISORS OF LOWER JAW

They are determined by peculiarities of margin, of crown curvature and of root, although these peculiarity are not enough pronounced .

1. Lateral surfaces are directed from cutting edge toward the neck, so that crown is wider on the cutting edge than on the neck.

2. The root is lateral squeezed.

3. The wider cavity of tooth is located on the level of neck and gradually narrowing cross in canal.

4. On the level of 1/3 lower part the canal is divided in delta-shaped form and then in the apex of root is joined again.

5. In 56 % cases there is 1 canal, and in 44 % cases -2 canal.

CANINES OF UPPER JAW (dentis canini)

l. They are cone-form.

2. The cutting edge is formed by confluence (joining) between two segment under margin, and in the place of joining they form well pronounced cusp. Medial segment is shorter than lateral.

3. Labial surface is convex and is divided into 2 facets by the non - pronounced roller - small medial and big lateral

4. Lingual surface is convex too and is divided by rollers on 2 facets with deepenings and sometimes with holes.

5. On the neck the roller crosses into the well pronounced cusp.

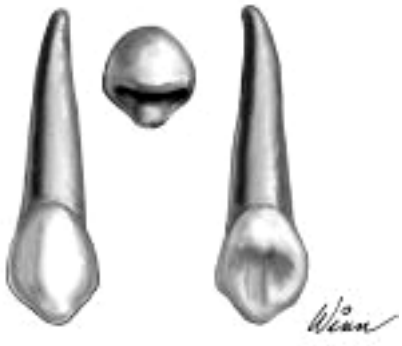
6. Contact surfaces are triangular form.

7. Root is well-developed, is cone – form, easily lateral squeezed. Lateral surfaces are more convex. There are non-pronounced sulcus on the two groove.

The root apex is often curved.

8. The peculiarity of margin and curvature is well-pronounced.

9. In 100 % cases there is 1 canal.



CANINES OF LOWER JAW

1. They are some less in size than the canines of upper jaw but have similar forms.

2. Lateral surface is convex, but the roller is non – pronounced, that why the dividing into the medial and lateral facets is non-precise.

3. Lingual surface is some concave.

4. Lingual cusp is well – pronounced.

5. The height of vestibular and lateral surfaces are big than height of lingual and medial surfaces.

6. The root has well-pronounced grooves on the lateral surfaces.

7. The cavities of canines of upper and lower jaws are wide and spindle-form. Crown part immediately crosses into the root canal.

8. The root of lower caninines sometimes has (6%cases) 2 canal-labial and lingual.

THE FIRST UPPER PREMOLAR (dentes premolars)

1 .Crown is right-angled.

2. Lingual surface is less than buccal, crown is larger toward in bucco-lingual direction.

3. Buccal surface is convex: the peculiarity of crown curvature is well-pronounced , but often this peculiarity may returns (opposite) that is the posterior part of buccal surfaces is more convex and anterior part is more plane.

4. Buccal surface crosses into the lateral surface and form the rounded margins.

5.Lateral surface has right-margin form, is convex, that posterior surface is more convex. They gradually cross on the convex lingual surface and no form margins.

6.Chewing surface is formed by 2 cusps, that buccal cusp has a big size. There is fissure between the cusps, this fissure is lateral limited by transversal grooves. As a result along the margins of chewing surface the rollers are formed.

7. The root is squeezed in anterior – posterior direction . There are deep grooves on the lateral root surfaces.

8. By the apex the root is divided into the 2 independent roots - buccal and lingual.

9. There are all peculiarities that permits to differentiate this tooth.

10. In 85 %cases there are 2 canals, in 6 % - 3 canals ,and in 9 % -1 canal.

THE SECOND UPPER PREMOLAR.

l. Has the form like the first premolar, but is less in size.

2.The crown is prismatic.

3. Buccal and lingual surfaces are in less size than 1st premolar.

4. There are 2 similar cusps on the chewing surfaces.

5. There is 1 root, easily squeezed and with little grooves on the lateral surfaces.

6. The bottom of cavity is saddle-form.

7. In 75 % cases there is 1 canal, in 24 % -2 buccal and lingual, and in 1 % -*3* canals.

THE FIRST LOWER PREMOLAR

1. Size is less than upper premolars.
2. The crown is roundish.
3. There are 2 cusps on the chewing surface. Buccal is bigger than lingual.
4. There is groove between the cusps.
5. Cusps joint each with other by enamel rollers.
6. The buccal surface is convex.
7. The peculiarities of crown curvature is well - pronounced .
8. The contact surfaces are lightly-convex and gradually are crossing on the lingual surface
9. The root is oval - form.
10. There are non-pronounced grooves on the anterior and posterior surfaces of the root.
11. Often the crown and root are located each to other under the obtuse margin toward the tongue.
12. The peculiarity of root is well – pronounced.
13. In 74% cases there is 1 canal and in 26%-2 canals.

THE SECOND LOWER PREMOLAR

1. Is in bigger size than 1st lower premolar.
2. The chewing surfaces consists of 2 similar well-developed cusps; between them on the edges there are enamel rollers.
3. There is deep fissure between the cusps.

4. The adding groove moves away from this fissure. This groove separates the lingual cusp into the 2 part and forms the 3-cusps tooth.

5. The buccal surface is like the 1st premolar.

6. The contact surfaces are more in size and convex than 1st premolar.

7. Lingual cusp is well-developed that why the lingual surface is more than the one of the 1st premolar.

8. The crown part of tooth cavity of premolars is squeezed in the anterior - posterior direction and has the glottis -form with 2 appendix according the cusps.

9. There is 1 canal, which is funnel-form entry.

THE FIRST UPPER MOLAR

1. There are 4 cusps on the chewing surfaces, which are separated each from other by grooves. One of these grooves begins on the anterior surface and crosses the chewing surface and then crosses on the buccal surface and continues till the neck of tooth. Anterior- buccal cusp is separated by this groove.

2. The second groove begins on the posterior surface then crosses on the chewing and lingual surface and separates the posterior-lingual cusp.

3. The 3rd groove is located in the middle of chewing surface and joins the both 1st and separates the anterior -lingual and posterior-lingual cusps.

4. The buccal cusps are cone-form , lingual cusps are more rounded.

5. The anterior cusps are bigger than posterior.

6. The buccal surface is convex and is separated by groove, has well-pronounced peculiarity of crown curvature .

7. The posterior surface is more convex than anterior, but has a bigger size than posterior.

8. The lingual surface is more convex than buccal , but is less in size than buccal; has non-pronounced groove , which crosses from the chewing surface.

9. There is well or non pronounced adding abnormal cusp on the anterior-lingual cusp (Carabelli). This cusp never achieves to the chewing surface.

10. Tooth has 3 well-pronounced roots: one-palatine, cone-form ; and two buccal - anterior and posterior.

11. Both roots are squeezed in the anterior-posterior direction.

12. In 57% cases there are 3,and in 4 % - 4 canals.

THE SECOND UPPER MOLAR

This tooth has the different structure of the crown. There are 4 variants :

1. The crown is similar as crown of the 1st molar , except the adding cusp (adding cusp is absence).

2. The crown is rhomb-form. The anterior- lingual and posterior - lingual cusps are close -contacted and the groove between them is easily-pronounced.

3. Anterior-lingual and posterior-lingual cusps was confluence in the anterior - lingual direction.

4. The crown is triangular - form and has 3 cusps - 1 lingual and 2 buccal.

The 1st and 4th forms of crown are often occur.

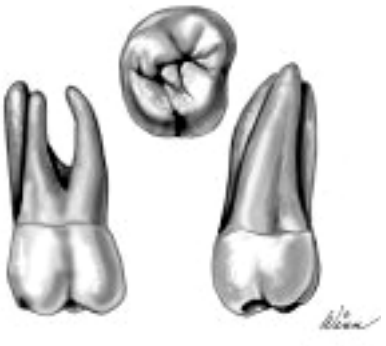
The tooth has:

1-3 roots , which are less in size than 1st molar.

2. Sometimes there may be the confluence between of all roots into the 1 cone-form root.

3. In other cases may be the confluence only between the buccal roots.

4. In the 70% cases there are 3 and in the 30 % - 4 canals.



THE THIRD UPPER MOLAR

Has different forms and sizes. Frequently the crown has 3 cusps, rarely -4, but there may be 5-6 cusps.

2.The amount of roots may be variable since 1 till 4-5.

3. There are 3 canals : lingual is larger and two narrow buccal.

THE FISRT LOWER MOLAR

1. Is the most bigger than other molars.

2. There are 2 grooves on the chewing surface - long groove , and transversal groove .

3.In the posterior buccal surface there are a little adding groove which moves aside from transversal.This location of groove forms 5 cusps on the chewing surface: 3 buccal and 2 lingual.

4. Rarely there may be 6 cusps.

5. The buccal surface is convex with well-pronounced peculiarities of crown curvature.

6. The contact surfaces are like the 1st upper molar: posterior surface of crown is less and convex than anterior.

7. The lingual surface is convex and less than buccal.

8. The crown is bend ever toward mouth cavity.

9. There are 2 roots anterior and posterior: they are squeezed and theirs wide is well pronounced in bucco-lingual direction.

10. There are long groove on the root surfaces.

11. The roots are moving aside to the back.

12. In the 65% cases there are 3 , in 29 % -4 , and in the 6 % - 2 canals.

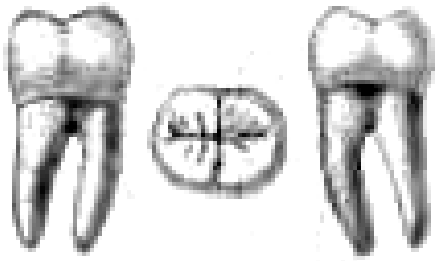
THE SECOND LOWER MOLAR

I. Is the less than the 1st molar, but is in similar form.

2. There are 4 similar in size cusps, which is formed by 2 confluence grooves on the chewing surface.

3. Rarely there may be 5 cusps, and the confluence of roots.

4. The peculiarity of root is well - pronounced.



THE THIRD LOWER MOLAR

1. May be in different form.

2. In the most cases the chewing surface consists of 4 cusps but, not infrequently there are may be 5 cusps , sometimes - 6-7 cusps.

3. In the most cases there are 2 roots, but, they often confluence into the one cone-form root.

4.The cavity of lower molars as the cavities of upper molars repeat the form of tooth.

HYPOPLASIA

Hypoplasia is the defect of the development which means the infancy of teeth or their tissues. The very critically form of hypoplasia is the aplasia – congenital lacking of tooth, part of tooth or whole enamel. In the wide practice of dentist the hypoplasia of enamel is met most of all.

According in the some author's opinions the hypoplasia of hard tissues is occurred as a result of the disturbances both formation of enamel caused by ameoblasts and the weakening of calcification process of enamel prisms.

Patrikieev (1967) thought that during the hypoplasia not only calcification processes are disturbance but at the first, the building of ptotein matrix of enamel as a result of a lack or slow down function of ameoblasts.

Groshikov (1985) thought that hypoplasia is occurred as a result of disturbance of metabolic processes in the tooth germs under influence of disturbance of calcification and protein metabolism in the fetus' s organism or baby or local cause affecting the tooth. Hypoplasia of enamel the irreversible process.

Frequently the hypoplasia of enamel is accompanied by disturbances of the structures of dentin and pulp.

There are hypoplasia both of primary and permanent teeth, but the hypoplasia of primary teeth is occurred rare because of the time of teeth formation.

Hypoplasia of primary teeth which is formed during the intrauterine period is caused by the disturbances in the organism of pregnancy woman. Hypoplasia of permanent teeth which is formed on the 5-6 life-month of baby is caused by disturbances of metobalic processes in the baby's organism.

But the diseases of child are occurred more frequently than of fetus, that is why the hypoplasia of permanent teeth are met frequently than of primary teeth. At the present time the hypoplasia of primary teeth is observed often than in the past and this fact is explained with success of decreasing of perinatal mortality.

But frequently hypoplasia of primary teeth is met during the diseases of baby on period of first weeks and months of his life which id reflected in the formation of temporary incisors, canines and molars.

In the world literature it is written that if the amount of diseases in childhood was higher the frequency of hypoplasia will be increased. Thus, for example, hypoplasia was met in 50% cases of children which has chronic stomach diseases aaccompanied with disturbances of metabolism (was begun before or soon after the birth).

Hypoplasia of primary incisors is occurred in the children which mothers during there pregnancy were undergone such diseases as rubella, toxoplasmosis and toxicosis. Hypoplasia was observed in the prematurity children, children with congenital allergy, endured hemolytic jaundice (jaundice was occurred as a result of incompatibility both mother's blood

and fetus according Rhesus factor), endured generic trauma, born in hypoxia. During the hemolytic diseases of newborn in the most cases the enamel hypoplasia intrauterine is occurred (at 25-32 week of pregnancy) but rarely during the 1st month of baby's life. Hypoplasia is permanent teeth is occurred under influence of different diseases in children during both formation and mineralization these teeth. Hypoplasia is found in the children endured rickets , tetany, acute infection diseases, toxic dyspepsia stomach diseases, alimentary dystrophy, endocrine disturbances, congenital syphilis, brain disturbances. Approximately 60% of hypoplastic defctsare occurred during the 9th monts of child's life when compensator and adaptive possibilities are week – pronounced.

The localization of hypoplasia both on the crown of tooth and as the same group belonging to destroyed teeth in the most depends on age of child endured the disease. Thus, when the child is endured diseases in the first months of life hypoplasia is developed in the area of cutting edge of central incisors and cusps of 6th teeth because their formation is begun on 5-6th months after the birth. On 8-9th month of life both second incisors and canines are formed. If the diseases are occurred in this period the hypoplasia lesions will be occurred on the cutting edge of lateral incisors and canines, at the same time the hypoplasia of central incisors and 6th tooth will be observed nearly on the equator level because a half crown is already formed. If disease is long-time continued in this case the changes of enamel will be very considerable.

The expression of hypoplasia depends on criticality of endured disease. If endured disease was weak-pronounced – in this case hypoplastic lesions will be as chalk-type spots but in the cases of critically diseases - the infancy of enamel up to the aplasia. The hypoplasia of hard tissues of teeth which is formed simultaneously is reffered as sustemic. But the hypoplasia of one tooth is reffered as local.

SYSTEMIC HYPOPLASIA

Clinically there are 3 forms of systemic hypoplasia: 1).changing of color 2).infancy 3).absence of enamel.

Weak level of infancy can be revealed as spots-frequently white, rarely yellowish color with clear borders and same size on the same teeth. The spots usually are revealed on the vestibular surfaces and accompanied by the uncomfortable feelings. The specific peculiaritis of spot is its resisting to the colors. The external layer of enamel is not painted with clors. The size, form and color of spot usually are not changed during the life. The thickness of enamel in the area of spot is the same as on the area of healthy enamel near it. On the X - ray pictures this form is not revealed.

The most critically fotm of hypoplasia is the infancy of enamel (wavy-form, pointed – form, grooved-form).

The wavy-form enamel is revealed by thr drying of surfaces when during the examination it is possible to distinguish small rollers. Between rollers the covered with unchanged enamel pouch is present.

Frequently, the pointed form of hypoplasia is met. This pointed pouches in the enamel are located on the vestibular and lingual surfaces on the different level of the different group of teeth. At the first time after eruption the enamel in the pouch area has normal color but then gradually is pigmented. However, in all cases it is tightly and smooth. Sometimes hypoplasia is revealed as alone cross-groove on the crown. Sometimes this pouch is very pronounced and the crown has visible decreasing of the size. This form of the hypoplasia is reffered as grooved form. There may be few grooves and they are perplexed with unchanged tooth's tissues. Seldom the cases when grooves are located on the whole height of the crown of some group's of teeth are observed. This form is called as ''staircased'' hypoplasia. It is very interesting that in the cases of grooved and ''staircased'' types of hypoplasia the enamel remained undestroyed.

The most seldom – occurred form of hypoplasia is the aplasia – the absence of enamel on the determinate area. In this cases the patient can complains of pain from irritants which will be passed after their removing.

Clinically aplasia is revealed as absence of enamel on the part of the crown, but often - on the bottom of cup-shape punch or in the groove around the crown.

In all cases of hypoplasia histology reveals at the first the decreasing of enamel thickness. Beside that, the inter-prism areas are increasing, the Retzius lines are dilatation, the borders of prisms lose their clear forms. The level of changes depends on degree of process. Beside the enamel infancy there may be present also the dentin infancy. In this cases the crown of tooth is gaining the form distinguished from the normal form of this group of teeth. For example Hutchinson, Furne, Phluger teeth.

Hutchinson teeth upper central incisors with barrel-form or screw-shape of the crown (the size of neck is bigger than near the cutting edge) and are characterized by presenting of semi-moon – form pouch on the cutting edge. The semi-moon pouch may be covered with enamel.

Furne teeth - these cases central incisors with screw-shape form of the crown but without of semi-moon pouch on the cutting edge. In the past there was opinion that Hutchinson and Furne teeth have been characterized for the congenital syphilis. According the opinion these were the part of triad of congenital syphilis: parenchymatous keratitis, congenital deafness and Hutchinson teeth. But later it has been determined that this anomaly can be occurred isolated from syphilis.

Phluger teeth – the first molars which crown size on the neck is bigger than on the chewing surfaces, but the cusps are infant and have been confluence give to crown the cone form.

Differentiate diagnostics: hypoplasia must be differentiated from the beginning form and superficial caries. In the case of caries the white spot usually is alone located on the surfaces of the neck of tooth. In the case of hypoplasia white spots are multiple are located on the any part of crown. Beside that in the case of hypoplasia the spot is not colored by the 2% solution of methyl blue, but in the case of caries the spot is colored. From superficial caries hypoplasia is differentiated on the base that in the case of hypoplasia enamel is smooth but in the case of caries enamel is uneven.

Treatment.

In the case of alone spots the treatment might not be conducted. But if the spots are located on the vestibular surfaces of incisors and are visible during the speaking and smiling it is necessary to remove this defect. The best results are achieved by the using of composite filling materials. If the defect is seriously it is necessary to use orthopedic treatment.

Prophylactics.

Prophylactics envisages the preventing of systemic diseases accompanied with pronounced disturbances of metabolic processes.

‘‘Tetracycline’’ teeth - these are teeth which have changed color appearing as a result of receiving tetracycline during of formation and calcification of tooth’ tissue. Tetracycline is deposited in the enamel and dentine of developing teeth , and also in bones of fetus or baby in the cases of introducing the tetracycline into the pregnant organism or baby’s organism. Tetracycline can causes not only pigmentation of teeth but hypoplasia of enamel also. The level of changing depends on dose and type of drug. Small doses cause only color changing but big amount of drug causes both changing of color and infancy of enamel. In the cases of receiving of dimethyl – tetracycline the changing of color is very intensive, but oxytetracycline – less intensive.

The pigmentation of enamel caused by tetracycline is very stabile and the cleaning of such teeth in further will be impossible, that is why tetracycline must be appointed to the children and pregnant women only according the vital testimony.

LOCAL HYPOPLASIA

This is the disturbance of enamel formation of permanent tooth appearing as a result of involving in inflammation process the germ of teeth which are located between the roots of primary teeth or as a result of mechanic trauma of developing follicle.

Local hypoplasia is revealed as spots – up white color to yellowish - brown color, but frequently as the point-shape pouch located on the all surfaces. In the serious cases aplasia can be occurred. Sometimes enamel of

Abrasion of teeth

The physiologic abrasion of teeth is observed both in primary and permanent occlusion. The primary incisors after their eruption have 3 cogs on cutting edges which up to 2-3 years are erased. If the abrasion is limited by enamel in young ages, in 40 year the dentin is being involved into this process and has yellow color. By 50 year the process of dentin abrasion is increased and gain brown color. By 60 year the considerable abrasion of anterior teeth is observed, and by 70 year abrasion usually achieves up to chamber of tooth crown.

Side by side with physiologic abrasion, the pathologic abrasion is met and the intensive loosing of hard tissues is observed in one, or group or in all teeth.

The clinical picture.

Pathological abrasion of hard tooth tissues is the wide spread disease and is observed by 11,8 % of person. Usually abrasion is observed by males (62,5%), but rarely by females (22,7). The reason of increasing abrasion depend on dentition condition, the overloading because of loosing of teeth, incorrect constructions of dentures, the mode of life, professional harms and incorrect formation of infancy tissues' structures. In the presence of anterior occlusion, the posterior surfaces of lateral teeth and cutting edges of anterior teeth are erased.

With age abrasion of cusps is increased. The length of incisors is decreased by 1/3 –1/2 up to 35-40 years. In this cases instead of cutting edge of incisors the big ground are formed. After the dentin' opening its abrasion is intensively increased than abrasion of enamel. As a result, the acute margins of enamel are created and often cause the trauma of cheek and lips' mucosa. If the treatment is absence, the abrasion is quickly increased and the crowns of teeth are considerably lowed. In this case the decreasing of a lower third of face is manifested by creation of mouth' angle – wrinkle. If the presence of considerable lowing occlusion, changing of maxilla – temporary joint maxilla – maxilla-temporary joint is observed and as a result of this the pain or burning feelings, decreasing of hearing and other symptoms of lowering are characterized for this occlusion. In the presence

of the futher progression of the process the abrasion reaches up to necks of teeth. In these cases the chamber of tooth is translucence through the dentin it never causes its opening because of reparative dentin' depositing.

In the presence of deepen occlusion labial surfaces of the lower incisors contact with palatine surfaces of upper incisors and as a result , these surfaces are considerably erased.

The most considerable erasing of tissues is observed in the presence of partially absence of teeth because of the remaining teeth are overloaded. Beside that the displacement of teeth, the resorbtion of bone and other symptoms may be presence. Frequently the abrasion is conditioned by the presence of incorrect made constructions both of removable and fixed dentures. In the presence of the clams using without artificial crowns, the abrasion of enamel and dentin in the neck area is occurred. In these cases patients will complain of acute pains from mechanical, chemical irritants. It is known that the specific conditions of some industries cause professional diseases. In the presence of some industries the defeating of teeth and often occurring abrasion may be observed the industries joining with production of organic and non- organic acids. The persons working at the industries where air contains the excess mechanical particles , may have excess abrasion of teeth. The abrasion of teeth is frequently observed in the presence of endocrine disturbances (disturbances of thyroid, parathyroid glands, hypophysis). In this case the mechanism of abrasion is conditioned by the decreasing of structure tissues' resisting. Thus, the excess abrasion may be observed in the presence of fluorosis, mottled disease, syndrome os Steyntone – Capdepone. The classification of M.J. Groshikov is the most comfortable for conservative dentistry.

The degree 1 – the small enamel abrasion of cusps and cutting edge is observed.

The degree 2 – enamel abrasion of canine, premolars, molars cusps and cutting edges of incisors accompanied with naked superficial dentine.

The degree 3 – abrasion of enamel and abrasion of considerable dentine part up to level of tooth chamber.

The classification of Brakko is wide spread in Europe. According this classification 4 degree are underlined:

1. Enamel abrasion of cutting edges and cusps;
2. complete abrasion of cusps accompanied by naked dentine up to 1\3 height of crown;
3. the further lowing of crown height accompanied with the disappearing of whole middle third of crown;
4. the spreading of process up to neck level of teeth.

The beginning symptoms of abrasion appear by sensitivity to the temperature irritants. Then during the process progression the pains from chemical and then from mechanical irritantsis joined.

Treatment - usually the orthopedic treatment is recommended. The sensitivity must be removed in the necessary cases.

ACID NECROSIS

The professional harmfulness exert considerable influence on enamel and dentin' condition. The most considerable changing on teeth are observed at persons working on the chemical works joined with acid producing. The first clinical sign of acid necrosis is the feeling of bitter taste, increasing sensitivity to temperature and mechanical irritants.

The appearing of this diseases first of all is joined with direct influencing of acid to the tooth' enamel. In this case the resisting of hard tissues is considerable decreasing. The rendering of mechanical factors at this background promotes for quickly losses of enamel and dentin. In this case the role of saliva shouldn't be ignored. Ovrutsky G.D. and Japaeev A.S. have shown that at the workers contacting with anorganic acid' steams the PH of saliva is decreasing till 5,8-6,2. They have concluded that sour reaction of saliva plays determinate role in the beginning of acid necrosis. Apparently, the presence of decreasing of PH of saliva its buffer properties becoming exhausted and remineralization potential is decreased which promotes the process of abrasion considerably.

Treatment.

The treatment envisages the creation of resisting structures for acid influence.

In this reason the fluorine combinations are used (2% solution of sodium floride, 75% florine paste) which decreasing the solubility both enamel and dentin. The moistened with 2% solution of sodium floride tampon is put upon the isolated from saliva dried surfaces of tooth. After 5 minutes tampons are removed and mouth is tinsed by water. The applications should be done systematic. Calcium drugs are appointed as courses of 3-4 weeks with interval 2-3 months.

In the cases of considerable destroying the orthopedic treatment is recommended.

Prophylactic measures.

It is important to improve the working conditions and to keep the special safety rulers. It is recommended to rinse the mouth 1 time in each 2 hours during the day.

FLUOROSIS

Fluorosis is the caused by high concentration of fluorine in drinking water. Damage of teeth is one of the early signs of this disease. According of opinion of some investigators dental fluorosis is hypoplasia due to specific origin promoted high florine in drinking water.

Florosis is the endemic disease. Fluorine is wide spread in the nature. It is an important biological element, playing the physiologic role in the organism. All of the organs of human containing the fluorine, but mainly it is present in teeth and bones. Adult person in average receive 0,5-1,1 mg of fluorine with food products and 2,2-2,5 mg with water in a day. It is so interesting that fluorine of food products is observed less than fluoride of water. As concentration of fluorine in drinking water increases as fluorosis is increases, but caries decreases. It was determined that big part of fluorine is secreted by kidneys and sweat glands, but less part remains in the organism.

Exactly mechanism of fluorosis is’nt clear up to day. It is considered that agent toxical influence to ameloblast what leads to incorrect formation

of enamel. It was determined that as fluorine is more, fluorosis also is more expressed. Side by side with this in most of persons of endemic regions there are easy changes. That means in same concentration of fluoride in drinking water the organism may differently response to its receiving. It is supposed that the fluorine being as fermentative poison in long receiving decreases the activity of phosphatase and destroy the mineralization of enamel.

Clinical picture.

Permanent teeth are frequently damaged (primary teeth very rarely).

According to government standards permissible concentration of fluorine in drinking water 1,1mg. Optimal concentration is 1,0 mg/l.

Concentration of fluorine in drinking water may cause alteration already formed teeth. In areas with hot climate fluorosis may be observed in middle concentration of fluorine in drinking water (0,5-0,7). It is explained with high receive water.

There are follow types of fluorosis:

- line form (hatched);
- spot form;
- chalk –dotty form;
- erosive;
- destructive.

Line, spot, and chalk-dotty types are manifested without dental loss but erosion and destructive types accompanied with loss of dental structure.

Line form of fluorosis.

Is characterized by appearance of small chalky strips – lines located in sub-surfaces layers of enamel. These strips might be well-pronounced, but often they are weak-pronounced and are revealed only by drying.

Line form frequently is observed on vestibular surfaces of upper incisors, seldom on lower.

Spot form.

This form is characterized by appearance of well expressed chalky-spots without strips. Spots are multiple and located along the whole dental surfaces. Spot lesion is observed on many teeth but especially on the upper

and lower incisor. Sometimes spots gets light-brown color. The special peculiarities of this form is that enamel of spot area is smooth and shining.

Chalky-dotty form.

This form is very variable. The enamel of all teeth has mat hue and on this background well-pigmented spots are visible. Sometimes, enamel is yellowish with presence of multiple spots and dots. In some cases instead dots there are superficial lesions with enamel loosing (diameter 1,0-1,5 mm and depth – 0,1-0,2mm) dots.Their bottom has light-yellowish or darkcolor. In the time of this form the enamel is quickly erase with revealing of dark-brown pigmentation dentin is observed.

Erosive form.

Is characterized by loss of enamel and expressed pigmentation of enamel. Erosions are observed. Erosion unlike form, dot, can forms the erase of enamel and dentin is present.

Destructive form.

This form is characterized by deformation of crowns because of erosive destruction and abrasion of tooth structure.

Tooth structure are brittle and maybe broken. But pulp chamber is never opened because of sedimentation of reparative dentin.

Destruvtive form is observed in the regions which natural reservoirs contain the fluorine over 5 mg/l.

Differential diagnosis.

On the spot stage the fluorosis must be differentiated from caries, which is characterized with presenting of alone lesion in typical sections of caries (perineck area, aproximal surfaces). In the case of fluorosis the lesions are multiple and located on the vestibular and lingual surfaces.

Beside that fluorosis should be differentiated with hypoplasia.

Treatment.

Treatment of fluorosis depend on pathological state. Topical treatment is useful by fluorosis accompanied by discoloration of enamel (spot form, chalky-dotty form). This method include bleaching with follow remotherapy (remineralization). The bleaching is done with solutions nonorganic acid solutions. After isolation of tooth from saliva tooth surface is dried by cotton

tampons and treated by 20-30% acid (phosphoric,hydrochloric acid) in 2-3 minute till lightening of enamel. After that tooth surface is rinsed by water and dried. It is necessary that after treatment of tooth by acid and drying it not be in contact with saliva. Then the application of 10% solution of calcium gluconate during 15-20 minutes should be done. In 1-2 days the procedure is repeated but only changed parts of enamel is treated. The course of treatment consist of 10-15 procedures. During treatment calcium gluconate, glycerophosphate are recommended by per os use. Recovering of natural shining of enamel is observed during 6-8 months.

Repeat treatment should be done in case of appearing of new pigmented spots (usually after 6-8 months).

Improvement of hygiene is important. In case of erosive and destructive form restoration of composite materials like evicrol are useful. Orthopedic treatment is also frequently used.

Prophylactic measures.

Intensive prophylactic measures should be done in embryogenesis of teeth and their mineralization .

Prophylactic measures are divided into collective, directed to reduce of fluorine in drinking water and personal prophylactic measures.

Reduce of fluorine in driniking water may be reached by replacing of water source or reduce of fluorine because of mix of water sources with using of chinks and glacial in the mountain area.There are special methods allowing to clean the drinking water from excess flourine.

Personal measures should be done since birthday.

Natural nutrition of baby is important. The water should be replaced by mlik and juices, adding of vitamin E,C,D, calcium drugs into the food products drastically decrease manifestation of fluorosis.

Contents of food products play an important role in prophylactic of fluorosis. It is necessary to exclude or restrict using of products containing with fluorine(for example sea fish,animal oil,spinach). It is recommended to take out the children out of the endemic region for summer period.

Clinical observations have shown replacement of water sources during

3-4 months yearly during first 8-10 years of life of baby help to normalization of enamel formation and greatly reduced damage of teeth by fluorosis.

THE WEDGE – SHAPE DEFECT

As the name of diseases refers the defect of hard tissues is wedge-shaped. The defect localized on the neck area both upper and lower teeth on the buccal and labial surfaces. Frequently this disease is beginning after uncovering of tooth' neck, that is why some authors think that wedge-shaped defect is one of clinical symptoms of parodont diseases. But really, there is no direct dependence between them.

At the present time there is present the opinion that this defect is occurred under mechanical influence. Thus, it is considered defect is formed under influence of tooth' brush. This is confirmed that defect is pronounced upon canines and premolars – teeth projecting from dental row. It is considered that defect is left pronounced by right –handed person, and right pronounced by left-handed person because left-handed persons clean intensively teeth from right side and back to front. Mechanical factor should be given the first place. The determinate role is belonging to the tooth structure and environment around tooth. Wedge- shaped defect usually isn't accompanied by painful. But usually, patients indicate only defect by neck of tooth. Defect is slowly increased and during of deepening its contour doesn't change and soften. Rarely quickly – passing pain by temperature , chemical and mechanical irritants is occurred. When abrasion process is slowly it isn't accompanied with pain because the reparative dentin has time for depositing and back to front the pain is occurred when the process is quickly – progressing because the reparative dentin hasn't time for its depositing. Defect is formed by pery-gum plan locating horizontally and by the second plane locating under acute angle. The walls of defects are compact, shining, smooth. The cavity of tooth is never opened. The defect might achieves such depth that under influencing of mechanical factors can be broken. In the beginning stage wedge-shaped defect must be differentiated from caries and erosion of hard tissue. In the cases of caries

the pain is occurred by irritants but in the case of wedge-shaped defects pain usually is absence. In the cases of superficial and middle caries the soft dentin is present and the surface is rough but in the case of defct the bottom is compact and smooth.

In the time of erosion the lesion is bowl-form but in the case of defect – wedge-shape. Beside that erosion never is occurred on the lower incisors. Erosion is accompany with pain and in some cases with sensitivity of enamel.

In the beginning of the process the stabilization measures are conducted. In this reason the drugs containing calcium and increasing of resisting of hard tissues are taken. The soft tooth brushes are preferred and florine containing tooth pastes are usued. The correct direction during the cleaning of teeth is very important.

In cases of pronounced defects the using of filling is recommended. The composite materials such as Evicrol and Consais are preferred because of possibility to fill defects without preparation.

DENTAL NECROSIS

Clinical manifestation.

The clinical picture of necrosis is beginning with the loosing of enamel' brilliance and appearing of chalk-spots which gradually change their color up to dark-brown. In the center of the hearth the softening and defect is observed. In this case the enamel becomes brittle and is chopped off by excavator. The dentin becomes pigmentation. Usually many teeth are involved into the process and are defeated. The patients complain of pains occurring from temperature, chemical, and mechanical irrtants and quickly pass after their removing. It is considered that this changing is occurred in the present of disturbances background of changing of function of the gland of endocrine secretion (thyroid, genital), in the period of pregnancy and others. The creation of the necrosis hearth on the vestibular surfaces in the neck area of incisors, canines, premolar and rarely molars are characterized.

Differential diagnostics.

It is necessary to differentiate the cervical necrosis of ename from pronounced stages of wedge-shapeed defects and erosion because both of these diseases have likeness only with localization of lesion' elements on the neck area or near it. But the external appearance of the pathology 3 types lesion' hearths have essential and specific peculiarities.

The treatment.

It is necessary to remove the existing sensitivity of teeth and to strengthen the hard tissues of teeth. If the lesion is very large the orthopedic treatment is recommended.

THE SENSITIVITY OF TEETH

The sensitivity of teeth is the high sensitivity to the mechanic , chemical and temperature irritants. The sensitivity usually is observed in the presence of carious lesions, abrasion of dentine, in the case of naked necks accompanies the parodont diseases.

In the presence of caries the sensitivity may be in the one local section. Frequently the hyperesthesia is observed in the presence of abrasion of tooth tissues when the loosing of enamel reaches till dentin-enamel boundary. But, the sensitivity in the presence of different types abrasion is not similarly.

Thus, in the case of enamel erosion the sensitivity is often observed but at the same time in the presence of wedge-shaped defect the sensitivity almost isn't met. Sometimes the sharp sensitivity is observed in the presence of small baring of neck (on 1-3 mm).

The hyperesthesia is divided on systemic when the many teeth simultaneously have the sensitivity, and limited – accompanied with sensitivity of little amount of teeth.

Clinically the hyperesthesia is displayed variously. Usually patients complain of intensively but quickly – passing pains from temperature (cold, warm), chemical (sour, sweet, salted) or mechanical irritants. The patients can not breath in cold air, accept only easily warmed up food and can not eat

sour, sweet, salted and fruits. As a rule, these phenomenon are stabile but rarely maybe temporary calm or stopping of pains observed (remission).

In some cases the difficulties by determining of bad tooth is occurred because if irradiating of pain to neighbouring teeth.

By examination the changing of structures or of parodont condition are revealed. Frequently the loosing of hard tissues on the chewing surfaces or cutting edge is observed. But, the loosing of tissue may be observed on the vestibular surfaces of incisors, canines and premolars.

In all cases the baring dentine is solid, smoothing, shining, sometimes has pigmentation. In the presence of probing of baring dentin the painfulness is occurred, sometimes the painfulness may be very intensively but quickly passing. The influencing of cold air, or sour or sweet causes the sensation of pain.

Sometimes the only small vestibular baring of neck maybe observed but the pronounced sensation of pain is always present. However, the pronounced barring of roots maybe present but the high sensitivity is determined as a rule only place. At times the hyperesthesia is observed by bifurcation of roots.

Differential diagnostics.

The hyperesthesia must be differentiated from acute pupitis because the presenting of acute pain is similary. The diagnosis is put on the basis of pain duration (in the presence of pulpitis the pain is prolonged and occurs at night), condition of pulp (in the presence of pulpitis the tooth reaction of currents is over than 20 mkA, but in the presence of hyperesthesia – doesn't changed 2-6 mkA).

The treatment .

The effective method was offered by Y.A. Federov and V.V.Volodkina. They for the local applying used the paste containing calcium glycerophosphate on the gliserine (6-7 procedures) equally wiyh reception per os of glycerophosphate or gluconate of calcium 3 times a day in dose 0,5 gr during a month. The special tooth paste ''Pearl'' has remineralization effect.

At the present time the remineralization therapy is in wide using. In this case the teeth must be isolated from saliva, thoroughly dried and cleaned from plaque. Then the 10% solution of calcium gluconate or remodent is applying for 5-7 minutes. After each third visit of patient it is recommended to treat teeth surfaces with 1-2% solution of sodium floride. Instead this it is possible to use florine varnish. Inside the calcium gluconate in 0,5 gr 3 times a day is appointed. Equally with this the juices, sour must be excepted and the special tooth paste ‘‘Pearl, Remodent, Cheburashka’’ should be used. As a rule, after

5-7 procedures the improvement is observed after 12-15 procedures the hyperesthesia is completely disappeared. The calcium ions can be introduced by electropharesis. After 6-8-12 months the recurring hyperesthesia may be occurred. In these case it is recommended to repeat whole treatment again.

THEORY OF DENTAL CARIES

In 1200 by Muslim dentist Gaubari in “*the book of the Elite concerning the unmasking of mysteries and tearing of veils*”, was suggested the idea or theories of caries being caused by tooth worms in fact do not even exist.

Pierre Fauchard (1678-1761) discussed many aspects of the subject of cariesology and rejected the idea that “*tooth worms caused tooth decay*” and noted that sugar was detrimental to the teeth and gingiva.

The *chemicoparasitic theory* was advanced by Miller in the latter part of the last century and is the one most widely accepted today. In 1882, **W. Miller** promulgated the (**acidogenic)** theory of dental caries that recognized two stages in the carious process: 1) decalcification of enamel; 2) dissolution of protein enamel matrix. Decalcification caused by metabolism of fermentable carbohydrates under the action of microorganisms resulting in production of organic acids. *Lactobacillus acidophilus* was thought to be the prime culprit and *Streptococcus mutans* have been implicated. The carious disease is characterized by a destruction of the inorganic portion and is accompanied or followed by a disintegration of the organic substance of the

tooth and formation of cavity. It is means that, the mineral of enamel is dissolved exposing the rod sheaths to degradation as well.

In 1928, **D.A.Entin** postulated the theory of a dental caries based on detailed research of physical and chemical properties of dental liquid and also physical properties of the tooth; it is *chemical - physical theory*. According this theory the dental tissues are a biological semipermeable membrane through which osmotic currents are capable to pass and it is caused by a difference of *osmotic pressure* of two main environment of a tooth-blood (*dental liquid*) as an internal and *stomachic liquid* as an environment. Depending on structure and properties of these favorable or adverse conditions the tooth can be framed. Osmotic currents have centrifugal direction and provide normal conditions for enamel and dentin (updating), simultaneously interfere with influence on it of adverse external factors in norm at favorable mutual relations between a tooth and these mediums. If the centrifugal direction of osmotic currents is weakened or gets a return direction (from enamel to a pulp) external cariesogenic factors influence enamel and predetermine occurrence of caries. The given theory represents caries in view of physical and chemical processes system *saliva-hard tissues* of a tooth, processes of *osmosis and diffusion*, change of frames on a surface of enamel, electric potentials and currents of an oral cavity.

The proteolysis theory received attention from such proponents as Gottlieb and Frisbee and is postulated that oral bacteria attack organic components of enamel and as a result the breakdown products dissolve the tooth minerals, particularly in lesions that develop on exposed root surfaces. The idea here is that bacteria first invade malformations commonly found in enamel. The most common of these are incompletely calcified occlusal grooves or fissure and protein lamellae that extend through enamel. As bacterial acids accumulate in these sites, surrounding protein is destroyed exposing calcified enamel to acids. Thus the proteolyses theory operates in the etiology of pit and fissure caries, in conduction with acidogenic theory.

In 1940-50 years **I.G.Lukomcky** has offered the "**biological**" theory: caries defect results from infringement of function of the *fibroblasts*, caused by internal factors. According to this theory the development of carious

process depend on conditions of pulp tissues. At quality of the imposed seal does not render influence on this process.

E.V. Borovsky, J.M.Maksimovsky and P.A.Leus-caries develop under influence of many factors, but the key role in its occurrence is allocated to *dental plaque* and *acids* which are formed as a result of vital activity of microorganisms. The microorganisms become attached to tooth surfaces by adhesive proteins in dental plaque where they are protected from the immunologic (*buffering*) properties of saliva. Thus, if plaque is allowed to form, microorganisms attach and metabolize food debris forming decalcifying organic acids (such as lactic). The acids that decalcify the enamel have pH of 5.5 to 5.2 or less and are formed in the plaque material (*organic nitrogenous mass* of microorganisms firmly attached to the tooth structure). The plaque that exists in the susceptible areas of the teeth has received a great deal of attention. Thus the development of carious disease requires the presence of sugars and bacteria, but is influenced by the *susceptibility* of the tooth, the bacterial profile, and the quantity and quality of the saliva. Many patients may have systemic problems that may directly or indirectly alter normal salivary functioning, thus increasing the potential for caries formation.

CARIES RISK ASSESSMENT

(Pilchard's Manual of Operative Dentistry, 1996)

Caries risk assessment – an assessment of the patient's individual risk of developing further carious lesions or progression of existing lesions. These procedures carried out during preventive and restorative procedures can serve as a monitoring aid for the success of treatment.

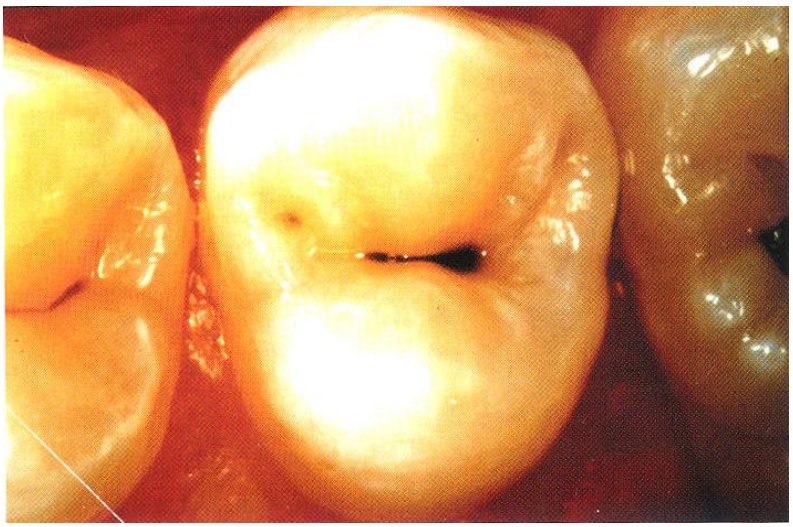
High risk for caries	Low risk for caries
General appearance	
Presence of the general illnesses	Absence of the general illnesses
Increased salivary flow or Xerostomia	Normal salivary flow
High caries rate	Low caries rate
Dietary factors	
Frequent sucrose intake	Restriction on the sucrose intake
Fluoride prophylaxis	
The low water fluoridation	The normal water fluoridation
Absence of fluoride modalities	Use of fluoride modalities as indicated
Non-use of a fluoride-toothpaste	Use of a fluoride-toothpaste
Oral Hygiene	
Irregular, insufficient tooth cleaning	Regular, effective tooth cleaning
The poor quality of tooth cleaning	The good control over quality of tooth cleaning
Saliva	
Low salivary flow	High salivary flow
Low buffering capacity	High buffering capacity
High MS counts	Low MS counts
High Lactobacillus counts	Low Lactobacillus counts
The tooth status	
New lesions	Absence of new lesions
The missing teeth	Absence of the missing teeth

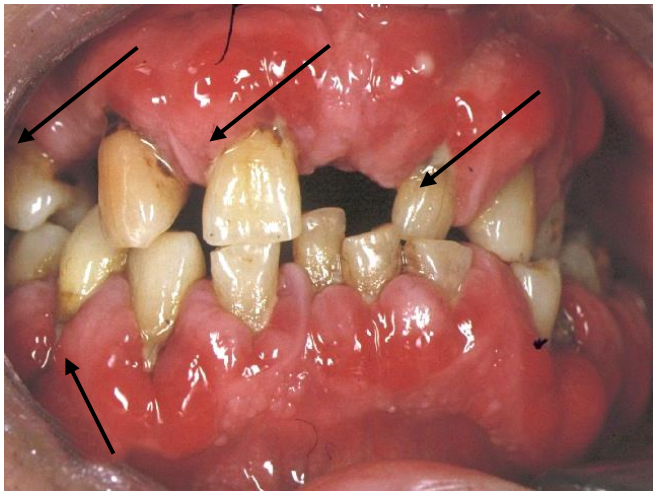
plaque is, at first, a soft, thin film of *food debris, mucin, dead epithelial cells,* and *bacteria* that develops on the tooth surface within about 24 hours after the tooth is cleaned. Within 2 hours a cell-free, structureless organic film-the pellicle completely cover the surface of teeth. It is formed from the selective precipitation of various components (*proteins*) of saliva. The early stages of colonization of the tooth surface involved adhesion between the pellicle and pioneering microorganisms. Bacteria as mature plaque communities in oral cavity convert *glucose, fructose*, and most commonly *sucrose* into acids such as *lactic acid* through a glycolytic process called fermentation. Dietary sucrose has two important detrimental effects on plaque: 1) provides a stronger potential for colonization by *microorganisms*; 2) mature plaque exposed to sucrose rapidly metabolizes in into organic acids. It must be noted that the mineral content of teeth is sensitive to increase in acidity from the production of lactic acid. The acids diffuse into the tooth enamel or dentin and dissolve or partially dissolve the mineral from crystals down inside the tooth. It must be noted that dissolution of apatites of external layer of enamel occurs at prolonged maintenance of a critical level of hydrogen ions and this process especially intensively in the weak areas of enamel (line of Retcius and interprismatic space). The most important of minerals is the *carbonate ion*, which makes the mineral more *acid-soluble* than pure *hydroxapatite*. Thus the organic acids involved in the beginning of the caries disease are normal *metabolic byproducts* of the microorganisms and are formed by the metabolism of fermentable carbohydrates. The microorganisms use *fermentable carbohydrates* trapped between the teeth, as an energy source for production of organic acids which lower the pH of the plaque. When *the pH* at the surface of the tooth *drops below 5.5* in the constant state of *back-and-forth demineralization* and *remineralization* between the tooth and surrounding saliva, demineralization proceeds faster than remineralization. The incidence of carious process is associated with the age of the dental plaque, the nature of the carbohydrate consumed, and the presence or absence of fluoride. For example, in the presence of dental plaque that has formed for 10-12 hours or less, the enamel demineralization resulting from a fed increased sucrose will be

remineralized by salivary components within about 10 minutes. In contrast, a time of at least 4 hours is required by protective agents of saliva to repair the destruction of enamel in the presence of dental plaque that is 48 or more hours old. The mouth contains a wide variety of bacteria, but only a few specific species of bacteria are believed to cause dental caries: the bacterial organisms, such as *Streptococcus mutans* and *sobrinus*, as well as several Lactobacilli species (*Lactobacillus acidophilus*), *Actinomyces viscous* are capable of plaque formation and are most closely associated with caries, particularly root caries because of their ability to generate a considerable amount of acid as a result of their metabolism of carbohydrates, and to survive in an acid environment (*cariogenic* or *acidogenic*). Streptococcus mutans and Actinomyces viscous are the main species that are capable of attaching to the *pellicle* within 1 hour after tooth cleaning. The adhesion process is very selective and requires specific organism receptors (*nutrients*) capable of attachment to certain areas on the precipitated salivary proteins of the pellicle. For example, the enzyme glycosyl transferase may be of critical importance in the adherence of microorganisms to the pellicle when sucrose is present. The dextrans have the property of absorbing more sugar which is turned into acid by the plaque bacteria causing the plaque to remain acidic for twenty minutes or more after each exposure of sugar. A *sucrose-rich diet* provides greatly increased accumulation of the organism in the plaque community, allows to bacteria to produce large quantities of *extracellular polysaccharides* (*dextrans* and *insoluble mutans*) that produces a diffusion-limiting barrier in the plaque and serve any functions (*adhesion* and *protection*); the combination of limited diffusion and tremendous metabolic activity makes the local environment anaerobic and very acidic. The microorganisms must have simple nutritional requirements by two basic processes: *catabolic-breakdown* complex molecules, such as carbohydrates and proteins, and release useful energy; *anabolic*-require energy to build complex cellular molecules from simple precursors. And the specific sites of the tooth - the grooves on the occlusal surfaces of molar and premolar and the point of contact between teeth provide microscopic retention for a relatively simple population of Streptococcus, but the root surface in the

gingival sulcus may harbor a very complex community dominated by *Filamentous* and *spiral bacteria*. When the some concentrations of sugar are eaten continuously throughout the day caries develop because the pH of the oral environment never returns to normal levels.

Reduced saliva is associated with increased caries since the buffering capability (antimicrobial products of saliva-lysozime, lactoferrin, agglutinins; saliva contains molecules that contribute to increasing plaque) of saliva is not present to counterbalance the acidic environment created by certain foods. There are two hypothesizes concerning the pathogenicity of plaque: 1) hypothesizes, which suggests that all plaque is pathogenic (*nonspecific plaque hypothesizes*); 2) *specific plaque hypothesizes* – dental plaque is *pathogenic* only because of presence of any associated clinical disease. Clinical observation and laboratory investigation often support the theory that dental caries is influenced by a number of secondary local factors: anatomic characteristics of the teeth (*coalesced* pits and fissure); arrangement of the teeth in the arch (*crowded* and *overlapped* teeth); presence of dental appliances and restorations In addition, the edges of restorations or artificial crowns, Intraoral appliances such as orthodontic braces or removable partial dentures can provide protection for microorganisms In addition, the edges of restorations or artificial crowns, Intraoral appliances such as orthodontic braces or removable partial dentures can provide protection for microorganisms. *Decreased saliva flow* (cariogenic factor) is very common during acute and chronic systemic illnesses. The medical conditions or the general health of the patient, function both of immune system and salivary glands (*Sjogrein's syndrome, diabetes mellitus, diabetes insipidus*, and etc.; medications, such as *antihistamines* and *antidepressants*) reduce the amount of saliva produced by salivary glands, diet, oral hygiene have a significant impact on the patient's caries risk. *Hereditary* factors (tooth morphology and enamel defects tend to follow a familial pattern), for example investigations have demonstrated a relationship between the numbers of Streptococcus mutans present in mothers and their children. Thus, the most common source of



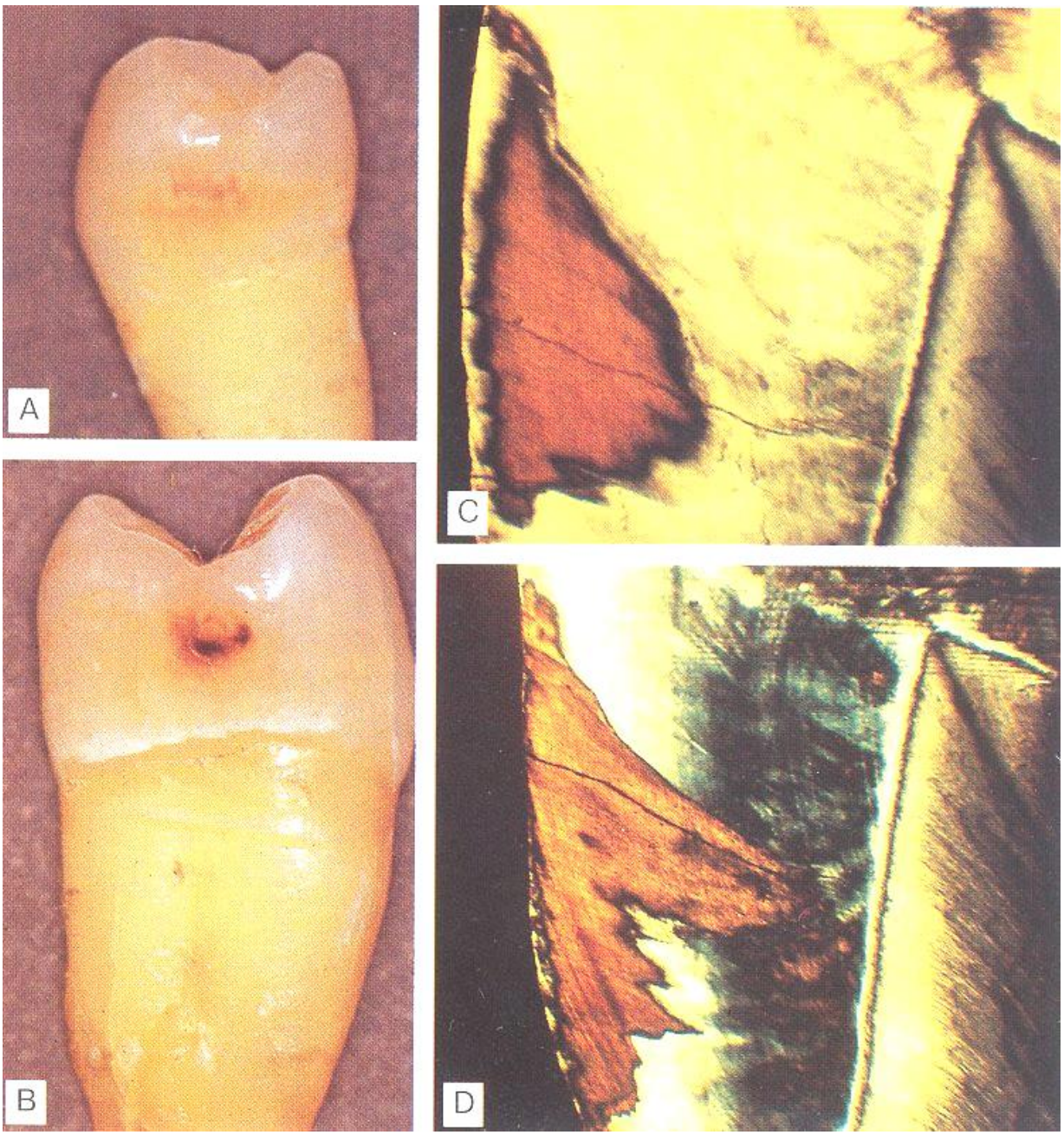


There are two broad classifications of tooth decay based on the anatomy of the tooth surface. Depending on which hard tissues are affected, it is possible to describe caries as involving enamel, dentin, or cementum.

WHITE SPOT CARIES (*seu macula cariosa*)

The caries is a dynamic pathological process of multifactor etiology in the hard tissues of the tooth results from complex interaction between both cariogenic (general and local) and protective influences and characterized by demineralization of the inorganic portion and destruction of the organic substances of enamel, dentin and cementum with the subsequent formation of defect (cavity).

There are several stages of caries development: a stage of a spot, on that stage caries is hardly noticeable and not perceptible. It appears as white and later dark enamel spot. So if it has appeared not on the front side it hardly can be found by non professional. In that case we deeply fluoridated the tooth that stops caries development and also recommended a regular hygienic cleaning.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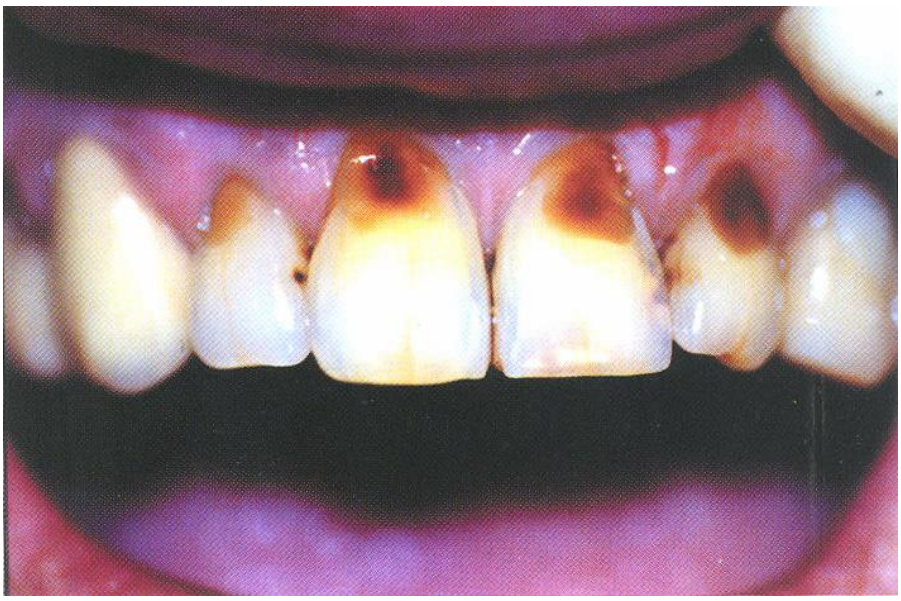

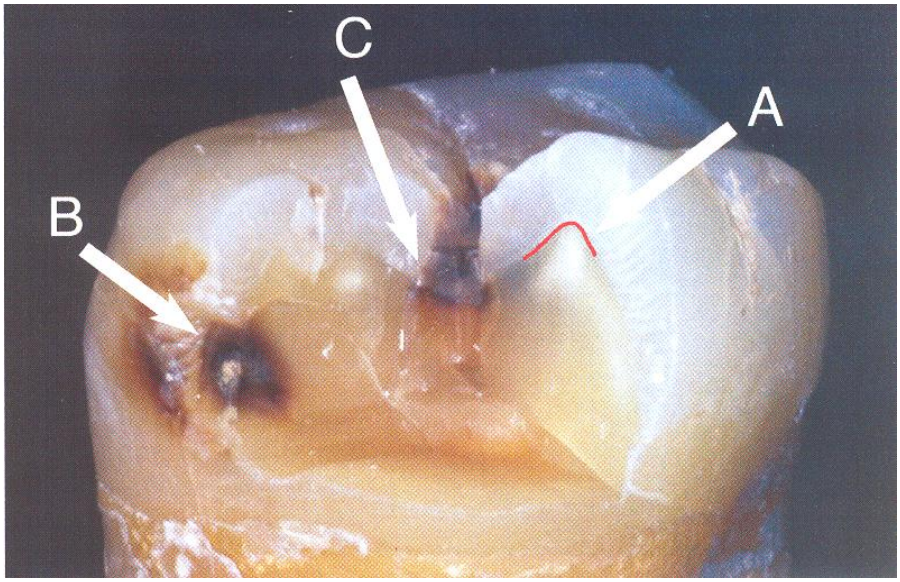
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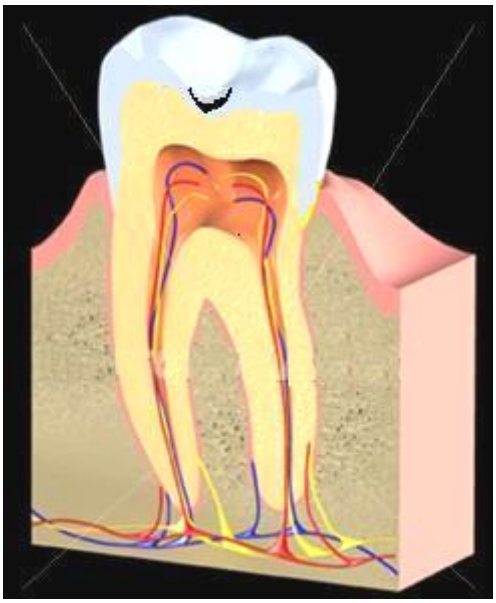


(desiccation) of the suspect surface of tooth with a compressed air, which removes moisture from subsurface layer of enamel and changes the optical properties (render the area opaque and white).

When the lesions are limited to the enamel it do not cause pain because the enamel has no nerves within it, and because the acids dissolves the mineral creating subsurface porosity these regions of enamel lose their translucency. Consider, that long conservation of surface (outer) layer of enamel over incipient lesions caused by two reason-structural features of an external layer (the big content of fluoride apatite) and constant process of remineralization which is always observed in an oral cavity due to supersaturation of the saliva with *acid - buffering systems* (bicarbonate, calcium and phosphate ions). Remineralization is the deposition of minerals into from saliva contents and fluoride (calcium and phosphate flow back into the tooth and form new mineral). Noncavitated lesion can by reversed (remineralization) or arrested and this process can by observed clinically as usually brown or black spots because of trapped organic debris and metallic ions within the enamel, and this region of enamel is much more resistant to subsequent acid attack. The reversal of the process is remineralization (replacement of mineral), which occurs when the acid in the plaque is buffered by saliva allowing calcium and phosphate, primarily from the saliva, to flow back into the tooth and form new mineral on the partially dissolved subsurface crystal remnants.

The individual may experience common early symptoms, such as occurrence of sensitivity to hot or cold which quickly passes. At this stage of carious process the vital response to *electric pulp testing* at the time of the initial caries is 2-6mcA.

Differentiate diagnostics: the white spot lesion must be differentiated from the spot form of hypoplasia-in the case of hypoplasia the surface of tooth is not colored by the 2% solution of blue metylen and spots are located on the vestibular and lingual surfaces of the symmetrical teeth and became visible immediately after tooth eruption; but carious spot are located on the specific (susceptible) areas of tooth and this region of enamel is colored by the 2% solution of blue metylen.

Initial caries must be differentiated from spot stage of fluorosis: the caries is located on the typical sections of disease; the lesions during fluorosis are multiple and located on the smooth vestibular and lingual surfaces of teeth, fluorosis is appeared from the time of eruption of teeth and it is considered as endemic disease.

Treatment

The presence of *fluoride* ion enhances the precipitation into tooth structure of fluorapatite. Incipient carious lesions are remineralized by the same process. Fluoride has antimicrobial activity, inhibit the enzymatic production of glucosyltransferase, and this reduces bacterial adhesion. Local conservative treatment which does not provide preparation of hard tissues is recommended. The dentist is compelled to prepare area of a carious stain at localization of carious process on frontal teeth, because of occurrence of aesthetic problems.

Preparation of the teeth provides extraction of changed pathological tissues with subsequent restoration of the anatomic form of a tooth with corresponding restorative materials (composite-have good aesthetic properties). Thus if the spots are located on the anterior teeth and are visible during smiling it is necessary to remove this defect. *Conservative* treatment plan includes the remineralization therapy, which carry out with using of various solutions.

1-Application of 10% solution of *calcium gluconate* during 15-20 minutes must be done .The course of treatment consists of 10-15 procedures. Procedures come to the and with application of 0.5-2% solution of *sodium fluoride*. At first the surface of enamel is processed with 1% solution of hydrogenous peroxide and the tooth must be isolated from saliva, thoroughly dried and then the cotton plugs which moistened with a 10% solution of gluconate calcium impose on a surface of a tooth during 20minutes.

2- The application of *remodent* - is consists of calcium, magnesium, sodium and organic substances and is applied as 1.2 or 3% solution. Course

of treatment consist of 15 - 20 application (procedures) during 15 - 20minutes (tampon is replaced each 5 min).

3- The application of 1 - 2% solution of sodium fluoride.

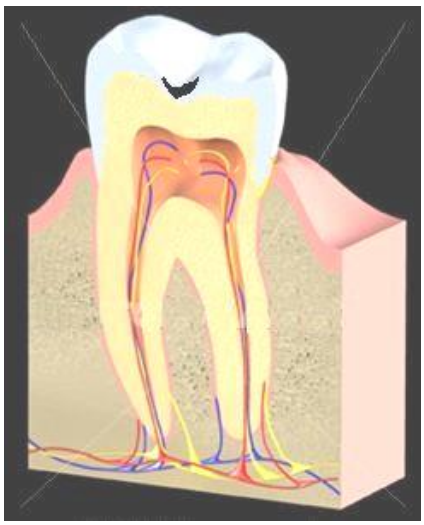
A tampon humidified with a solution, impose on the cleared and dried surface of a tooth for 10 - 12minutes. Usually 2-4 applications carry out during each 3 - 5days. 3 - 4 courses are recommended in year.

4 – The treatment consists of the removal of the diseased tissue and replacing it with a restorative material (one of the newer composite materials). If the oral pH remains high enough for sufficient time (at pH7) then complete remineralization of enamel may occur. Thus the demineralization of subsurface incipient lesions may occur as long as the surface layer of the enamel remains intact. Thus treatment of such lesions is conservative and may include dictum modification to remove sugar, proper oral hygiene to reduce bacteria, and use of topical fluoride to inhibit microbiologic activity, retard demineralization, and promote remineralization of enamel.

SUPERFICIAL CARIES (*caries superficialis*)

The tooth becomes sensible to temperature and mechanic influence.

It arises on a place of a white or pigmented stain as a result of destructive changes of enamel. Thus, the enamel surface is finally undermined, and the explorer falls into already destroyed subsurface. If subsurface lesion will continue to enlarge the eventual collapse of the surface layer and the formation of frank lesion is observed (unless the demineralization is arrested or reversed). Enamel appears rougher as a result of surface demineralization. Quite often the roughness is taped in the center of an extensive white or pigmented stain. The pulp of a tooth at superficial caries reacts to a current force 2-5mcA. Probably, short - term pain occurs by influence of chemical and temperature *irritations* - sweet, salt, acid.



carbonated drinks; the result of regurgitated stomach acids (in bulimic individuals).

Treatment

A dental handpiece is used to completely extraction of changed pathological tissues with subsequent restoration to return the tooth to anatomic form, functionality and aesthetic condition.

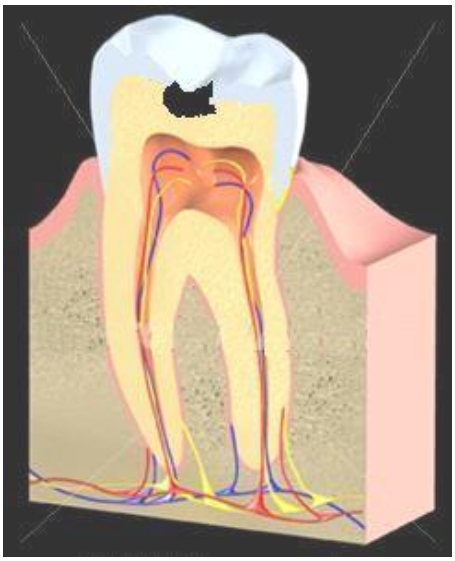
MEDIAL CARIES (*caries media*)

Medial caries involves enamel and dentin.

At this form of carious process the integrity of *dentine - enamel junction* (DEJ) is broken, however, above a pulp cavity thick enough layer of not changed dentine is kept. From influence chemical and temperature irritations there can be short - term pain sensations which quickly pass after their elimination. Carious cavity is filled by pigmented and a softened dentine. The pulp of a tooth reacts to current force 2-6mkA. Medial caries involve little dentin. The vital response to electric pulp testing at the time of initial examination at this stage of carious process is normal. The examination of carious tooth cannot be considered complete without a radiograph. The carious process arise the DEJ. As microbial invasion progresses along *dentinal tubules,* acid production decalcifies surrounding (intertubular) dentin.

Eventually, the cone-shaped lesion (enamel caries) contacts dentin along the DEJ. At first only a small spot of dentin is exposed to the action of carious microorganisms. In addition, the demineralization process spreads at the DEJ undermining the enamel and subsequently extending into the dentin.

Once the caries reaches the dentine at the dentine-enamel junction, the decay follows a *triangle pattern* which is typically described as two triangles (one triangle in enamel, and another in dentin) with their bases conjoined to each other at DEJ - it is typical of pit and fissure caries, unlike smooth - surface caries (where base and apex of the two triangles join). Caries have



Treatment

If second layer of dentin covers the pulp, the tooth is restored in the conventional manner.

If the *amalgam* is used and because of these high heat conductivity (temperature) and toxicity, there is a necessity of a covering of exposed dentin by isolated lining (*bases*), which prevents temperature and toxic influence of amalgam on a tissue of tooth.

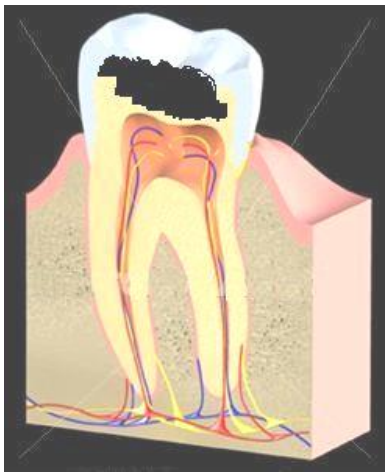
Dental materials also include cements, composite, and porcelain. The materials that are used for restoration of tooth should have the following requirements: 1) good retention to the tooth tissues; 2) esthetically compatible to tooth structure; 3) ease of placement; 4) continuous fluoride release.

DEEP CARIES (*caries profunda*)

At this form of carious process there are appreciable changes of a dentin. At survey the deep cavity filled with a softened dentine and hanging edges of enamel around the cavity are found out. The pulp of a tooth usually reacts to current force 2-6μkA, but the excitability can be reduced (in limits till 10-12μkA).

Patients specify short-term pains from mechanical, chemical and temperature irritations. It is severe carious lesion that can be seen *radiographically* to penetrate more than half the dentin and develop forward the pulp chamber.

Thus, the radiograph reveals an extensive region of demineralization within the dentin (arrows).The carious process continues through the dentinal tubules, which are responsible for the triangular patterns resulting from the progression of caries deep into the tooth. As the destruction of the dentin progresses along with breakdown of the organic components, the bacteria invade the dead tissue. The patient’s complaints and experiences are often valuable in determining of the extent of the lesion.



exposure of the pulp. Gross caries removal under *rubber dam* isolation is accomplished; *calcium hydroxide* was used as a sedative base (it was placed over the remaining caries).

The walls of cavity are extended to sound tooth structure because carious enamel and dentin will prevent the establishment of an adequate seal during the period of repair. The remaining thin layer of dentin in the base of the cavity is covered with a biocompatible base material then sealed with durable interim restorations.

Indirect pulp capping method of treatment of deep carious lesion:

Depending on the extent of tooth destruction, various treatments can be used to restore teeth to proper form, function and aesthetics.

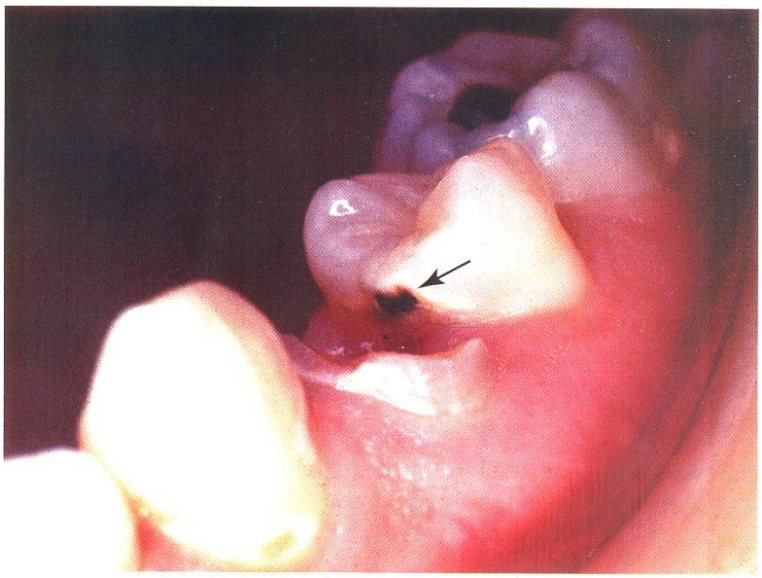
Calcium hydroxapatite initiate the production of reparative dentin by *fibroblasts and mesenchymal cells* of the pulp tissue, which is produced at an average of 1.5μm /day, but can be increased to 3.5μm/day.

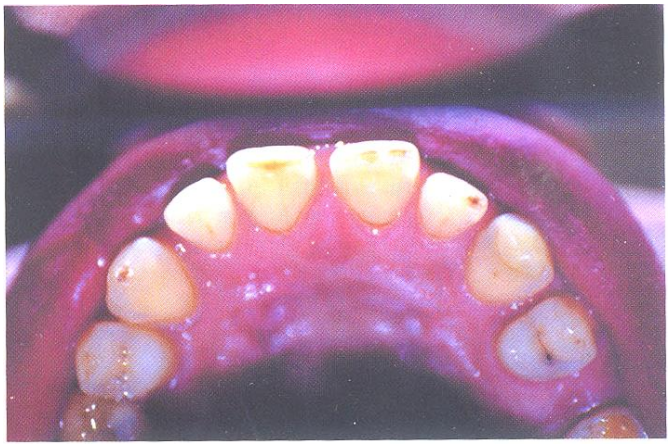
If the remaining dentin thickness is less than 0.5mm it is important to protect dentin surfaces from direct contact with unset materials by using calcium hydroxapatite.

In a tooth with a deep carious lesion, no history of spontaneous pain and a vital pulp (demonstrated by electric testing), incomplete.

Excavation of carious cavity may be indicated - placement of thin layer of calcium hydroxapatite on the dentin remaining over the pulp.

A direct pulp cap is the placement of calcium hydroxyapatities directly on exposed pulp tissue and the surrounding deeply excavated dentinal area. These techniques of indirect pulp capping may stimulate the formation of reparative dentin. In operative procedures, *affected dentin* (zones 2and 3) that is not yet invaded by bacteria does not require removal; *infected dentine* (zones 4 and 5) that is booth softened and contaminated with bacteria, and thus requires removal. The outer layer (infected dentin) can be selectively stained (colored) by caries detection solutions *-1% acid red 52(acid rhodamine B or food red 106*) in propylene glycol. This solution stains the irreversibly denatured collagen, but not the reversibly denatured collagen; this technique may provide a more conservative tooth preparation (because of evidence of the boundary between affected and infected tissues).





cutting abilities and permits to do the freely manipulations with instruments in the cavity.

It is expediency on this stage to use the small cylindrical and round burs in according with sizes of entering hole of carious cavity or less than one.

3. ***The extension of carious cavity***. On extension of carious cavity the margins of enamel are equalized, the lesion fissures are removed and acute corners are made round. The cavity is extensioned by the fissure burs of middle and big size.

4. **Necrectomy**. On this stage the lesion of enamel and dentin is finally removed from the carious cavity . The volume of necroectomia is determined by the clinical view of caries, localization of cavity and its depth. The preparation of the bottom of carious cavity should be conduct in the limited zone of hypercalcinated (transparent) dentin. This is determined by the explore of cavity bottom with probe and excavator. It is permissible to remain on the bottom only strong pigmentation layer of dentin. In case of the acute carious process of children in several cases it is permissible to remain (preservation) the small layer os softening dentin because there is the danger of lancing and trauma of pulp. By conducting of necroectomia it is necessary to bear in mind that there are many highly sensitive zones in the area of dentinoenamel junction in the zones of interglobular and close-pulp dentin. This zones are very sensitive to irritants. Necroectomia is conducted by excavators or round burs. It is forbidden to use the inverted cone and fissure bur during the treatment of bottom of profunda carious cavity because there is the possibility of lancing and infection of pulp.

5.**The forming of carious cavity**. The target of this stage is the creating of favourable conditions which will assist for reliable fixing and lindering preservation of constant stopping. In case of surface(superficial) and middle caries the cavity with perpendicular walls , right angles, plane bottom is the most efficient. The cavity may be triangular, rectangular, cruciform , so to be conform to anatomic form of fissures . During the formation of cavity bottom of profound caries it is necessary to bear in mind about topographical peculiarities of tooth cavity. Due to mark that the horns of the pulp are located very close to the margins of cavity it is necessary to form the bottom like the small deepening shape in the secure zone. For the best adhere of stopping it is usefull to create the ditch-form,

deepening -form, notching - form supporting points in the preservation walls with gradual narrowing toward the entering hole. The formating of cavity is made with inverted -cone, round , wheel burs.

6**. The smoothing of enamel margin.**

The duration of preservation of the constant stopping is determined by the stage of the smoothing of enamel margin. The external part of enamel prisms near the entering hole into the carious cavity as rule have not the support from liable dentin and are the place of leas resistance for masticatory pressure. Breaking of sap enamel margins quite often assist to the produce of recurrence of caries. The smoothing of enamel margins is produced by carbide stones. It is envisaged for the forming the 45 – degree angle of taper along the cavity margin. This taper like the hat of nail protects the stopping from axial change position under masticatory pressure. The enamel margin after smoothing must be flat and has no jags. Due to mark that by filling with amalgam taper is formed into the all depth of enamel but with metallic supplementary sheet - into superficial layer of enamel, but when polymer materials - taper is need not , the enamel margins should be only smoothed. The forming of taper is necessary only for materials which have no adhere.

7.**The irrigation of cavity**. After preparation and forming, the cavity must become free from dentin sawdust by the current air or water or is irrigationed by cotton rools moisten with week antiseptic solution. Using substances must no be irritant for pulp.

8.**Drug treatment of cavity**. During the all stages of preparation of carious cavity the instrumental treatment must be combinate with drug treatment for render harmless the infected dentin. For this purpose the week solutions of desinfected preparations are used (3% hydrogen peroxide, l% solution of chloramine, 0,1 % solution of furaciline).It is inadmissible to use virulent and irritant drugs. The medicamentous treatment is finished with the careful drying of cavity by warm air (in cases of surface and middle caries it is admissible to use the alcohol and ether.

9.**The imposition of medical paste** .During the treatment of profound caries it is necessary to create the depot of medical preparations in the cavity for decreasing virulent of bacteria of infected dentin , liquidation of reactive displays from the pulp and calcification of the bottom of cavity and stimulation of reparative dentine sediment. The pastes are prepared with water or oil basic, then put into the cavity by the small smoother and carefully condense to bottom.

10**. The imposition of isolated linings.** The medical paste in the cavity is covered with artificial dentin for prevention the inactivation of drug preparations. The artificial dentin fulfill the function of isolated lining. Above the lining of dentin the phosphate cementum is put up. The lining must be uniformly cover the both dentin of bottom and walls of cavity, does'nt change its form and close no the adding supporting points. In some cases the castle- shaped points are created in the walls of linings. Lining material is put up by smoothers and stoppers , spreaded to bottom and walls.

11 .**The imposition of constant stoppings.** The prepared filling material is put up into the treatment cavity by stopper or smoother, carefully condenses to bottom and walls of cavity. The lining of phosphate cementum must be whole covered by constant filling material. The stopping is compacted by stopper, formed by smoother. For amalgam it is necessary to use special instruments. By forming the constant filling it is necessary to pay attention for restoration of anatomic form of crown. For the restoration of functional ability of tooth, the tooth is introduced in the contact with its antagonist. For this aim before the filling material is full harden the patient has to carefully and easily close teeth and do the lateral masticatory movings .The adding filling material is removed by smoother, cotton wool rools (filling of amalgam), or carbide stones (cementum and plastic).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increase retention. The resulting bond should reduse the possibility of marginal stain which is the invariable results of microleakage.

Cavity form

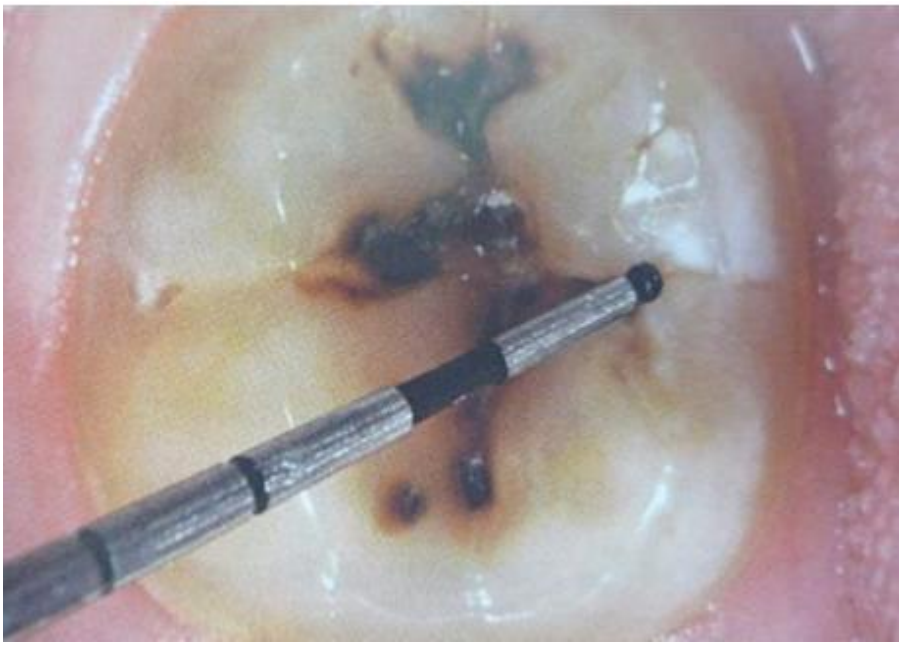
In general terms the objectives of cavity preparation are to remove all defects and give the necessary protection to the pulp, to locate the margins of the restoration as conservatively as possible, to form the cavity so that under the force of mastication the tooth or the restoration or both will not fracture and the restoration will not be displaced, and to allow for the esthetic and functional placement of a restorative material.

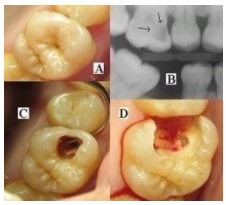
Most of the scientific foundation on which these objectives are executed was presented by Black. For many years the Black cavity preparations, with few modifications, formed the basis for most operative cavity preparation procedures. Modifications of Black's principles of cavity preparation have resulted from the influence of Bronner, Ireland, Markley, B. Sturde-vant, Sockwell, and C. Sturdevant, as well as from improvements in restorative materials, instruments, and techniques, and the increased knowledge and application of preventive measures for caries and periodontal disease.

Cavosurface angle. The cavosurface angle is the angle of tooth structure formed by the junction (at the margin) of the prepared cavity wall and the external surface of the tooth. The treatment of this angle differs with the location on the tooth, the direction of the enamel rods on the prepared wall, and the type of restorative material to be used. Finishing this area may be in the form of a bevel, a butt or 90-degree angle, or a chamfer. These various types of margin finishes will be discussed in detail in chapters dealing with the cavity preparations for different restorative materials, as well as in the section Steps in Cavity Preparation.

Cavity classification

There are several acceptable methods of cavity classification. The simplest classification is according to the number of surfaces involved. The simple cavity involves only one surface, the compound cavity involves two surfaces of the tooth, and the complex cavity involves three or more surfaces. This classification leaves much to be desired in that it is too generalized.




A
B
C
D


Dental caries
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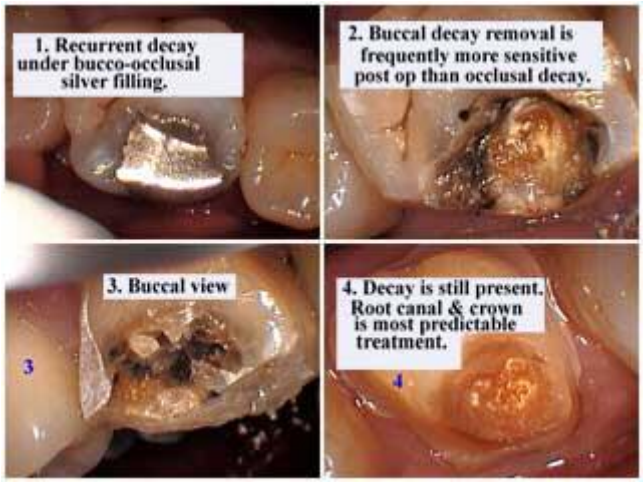
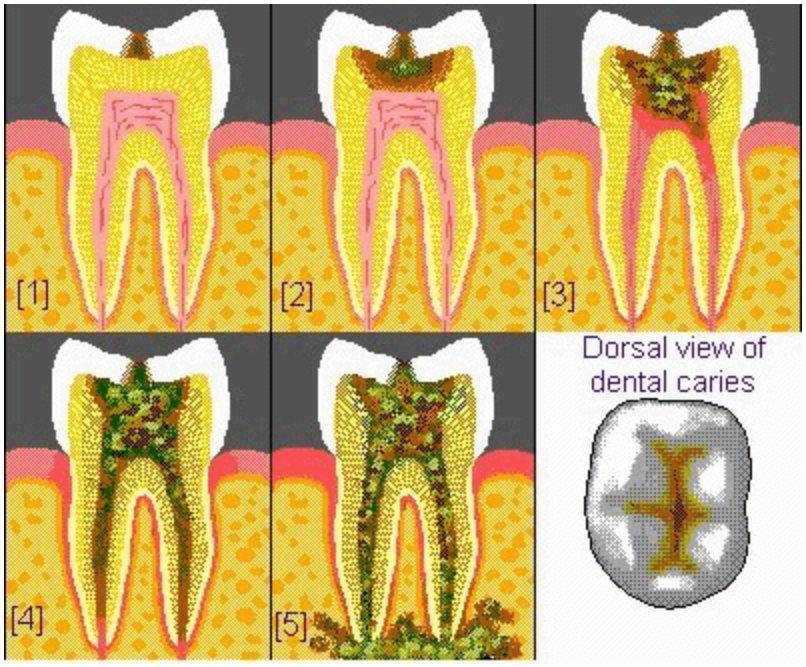

1. Recurrent decay under bucco-occlusal silver filling.
2. Buccal decay removal is frequently more sensitive post op than occlusal decay.
3. Buccal view
3
4. Decay is still present. Root canal & crown is most predictable treatment.
4


[1]
[2]
[3]
[4]
[5]
Dorsal view of dental caries

The latter method of cavity classification categorizes the types of cavities for easy recognition. This method of classification is used throughout the text, and thus a complete description along with component nomenclature follows:

Class I. All pit and fissure cavities: cavities on occlusal surfaces of premolars and molars (I-A) (Fig. 1), cavities on occlusal two thirds of the facial and lingual surfaces of the molars (I-B), cavities on lingual surfaces of maxillary incisors (I-C)

Noting again that the cavity walls take the names of the surfaces toward which they face, the walls of Class I cavities follow:

Walls of the occlusal cavity (I-A) (Fig. 2)

Mesial

Distal

Facial

Lingual

Pulpal

Walls of the facial and lingual cavities of molars (I-B)

Mesial

Distal

Occlusal

Gingival

Axial

Walls of the lingual cavities of incisors (I-C)

Mesial

Distal

Incisal

Gingival

Axial

Line angles and point angles take the names of the walls or surfaces forming them. Although most cavities take the general form of a box, two walls often join in an arc rather than in a distinct line. In these cases the approximate area of junction of the walls is still designated in terms of a line angle for descriptive and communicative purposes.

Angles of Class I cavities

Angles of the occlusal cavity (I-A) (Fig. 3)

Line angles

Mesiofacial

Mesiopulpal

Mesiolingual

Faciopulpal

Distofacial

Fig. 1. Typical Class I preparation for amalgam on maxillary premolar

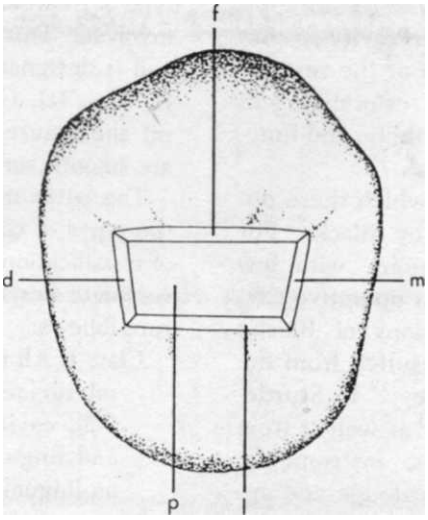


Fig. 2 . Schematic Class I cavity preparation on occlusal surface of maxillary premolar illustrating cavity walls

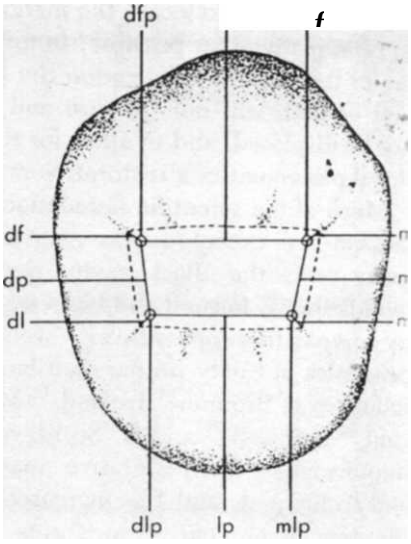


Fig. 3. Schematic Class I cavity prepation on occlusal surface of maxillary premolar illustrating cavity line angles and point angles as denoted by letter abbrevi tions, such as* fp*, denoting faciopulpal* line *angle, and* mfp*, denoting mesiofaciopulp point angle

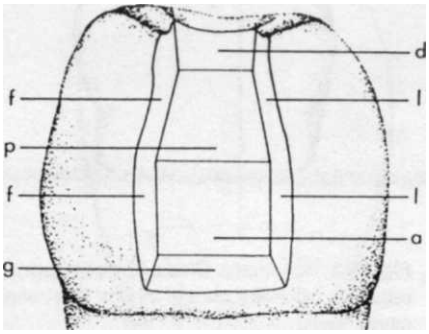


Fig. 4. Typical Class II mesiooccIusal cavity preparation for amalgam on maxillary premolar

Fig. 5. Schematic Class II mesiooccIusal cavity preparation for amalgam on maxillary premolar illustrating cavity walls on both occlusal and proximal portions.

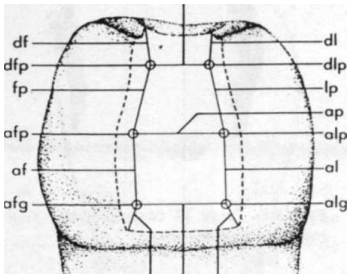


Fig. 6. Schematic Class II mesiooccIusal cavity preparation illustrating cavity line and point angles on occlusal and proximal portions and junction of occlusal and proximal portions.

Distopulpal
Distolingual
Linguopulpal
Point angles
Mesiofaciopulpal
Mesiolinguopulpal
Distofaciopulpal
Distolinguopulpal
Angles of the facial and lingual cavities
of molars (I-B)
Line angles
Mesiogingival
Mesiooccl usal
Distogingival
Distooccl usal
Axiomesial

Distoincisal
Axiomesial
Axioincisal
Axiodistal
Axiogingival
Point Angles
Axiomesiogingival
Axiomesioincisal
Axiodistogingival
Axiodistoincisal

Class II. Cavities on the proximal surfaces of the **premolars and molars (Fig. 4)**

Walls of the proximooccl usal cavity (II) (Fig. 5)
Proximal portion
Facial

Axioocclusal
Axiodistal
Axiogingival
Point angles
Axiomesiogingival
Axiomesioocclusal
Axiodistogingival
Axiodistoocclusal
Angles of the lingual cavity (I-C)
Line angles
Mesiogingival
Mesioincisal
Gingival
Lingual
Axial
Occlusal portion
Mesial (or distal)
Facial
Pulpal
Lingual
Angles of the proximoocclusal cavity (II) (Fig. 6)
Line angles
Proximal portion
Axiofacial
Faciogingival

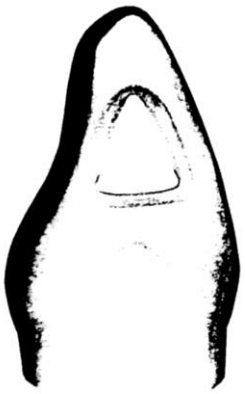


Fig. 7.Class III cavity preparation on maxillary central incisor.

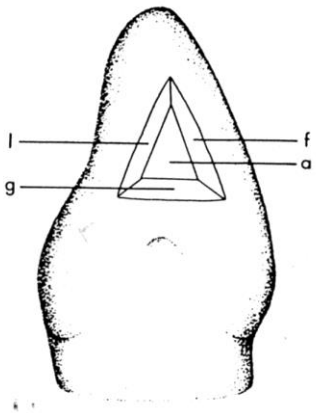


Fig. 8.Schematic Class III cavity preparation on maxillary central incisor illustrating cavity walls.

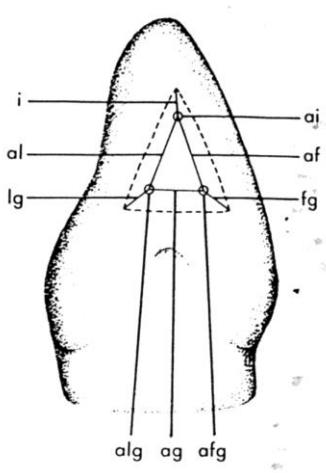


Fig. 9.Schematic Class III cavity preparation denoting cavity line and point angles. Note exception to general rule for incisel line angle and point angle.

Linguogingival
Axiolingual
Occlusal portion
Distofacial (or mesiofacial)
Faciopulpal
Linguopulpal
Distolingual (or mesiolingual)
Distopulpal (or mesiopulpal)
Point angles
Proximal portion
Axiofaciogingival
Axiolinguogingival
Occlusal portion
Distofaciopulpal (or mesiofaciopulpal)
Distolinguopulpal (or mesiofaciopulpal)
Junction of proximal and occlusal portions
Line angle
Axiopulpal
Point Angles
Axiofaciopulpal
Axiolinguopulpal

Class III. Cavities on the proximal surfaces of incisors and canines that do not involve the incisal angle (Fig. 7)

Walls of the proximal cavity (III) (Fig. 8) Facial
Axial
Lingual
Gingival

Angles of the proximal cavity (III) (Fig. 9)
Line angles
Axiofacial
Faciogingival
Axiogingival
Linguogingival
Axiolingual
Incisal
Point angles
Axiofaciogingival
Axiolinguogingival
Axioincisal

Class IV. Cavities on the proximal surfaces of incisors and canines that do involve the incisal edge (Fig. 10)

Walls of proximoincisal cavity (IV) (Fig. 11)
Proximal portion
Facial
Axial
Gingival
Lingual

Incisal portion
Facial
Pulpal
Mesial (or distal)
Lingual
Angles of the proximoincisal cavity (IV)
(Fig. 12)
Line angles
Proximal portion: same as those of proximal cavity (III) except for the incisal angle

Incisal portion
Mesiofacial (or distofacial)
Faciopulpal
Linguopulpal
Mesiolingual (or distolihgual)
Mesiopulpal (or distopulpal)
Point angles
Proximal portion
Axiofaciogingival
Axiolinguogingival

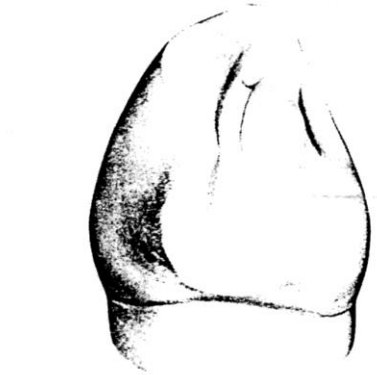


Fig. 10.Class IV cavity preparation,including incisal portions, for inlay on maxillary canine.

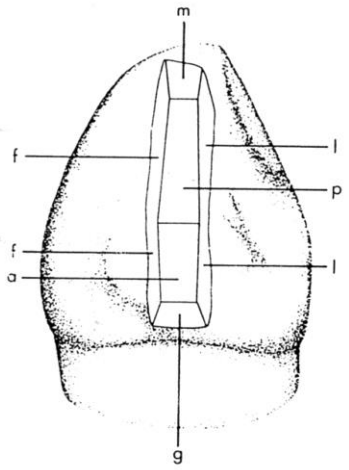


Fig.11 .Schematic Class IV cavity preparation illustrating cavity walls on proximal and incisal portions.

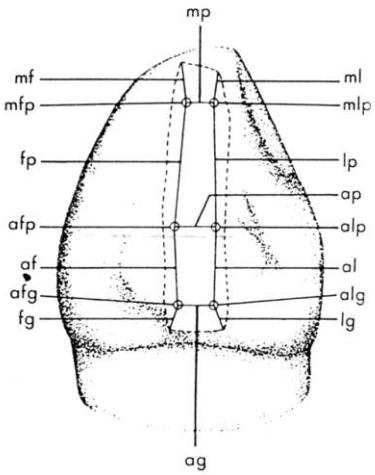


Fig. 12.Schematic Class IV cavity preparation on maxillary canine denoting line and point angles.

Fig. 13. Typical Class V cavity preparation on facial surface of maxillary central incisor.

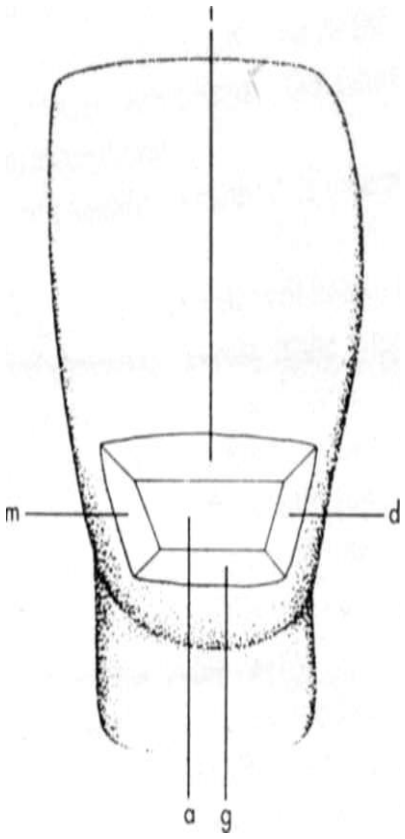


Fig. 14. Schematic Class V cavity preparation on maxillary incisor illustrating cavity walls that are similar to walls of Class I-B or I-C cavity preparation.

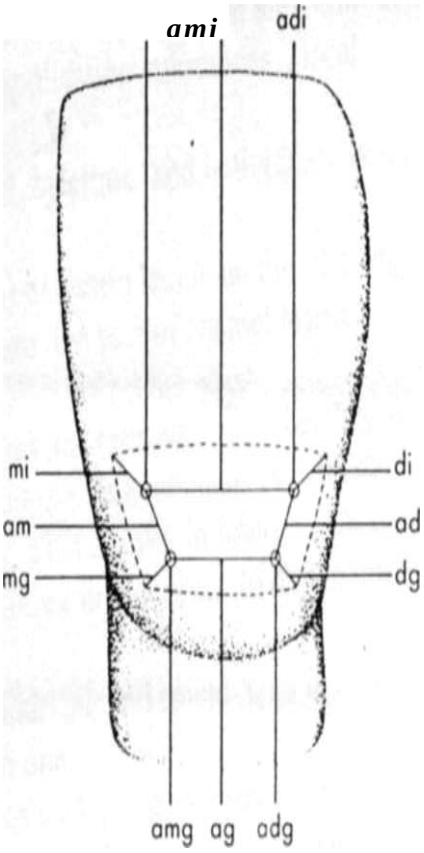


Fig. 15. Schematic Class V cavity preparation denoting cavity line angles and point angles that are same as those of Class I-B or I-C cavity preparation.

Incisal portion

Mesiofaciopulpal (or distofaciopulpal)

Mesiolinguopulpal (or distolinguopulpal)

Junction of proximal and incisal portions

Line angle

Axiopulpal

Point angles

Axiofaciopulpal

Axiolinguopulpal

Class V. Cavities on the gingival third of the facial or lingual surfaces of all teeth (not pit and fissure cavities) (Fig. 13)

Walls of the facial (Fig. 14) or lingual cavity (V): same as those of Class I-B (facial) or Class I-C (lingual)

Angles of the facial (Fig. 15) or lingual cavity (V)

Line angles: same as line angles of Class I-B or

Class I-C

Point angles: same as point angles of Class I-B or

Class I-C

In addition to the classification of Dr. Black (Class I through V) another category may be used:

Class VI. Cavities on the incisal edge of anterior teeth or on the occlusal cusp heights of posterior teeth

The cavity walls and line and point angles take the names of surfaces involved and vary considerably because of the extension necessary as a result of the varying degree of lost tooth structure and the cutting necessary in following sound cavity preparation principles.

CLASS 1 CAVITY PREPARATION

Facial and lingual extension and width are dictated by the caries, types of restorative materials.

The occlusal restoration is the more boxlike preparation outline may be preferred, resulting in greater retention and resistance to fracture (this preparation can be compared to a room that has four vertical walls that are perpendicular to occlusal forces, and a horizontal floor). If two small, faulty pits (caries) present on a chewing surface and if caries process is not spread along the facial or lingual fissure and grooves (at significant thick enamel platen between them) is formed two isolated cavities; at significant thin enamel platens between the small caries and at spreading of carious lesion along the facial or lingual fissure and grooves radiating from occlusal surface it is expedient to create a uniform cavity.

At localization of cavities in blind fosse of teeth is appropriate the rounded or oval cavities with a flat floor. The small carious cavities, located on the chewing and buccal surface and at presence of a sufficient layer of the intact hard tissue it is possible to prepare two independent cavities. If a layer of intact tissue between lesions is thin then form a uniform cavity with a step. If on a chewing surface are available deep fissure without attributes of caries and a small carious cavity the preparation is shaped up to healthy tissues – preventive sealing of invasive closing

fissure with hermetic(sealent). A large, extensive restoration may be reguired in treating a large carious lesions, more conservative restoration may restore the tooth when the lesion is small.

For modern principle of tooth preparation is necessary to extend the restoration as conservatively as possible. Modified class 1 tooth preparation is prepared with a small round or inverted cone diamond. Extensions into marginal ridges and cusps should result in approximately a 1.6 – mm thickness of remaining tooth structure for premolars and approximately 2 mm for molars. These limited extensions help pressure the dentinal support of the marginal ridge enamel and cusps tips. The small carious cavities, located on the chewing and buccal surface and at presence of a sufficient layer of the intact hard tissue it is possible to prepare two independent cavities. If a layer of intact tissue between lesions is thin then from a uniform cavity with a step. If on a chewing surface are available deep fissure without attributes of caries and a small carious cavity the preparation is shaped up to healthy tissues – preventive sealing of invasive closing fissure with hermetic. This form is generated by inverted cone or fissure diamond bur. Preserve the strength of the cuspal and marginal ridge areas as much as possible. Coarse diamond creates a 0.25 – 0.5 mm level width at a 45 –degree angle.

At the class 1, if a facial and lingual groove on the tooth surface is involved by carious process the preparation design would be a combination of conventional and beveled conventional. At some cases the internal angles of tooth preparation should be rounded to reduce stress concentrations in the amalgam. If caries disease is appeared on the occlusal and buccal surface, then, preparation extends from the occlusal surface through the facial cusp ridge onto the facial surface. The convergences usually provide sufficient preparation retention form. Ensuring retention form the is made by preparing retention locks with round bur. Conventional outline includes occlusion pits and fissure. Minimum preparation depth of 1.5 – 2 mm is recommended for amalgam restorations to withstand occlusal forces and thickness of 1 – 1.5 mm may be sufficient for cast metal restorations. This 0.5 mm occlusal step will contribute to the retention of the restorations.

This extension provides additional retention form even though the groove is not faulty. Lingual surface groove preparation outline on a molar protect the facial

cusps from infringement; the facial surface groove extension on lower molar teeth protect the lingual cusp from fracture. Extension for prevention include those pits and fissures adjoining the carious cavity , should be considered for young patient, who has a high caries rate, poor oral hygiene and for protection of adjacent pits and fissures can be used sealants. Minimum preparation depth of 1.5 – 2 mm is recommended for amalgam restorations to withstand occlusal forces and thickness of 1 – 1.5 mm may be sufficient for cast metal restorations. This 0.5 mm occlusal step will contribute to the retention of the restorations. This exrension provides additional retention form even though the groove is not faulty. Lingual surface groove preparation outline on a molar protects the facial cusps from infringement ; the facial surface groove exrension on lower molar teeth protects the lingual cusp from fracture.

Most tooth preparations resulting in uniform depths, particularly wall forms, and specific marginal outline are still required for amalgam, cast metal restorations and some types of materials.

CLASS 2

There are some variants of class 2 tooth preparation depending on presence or absence of access to a cavity and character of distribution of carious process. At easy approach to the lesions may be used conservative slot preparation without large tissue involvement. At placement of caries above the equator of a tooth, because of sufficient intact tissue preparation begin with occlusal surface and create a grooving form cavity. If carious process is distributed to all contact surface , preparation begin on the chewing surface where an additional platform is formed for providing good retention and for redistribution of chewing loading. The access to proximal lesion can be obtained from lingual direction due to the preservation of overhanging enamel margins. These points are formed along the fissure without infringement of integrity of cusp. Depth of additional preparation must be 1 – 2 mm is beneath of DEJ.

At defeat by caries of both contact surface of tooth is formed mesioocclusodistal cavity with the general additional platform . The tooth preparation has two components – the occlusal step portion similar to class tooth

preparation and the proximal box portion. The buccal and lingual walls of the occlusal portion and proximal boxes are prepared so that they converge slightly towards the occlusal to prevent the restoration from dislodging. If carious cavity is small only pathological tooth tissues must be removed and included in the outline form. If only one proximal surface is being restored, the opposite marginal ridge support should be maintained. For avoiding contact with the adjacent tooth the separation of closely located teeth with disc is useful because, relieve the entrance to the prepared area. The gingival floor is prepared flat with an approximately 90° - degree cavosurface margin. Gingival extension should be as minimal as possible, trying to maintain an enamel margin. Lingual and occlusal walls will be convergent occlusal, adding to retention form. No bevels are placed especially on the occlusal margins,because this could result in fracture or wear of the composite in these areas.

Thus, conventional Class 2 composite preparation of defect is similar to that for amalgam, except: no secondary retention points are incorporated; the extensions are less; there is no requirement for a 90° - degree margin. The modified design is indicated when only the proximal surface is faulty, with no lesions on the occlusal surface and because the composite wiil be retained in the preparation by micromechanical retention, no secondary preparation retention features are necessary. Additional resistance form involves both resistance of the remaining tooth structure against fracture from occlusal force and resistance of restorative material against fracture and displacement. The use of retention locks is recommended in tooth preparation with extensive proximal boxes and large carious lesions. The should be placed 0.2 mm inside the DEJ. Class 2 lesions can involve just one or both proximal surface ; but obtaining access into the proximal lesion requires breaking through the occlusal marginal ridge. Bevels are placed at the cavosurface for perfect adaption and for minimize the cavosurface gap between tooth and material.

CLASS 3

The board contact between the teeth, the height of the gingival tissue makes it difficult to prepare a typical Class 3 cavity and restore it adequately. At presence of easy access to carious lesion is formed triangular - form cavity. The basis of a

triangle should be inverted to gum , and top to cutting edge. At the dense contact between teeth preparation is begin with lingual surface.

At the spreading of carious process to all contact surfaces it is essential to form additional retention point on the oral surface. The perygingival wall of cavity is formed under right or sharp angle to the floor for the best fixation of the material. The axial wall should be follow contour of the external tooth surface. The internal angles should be more rounded. The boxlike preparation form provides primary retention form. Lingual dovetail additional retention; cutting should not extend beyond midlingual position, may be incisor and gingival extensions of dovetail. The traditional preparation may be more triangular in shape with three walls and floor (facial, lingual, and gingival, and axial floor). This procedure is made with the using of fissure or inverted – cone burs. Because of the typical need for esthetic restorations in frontal teeth this class is predominant sites for the use of composite restorations and no additional preparation retention form is usually necessary. Sometimes a groove or cove may be necessary for Class 3 restorations if that are very large or extent onto the root surface. The lingual approach is preferable, because the facial enamel is conserved for enhanced esthetics. If extensive caries extends onto the facial surface it is indications for a facial approach. The beveled conventional preparation is characterized by external walls that are perpendicular to the enamel surface, with the enamel margin beveled during a large carious lesion. If a retention groove is to be placed, the axial wall should be 0.5 mm into dentin ; if the preparation outline extends gingivally onto the root surface the depth of the axial wall should be 0.75 mm. Conventional Class 3 tooth preparations is primary indication for the restoration of root surface that has no enamel margin.

Modified Class 3 tooth preparation is indicated for small and moderate lesions. Prepare the level by creating a 45 degree angle to the external surface and to a width of 0.25 to 0.5 mm. For the amalgam adequate mechanical retention points still must be incorporated in to the preparation. The initial depth of the axial wall will be 0.2 mm inside the DEJ and 0.5 mm inside the DEJ; on the root surface should be 0.75mm to 1mm deep, providing room for a retention groove and adequate thickness of the amalgam. The enamel rods should be supported by sound dentin. The outline form should be extended around cusps and avoid

undermining the dentinal support of the marginal ridge enamel. Cavosurface margins of a class 2 and 3 preparation should be 90 degrees. Because of its metallic color's, amalgam is easily distinguished from the surrounding tooth structure and requires specific and uniform axial depths and incorporation of secondary retentive features.

CLASS 4

It is recommended to prepare the cavity from lingual surface. At pathological horizontal attrition of hard tissues when the cutting edge turns in cutting surface it is expedient for creation of additional platform on a cutting surface. The occlusal factors may dictate a more conventional tooth preparation form, with more resistance form features and secondary retention form features.

The use of a microfilled composite as a veneer over a hybrid composite core may be improved esthetic results. The conventional tooth preparation design has application in those areas that have margins located on root surface. The beveled conventional tooth preparation usually is indicated for large Class 4 restoration; the modified tooth preparation is indicated for smaller Clss 4 needs. The preparation walls may need to prepared in such a way as to resist occlusal forces. If a large amount of tooth structure is missing, groove retention form may be indicated – less conservative. Remove all weakened enamel and establish the initial axial wall depth at 0.5 mm into dentin – beveled conventional preparation. The beveled is prepared at a 45 – degree angle to the external tooth surface with a round diamond bur. The width of the bevels should be 0.25mm to 2 mm, depending on the amount of tooth structure missing. The gingival retention groove is prepared 0.2 mm inside the DEJ at the depth of 0.25 mm modified Class 4 tooth preparation is indicated for small or moderate lesions and usually no groove or cove retention form is indicated. The axial depth is initially no deeper than 0.25mm inside the DEJ. Depending on the degree of involvement this preparation may have only one flat wall or may be made up of two main surfaces: a gingival surface and a more axial surface. These two portions may join at an angle called the axiogingival line angle.

CLASS 5

Defect located entirely on the root of the tooth require the use of a conventional preparation design: a).initial tooth preparation with 90 – degree cavosurface margins and axial wall depth of 0.75 mm; b). remaining infected dentin excavated and incisor and gingival retention form prepared. These grooves are prepared 0.25 mm in depth into the external walls. Bevel increased retention due to the greater surface area of etched enamel; decreased micro leakage due to the enhanced bond between the composite and the tooth, decreased need for groove retention form and is indicated for the replacement of an existing, defective restoration and for a large carious lesion.

Modified claas 5 tooth preparation – is to restore the lesion or defect as conservatively as possible, are ideal for small enamel defects, extension of preparation into dentin initially no deeper than 0.2mm.

For amalgam it is essential retraction of the free gingival with retraction cord to provide access and to reduce the possibility of cutting instruments damaging the free gingival. Cervical amalgam restorations were overextended.

The preparation for a class 5 composite restoration is usually kept as conservative as possible, with an equally deep convex axial wall, the retention of amalgam restorations is obtained by preparing retentive grooves that are extensions of the axial wall in an occlusal and gingival direction.

A class 5 inlay must have walls slightly divergent towards the tooth surface to allow the wax model removal from the tooth model and there should be short bevels prepared of the cavosurface margins.

CLASS 6

The typical class 6 tooth preparation should be as small in diameter and as shallow in depth as possible. Sensitivity to hot and cold are a frequent complaint with class 6 lesions. The preparation walls need to diverge occlusally to ensure a 90 degree cavosuraface margin.

Conservative tooth preparation is particularly important with Class 6 preparations because it is easy to undermine enamel on incisor edges and cusp tips. Preparations are similar to procedures described for Class 1 praparations. The resultant preparation for a Claas 6 lesion conservatively follows Black’s principles

of cavity preparation. And the restoration of choice depends on size and location of the lesion and the need for strength and esthetic .

ENDODONTIC INSTRUMENTS

The success of endodonty treatment depends on thoroughly cleaning of root's canal and its best obturation. This is possible only by instrumentation treatment. There are different for base of systematization of endodontic instruments. The method of using, the length and size of transversal cutting, the shape of working part and instrument' apex, the method of using in action (handle, machine), composition of alloy.

Materials. When instruments are made of stainless' steel (corrosion-proof steel) it characterized as flexible; from carbon stainless - the bristling, from titan - elasticity. The instruments which are made of nickel-titan alloy have the most plasticity.

It's useful to deviate endodontic instruments into the groups in depending on their functions:

1. for preparation of tooth cavity
2. for extension of mouth of root' canal
3. for passing of root' canal .
4. for extension of root 'canal
5. for determining of size length of root's canal
6. for filling of root 'canal

The nomenclature follows the recommendations of the International Organization for Standardization (ISO):

1. *Hand-operated* include K- type reamers and files, broaches, Hedstrom- type files, and so on.

2. *Engine-driven* are hand types that have a latch that inserts into slow-speed hand-piece. These include rotary (Gates-Glidden and Peeso) engine-driven reamers and files and reciprocating files or reamers.

3. *Ultrasonic and sonic* are diverse in design.Some resemble files barbed broaches, some resemble files, and others are diamondcoated wires. All insert into a dedicated vibratory handpiece that energizes the instrument.

4. *Nickel titanium has been adapted both for hand instuments and rotary applications*. Several designs have developed. Both hand - and engine driven instruments have various configurations. The cross section of the instruments takes many shapes.

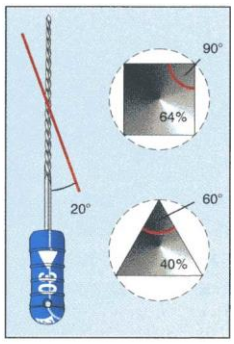
Physical Characteristics.

To debride a region of the canal space completely, the instrumenr must contact and plane all walls. Despite continual improvements in design and physical properties, there are still no instruments that totally clean and shape all root canal spaces. Irregular canal spaces do not correspond to and cannot always be well prepared by an instrument with a regular (round) shape. In addition, stainless steel instruments are relatively inflexible, which renders them not particularly adaptable to canal curvatures. Nickel –titanium instruments are more flexible and adapt more readily ti fine, curved canals but have no advantage over stainless steel files in irregular canal spaces. These congruencies between reality and ideal shape require judicious and skillful use of canal preparation instruments to maximize debridement and to avoid procedural errors.

The instruments for the extension of mouth of root canal

Gates- Glidden drill with short drop form fixing on the long thin handle. The length of working part with handle is 15-19 mm. There are 6 sizes (1-6) with section 050; 070; 090; 110; 130. This units is intend for the working with low -speed angle handpieces. This instrument is used for the extension the mouth of canal and passing of direct fragment, and for extracting of gutta-percha point out of the canal. The modification of this instruments is the flexo gates (Handy Gates). This instrument has safety apex for the treatment of apical part of root canal. This instrument is useful for the treatment of curved canals.

Largo (Peeso -Reamer) drill with prolonged working part which is crossing into the hardhandle. There are issued 6 sizes with section 070; 090;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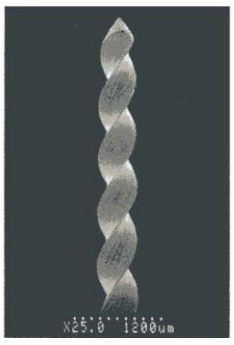

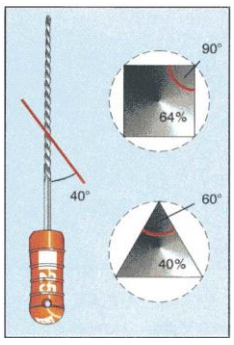
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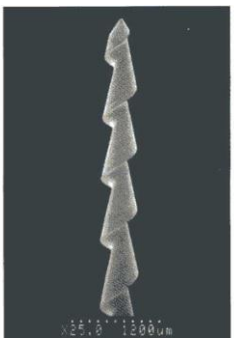

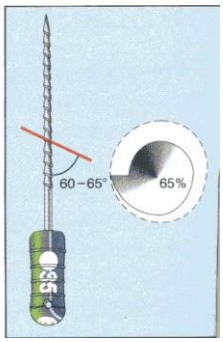
60–65°
65%


A
B
C
D


A
B
C
D


25mm
№
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45
50
55
60
70
80
90

0,22; 0,27; 0,32; 0,37. Its using except the breakdown of instrument and forming the places in canal.

K-Rimer Forside are used for the passing of very thin canals (molars) when there are the difficulty of mouth opening(Fig.1). The collection includes 18 instruments with diameters 006; 008; 010; 015; and length of working part 21; 25; 28; 31mm(Fig. 2).

The instruments for the extension of root' canal (files).

The files have more twisting than rimers and this complicate the evacuation of dentin's debris from canal. The files are turned toward and against the clock-hand, periodically files are extracted and cleaned from dentin's debris. There are K-files (Kerr), K-flexi file Golden medium. The cutting is made by the scratching during the extracting of files from canal, or penetration, rotation and retraction. According with standards there are 21 sizes with length of working part 21; 25; 28; 31 mm. Vulford (1996) thought that the fundamental instrument for working is K-files with sizes 08 -060. The size 020 is often used .

K-flexi file -the flexible canal' extensors used for the extension of thin and curved canals. In collection there are 6 sizes: 015; 020; 025; 030; 040 with length of working part 21, 25, 31 mm.

K-flexi file Golden medium - the flexible canal' extensor of intermediate size and are issued for the flexible crossing from one-size to next. The serial from 6 sizes are issued: 012; 017; 022; 027; 030; with the length of working part 21, 25, 31 mm. For the removing some problems with deformations and breakdown of K - files, it is recommended to use nickel - titan alloy ‘‘nitinol’’. These ones have high ftexibity cutting peculiarities and safety of working, besides that the apex instrument is modified. This instrument has no agute side. The name of this instrument provides the best passing of curved canals.

The analog of fIex-R-file is the flex – O – file .

Hedstrom file (H-file) this file cuts only in one direction by retraction. S-file is modification of H-file.

Canal Master U -are the newest type of instruments. These are characterized by:

1. Have blunt apex.

2. Have small sizes of cutting head (no more than 3mm).

3. Have high flexibility of handle.

The cutting edges have pronounced U - shape. The hand instruments are issued by series from 13 sizes : 020; 025; 030; 035; 040; 045;050; 055; 060; 070; 075; 080.

There are "half sizes 022,5; 033,2 et s either. These are issued the instruments for machine's treatment with size 050-100. It's supposed, that it is necessary to do uninterrupted rotating movements toward the clock -hand. It is important because the conical - form of the working part of the working part of instrument provides the creating of conical form of canal. And this provides optimal cleaning and creates the optimal condition for filling.

Profile Orifice Shapers - these instrument have blunt apex and conicity of 4-6%. There are 6 diameters (l-6). The length of cutting surface is 10 mm. This instrument is used for the treatment of crown' part of the root. The advantage is this instrument extends the crown part till first bend (winding) and creates the crossing in conical form into the more deeper parts of canal.

Profiles have 4 peculiarities, which differ them from other instruments:

1. They are made from nickel- titan alloy and this give them super high plasticity. This permits to treat canal with turner to 90°

2. Profiles have pronounced narrowing to hard apex of instrument. This permits to use instrument more effectively. The instrument with 2% of conical in complete contacts with wall (right) during the length, but instrument with 4% or 6% of cone contacts on the limited zone (left).

3. The third-peculiarities of profiles is the-U shape of transversal cutting without pronounced cutting side. This permits to remove the debris from root canal.

4. The 4-th peculiarities is the modified apex (blunt). This permits to the instrument to penetrate into the all curve' canals.

Greater Taper (GT) Rotary files

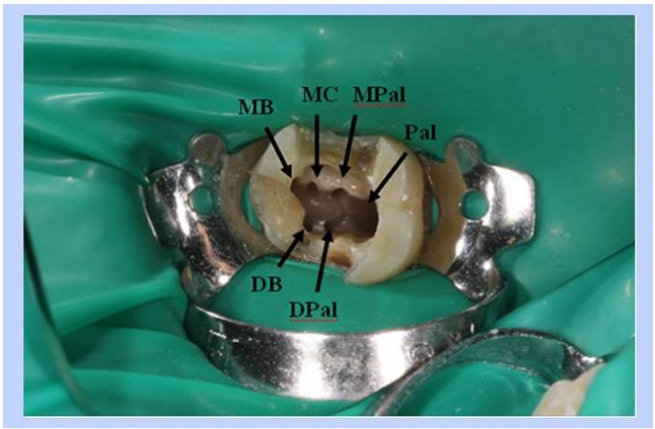
These instruments are maximum adapted for the preparation-of root' canal, by the method of Grown Down. Likewise as profiles, G T

are used for working during the rotary regime toward the clock-hand with speed 150-350 r/m with the using of appropriate handpiece.The collection of GT files consists of 4 group.

3 groups of instruments have similar conical of 10, 08, 06 and 0,4 but different diameter of apex. Diameter of apex 20 (yellow) is used for the narrow canals, 30 (blue) for middle canals, 40 -with black mark for the treatment of wide canals. Auxiliary files (3 files) have the conicaity of 12% and diameter of apex 35 50 and 70 and are intended for extension of crown part of canal.

The optimal speed is 300 r/m for the instruments 20, 30, 40. For the auxiliary files (12/35, 12/50 12/70) speed may be 500 rev/min. The preparation is began with maximum conical of 10% and then is decreased 08, 06, 04. If it is necessary, there is possible to repeat extension. Besides these machine there are nickel- titan hand GT files with conical of 12, 10, 06 % and diameter of apex 20. This instrument provides the high level of safety. The most size of apex of instrument (020 mm) guaranteed non aggressive preparation of apex' part without anatomy destroying. Each following instrument contacted with canal 'wall only at the limited part of its length, and this excepts the possibility of jamming and breaking of instruments.

Pro taper - the instrument with changing conical from apex to handle. The high flexibility and convex – triangular – transversal cutting provides for instrument the stability fixing conditions and more increases safety of the treatment. Collection consists of 6 instruments. Pro-tapers as profiles are intended for the working in rotary regime, but speed must be in the limit of 250-350 rev/min. There is forbidden to use high pressure tooth. Instrument is bring in and bring out in rotary condition, but flexible up and down movements during 3-5 s provides the treatment of canal. The working time with 1 instrument is 10-15 s provides the treatment of canal. The treatment of root' canal is finished during 3-4 min. There are wide assortment of endodontic handpices for using of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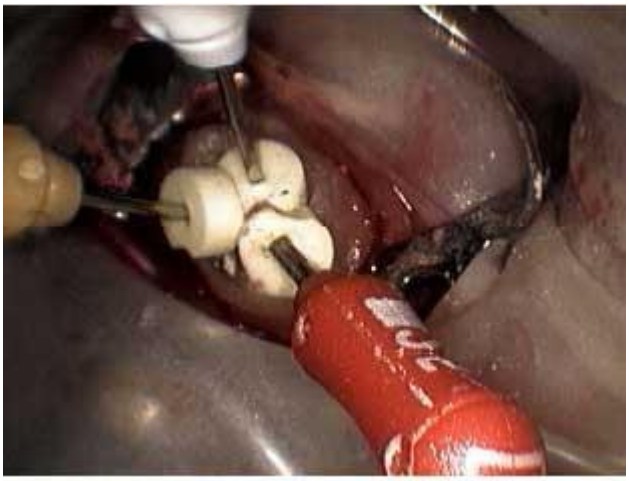

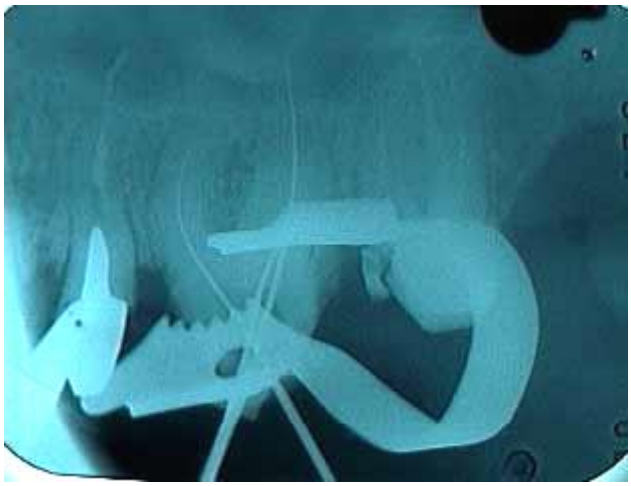

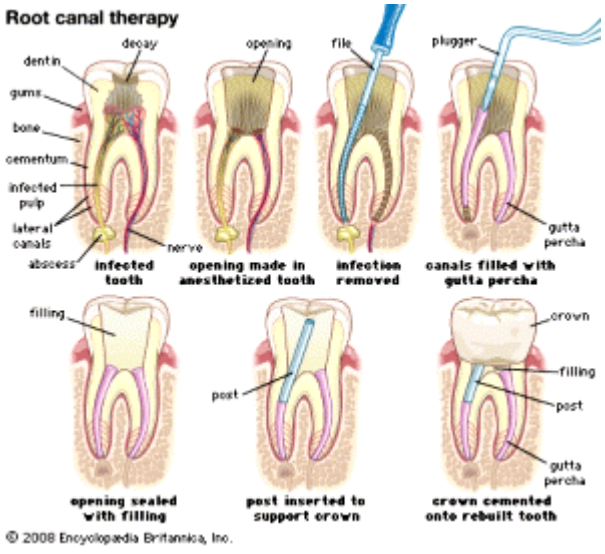
Root canal therapy
dentin
decay
gums
bone
cementum
infected pulp
lateral canals
abscess
nerve
infected tooth
opening
opening made in anesthetized tooth
file
infection removed
plugger
gutta percha
canals filled with gutta percha
filling
opening sealed with filling
post
post inserted to support crown
crown
filling
post
gutta percha
crown cemented onto rebuilt tooth
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In this reason it is recommended to use the special burs with smooth apex 'part which will excepts the possibility of bottom' perforation. The direction of bur must be identical with axis of tooth.

4.The mouth of canals have to be on the border between both bottom and cavity' wall. In this case the instrument slips on cavity' walls , goes into root canal . As far as access to the tooth' cavity are created it is necessary to make Radiograph-picture which will gives the information about tooth disposition in the jaw, its incline concerning the root, incline of tooth, amount of canals, theirs permeability, destruction changes of periodont. After that the forming of access to the tooth' cavity is made. This, process is divided into 2 stages:

On the first stage the preparation is done by the high speed handpiece. Except the changed tooth tissue are removed, the roof of tooth cavity is removed too. It is important to determine the direction of tooth axis and correct direction of bur. After the opening of tooth cavity and partially removing of roof this stage is finished. It is recommended to do the second stage by using of low-speed regime with burs which have lengthening tail part

The removing of beetling parts are doing by the fissure and round burs with_movements from tooth cavity toward outside. Due to remember that the opening of tooth cavity' lancing is regarded as right only in that cases if access of canals is easy. If the beetling parts are remained the non-permeability root canals will be created. This doesn't permit to make the complete mechanical (instrumental) and medical treatment. The most "non-permeability" are the mesio -buccal canal in lower molars because the mouth of this canal has changed its position toward the buccal direction. In all cases there are remain beetling parts which prevent its exposure. The second place of "non-permeability" teeth is occupied by mesio- buccalcanal in upper molars. In these teeth the difficulty of permeability is created by its direction but not by beetling parts. The instrument must take the posterior -buccal direction , which permits to open the mouth of canal and enters into the root canal. The mouth of canal is located near (2-3 mm) the mesio-distal. Side by side in the upper molars in 50% cases there is present 4 canal located in

anterior-buccal root. This possibility require; requires that searching will be done. The acute angle probe is used for this reason. If the searching of mouths of canals is so difficulty the cavity of tooth is treated with EDTA, or other drugs, containing acid.

The passing of root canal.

After providing of access to the tooth cavity in many-root teeth and exposure of canal mouth, on its place the funnel-shape extension is created by the using of Gates -Glidden or Orifile Shapers. This will permits easier passing into the root canal. After that the removing of root canal' contents will be done. In the teeth which have the health pulp and well- permeability canal, the pulp is removed by barbed broaches, or often with files during the process of root: canal' extension. In the case when tooth has the dead pulp, the necrosis tissue is removed by files during the process of root canal extension and its rinsing. Then the passing of root canal is done by using of rimers. The size of rimer is chosen individually and depends on many criterions. Using of the instrument with appropriate diameter allows the working length of tooth is set up. The working length of tooth allows to determine the finally level of filling. Its border is located on a level of physiological narrowing or 1.5-2 mm non reaching to the anatomical apex. The filling of root canal must be done only till physiological narrowing. Some of authors decide that the opening of apex is equally as perforation, The line from physiological narrowing which doesn't reach to the apex on 1.5-2mm till the mouth of canal is called the working length of root. There are 3 methods of determining of the working length of tooth:

l. There are the standard table of meanings of lengths of roots for different teeth;

2. Radiograph-method with using of inserted endo-instrument into the root canal which has the rubber limitation;

3. Electrometric method by using of special apparatus-; apex-determinant. For example-“Foramatron D-10”, “Root ZX” , produced by "Morita Corp", "Justy II" produced by firm "Hayer Werken” and others. The principle of these apparatus is based on the measure of difference both mucous resistance and tooth tissue_resistance. On the strength of the


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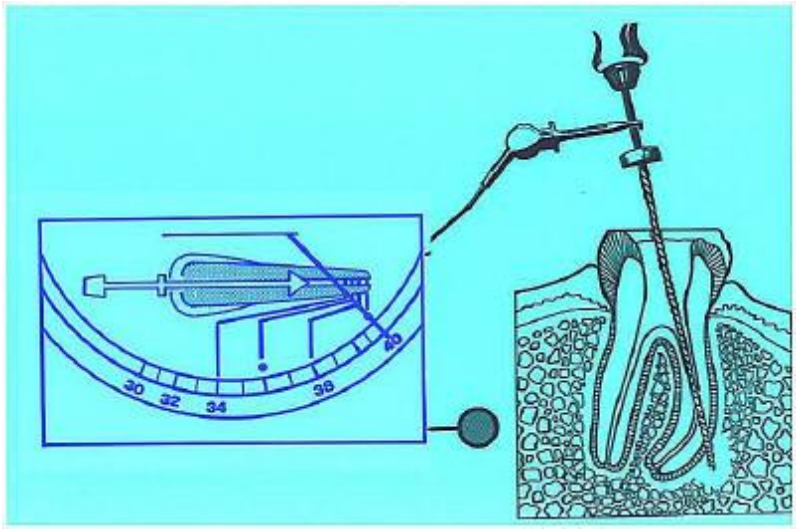
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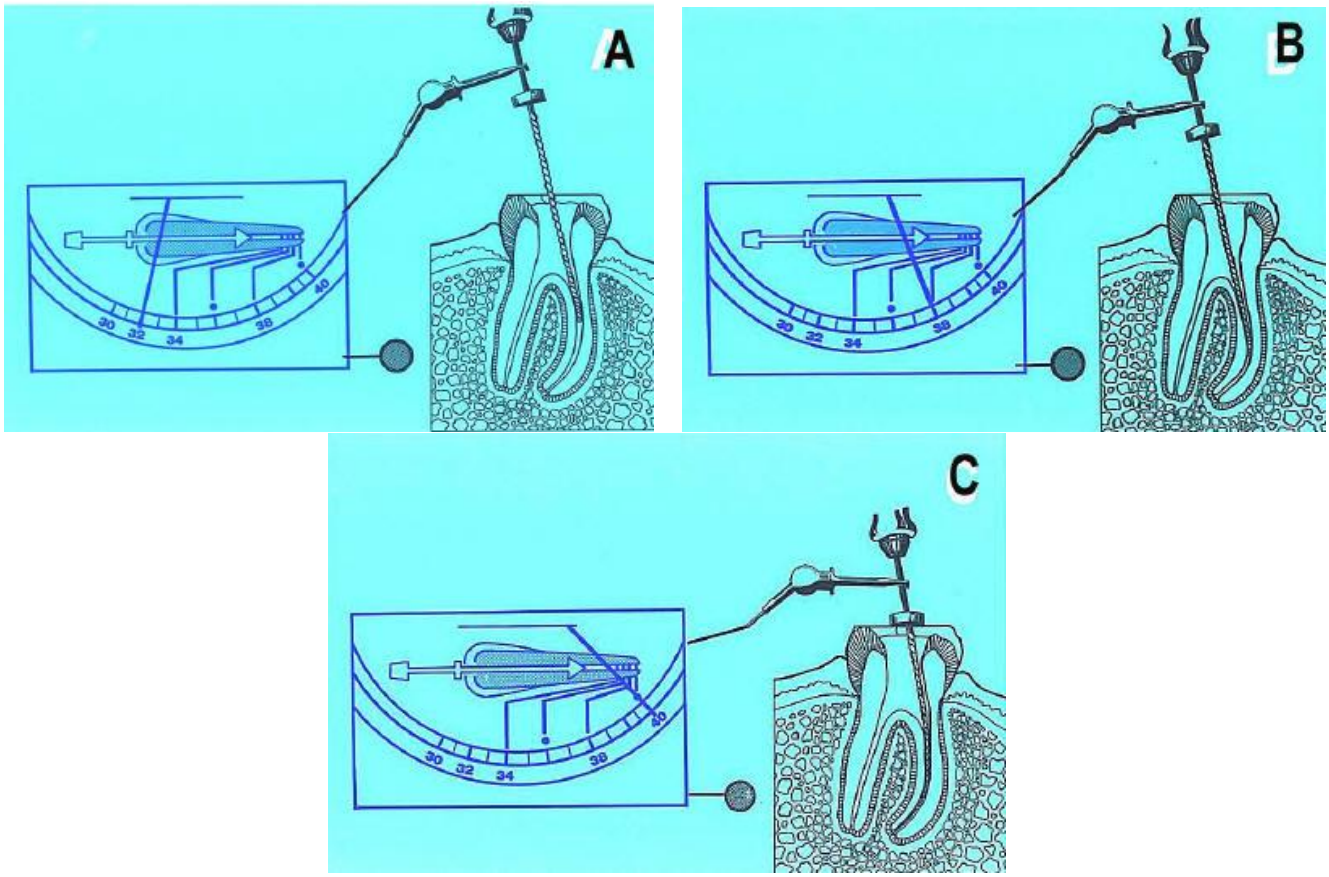
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The extension of root canal

As rule : the roots have some curvatures especially in apex part. Shapes and diameters are variable either. There is possibility of most changing of root canal by age. At the present time there are ranges of methods of root canal' treatment. But the aims and targets of biomechanical treatment always remain constantly:

1. to remove pulp tissue and its necrosis
2. to remove infection dentin
3. desinfection of canal
4. to form the root canal for filling

The root canal after preparation must appropriates to the follow requirings:

1. to keep its direction
2. to has cone form
3. to be ended by apical narrowing
4. doesn't have protuberance unevenness on the walls

The treatment of wide and direct canals is very easy but treatment of narrow and curved canals are joined with most difficulties.

The standardized technics

This method was used during many years. In according with this method the files of successive increasing size are introduced into the canal during the whole working length. The canal was extension till the white sawdust was appeared on the apex of instrument. The treatment with taking down of a strip was continued by the files of 2-3 sizes for the finishing of treatment. This method is satisfied only in straight canals because it permits to remove infectious dentin and to create cone with incline of walls -2°, which is in according with standard cone of endodontic instrument.

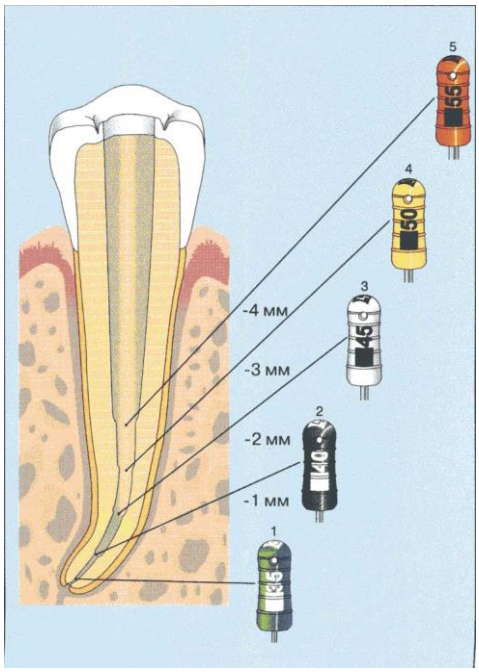
But in curved canals the using of big -size files which are not flexible is finished by creation of ledge on the place of bend or

perforation. That is why in similar cases this method is unacceptable.

STEP-BACK METHOD (from the little to big).

This method was proposed by Mandel , 1993 for the treatment of curved canals(Fig.1). The extension is begun with K-file likewise K-rimer ' size. At the beginning the rubber restriction is fixed through all length of tooth, for example - 20 mm, but the thickness of using rimer was 015. Then the files of following size - 020 is taken and canal is treated through the similar length -20mm. After that it is returned to the initial thickness of file 015. After rinsing of canal with solution EDTA it is treated by the file 025 through the initial length -20mm. After the file and debris are removed it is returned to the instrument 020. This excepts the blockage of apical hole from dentin debris. The treatment of canal is finished by the file 025 through whole working length -20mm. After that the method is some changed. The file 030 is dressed with rubber limitation through the length 18mm and the canal is treated with the primary introducing into the canal of solution EDTA and then rinsing. Then, returning to the size 025 canal is treated through the depth 20mm. Then with follow file 035 with rubber limitation for 16mm canal is treated and again with file 025 it is passed for depth 20mm. In the further canal is treated with file 040.and returned to the size 025. Thus the canal is treated until to receive required size of instrument, usually 040-050 preserving the size of apex part of canal - 025. There is possible to use other hipochlorite Na or 3% solution of hydrogen peroxide. This method has following advantages:

1. It is provided the best entrance to the apical part of root canal.

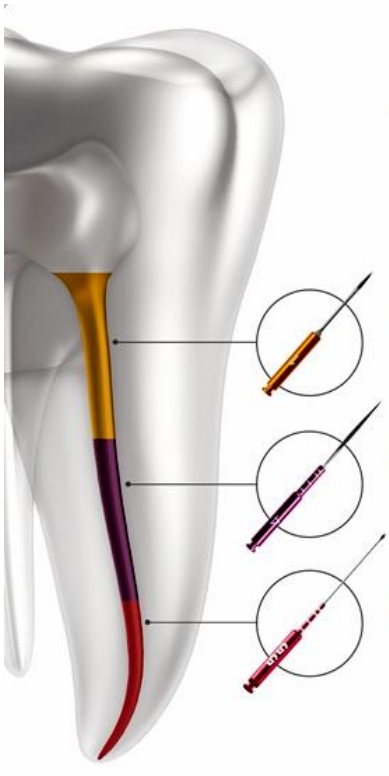

5
55
4
50
3
45
2
K10
1
35
-4 мм
-3 мм
-2 мм
-1 мм

the canal to prevent debris or ledging but it is usually straightforward to get the file to length. The only place you need to be very careful is near the desired working length where the file can tug through the apex and blow out your apical constriction. I find working very slowly with a firm grip on the handpiece (on 300rpm) helps stop this happening.

You then work up the file sizes to your desired MAF with each file going to working length in turn. This could be F1 for protaper or 25(6%) for M2 K3 or the designated size for bio race. It‘s up to you where you finish but I like to typically end on 30 (6%) as I’ve said earlier. Between each file you should irrigate the canal and regain patency with the size 10 file to make sure there is no debris build up

One bit of advice I once got was that if the apical canal is not infected (i.e. the pulp had irreversible pulpitis which is likely to not have infected the apical region) you can prepare to a narrower MAF because it is less critical to get the irrigant to the apex than if you have an apical periodontits and clear infection in the apex area. Remember a smaller MAF means you have removed less tooth tissue and there is less chance of a fracture later on in the tooth’s life.

Crown down (large to small): is just another way to do the same thing. The basic idea is that after you have created your glide path you introduce a large MAF tapered file. You stop when you reach resistance then continue with a smaller file in sequence until you reach the working length. So for instance with protaper you may start with a size 40 (6%) insert it until you feel resistance then back out. Clean and irrigate the canal and recapitulate working length with a size 10 file. Then you use a 35 (6%) file and go as far as you can with that. You continue this sequence until you are at the working length desired and then work up the files to get the MAF you want to working length.



Treat endodontic cases with confidence using the new crown-down LightSpeed® instrumentation system.

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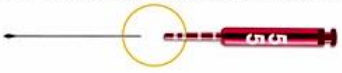
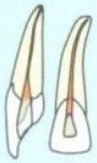


UPPER JAW

ISO 50 or 60

ISO 50
ISO 35- 40
(if curved)



ISO 50 or 60

B: ISO 35 or 40
P: ISO 40

1 canal:
ISO 50 or 60

B: ISO 35 or 40
P: ISO 40

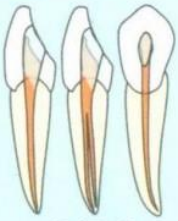
1 canal:
ISO 50 or 60

MBs: ISO 35 or 40
DB: ISO 35 or 40
P: ISO 50 or 60

MBs: ISO 35 or 40
DB: ISO 35 or 40
P: ISO 50 or 60

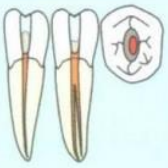
B: ISO 40
L: ISO 40

1 canal:
ISO 50



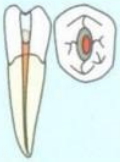
B: ISO 40
L: ISO 40

1 canal:
ISO 50



B: ISO 40
P: ISO 40

1 canal:
ISO 50 or 60

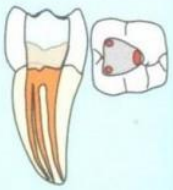


B: ISO 40
P: ISO 40

1 canal:
ISO 50 or 60

MB: ISO 35 or 40
ML: ISO 35 or 40

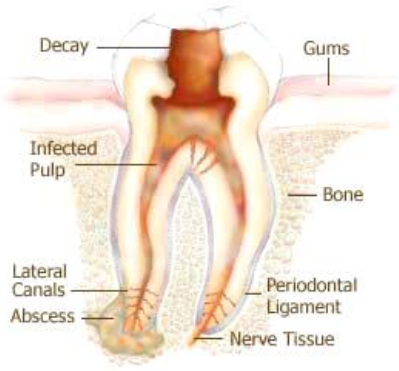
D: ISO 50 or 60
2 Ds: ISO 40 or 50



MB: ISO 35 or 40
ML: ISO 35 or 40

D: ISO 50 or 60
2 Ds: ISO 40 or 50

LOWER JAW


Decay
Gums
Infected
Pulp
Bone
Lateral
Canals
Abscess
Periodontal
Ligament
Nerve Tissue

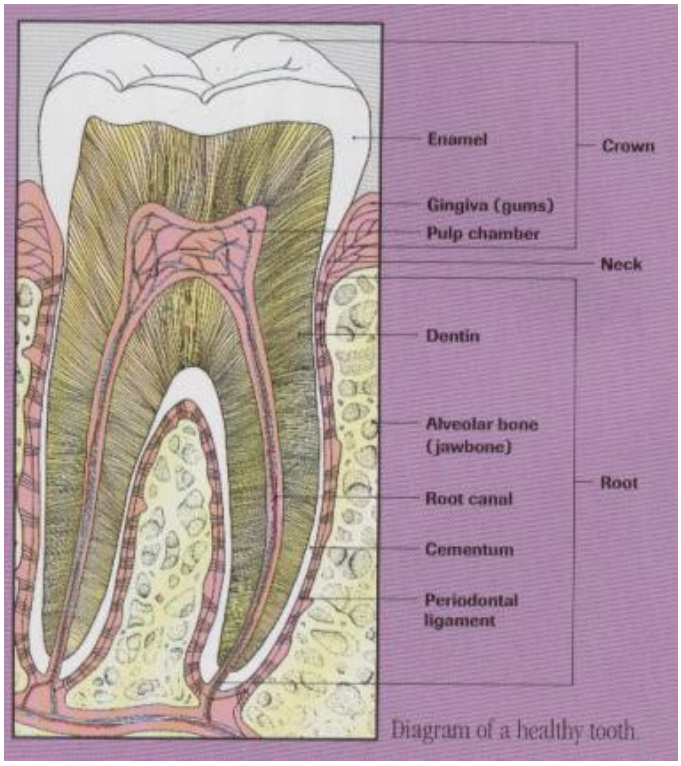
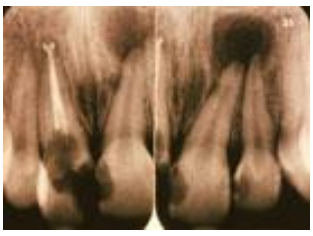


Diagram of a healthy tooth.



THE ACUTE DIFFUSE PULPITIS

Pulpitis acute topical quickly passes (after 1-2 day) into the acute diffuse.

Inflammation includes all of the crown and root pulp and spread to all pulp. This stage is lasted till 14 days.

The first 1-2 days the patient complains of long spontaneously pain all of types of irritants but frequently of cold and the painless period is quite long. The pain doesn'tpass after the removing of irritants The pain is occurred on most of cases at night spontaneously any irritants. Then gradually crossing to the pus inflammation the painful periods become longed and the ''light'' painless periods becomes shorted. The pain is lasted a few hours. The painless period lasts few minutes. The pain is spread and patient can not exactly indicate the painful damage tooth. The irradiations of pain is presence and increased. In this period the hot irritants stimulates and promotes the pain but the cold irritant calms this one because of vessel-narrowing effect.

During examination the follow conditions are observed:

- the deepen caries cavity;
- the bottom and walls of cavity are durable
- the probing is painful in the whole bottom in the serous period, but the probing is painless the pus period;
- the chamber is locked;
- the reaction of cold is sharp only first 1-2 days (serous period) and very sharp in the pus period and after removing the irritant never pass immediately. Sometimes during the drop of pus might be secreted;
- the percussion is painful;
- EOD in the projection of the all inflammation horns is 30-35 mcA.

Acute local pulpitis should be differentiated from:

- acute pulpitis localis;
- exacerbation of chronic pulpitis;
- acute apical periodontitis;
- exacerbation of chronic periodontitis;
- alveolitis;

- antritis (highmoritis);
- difficult eruption of wisdom teeth

CHRONIC FIBROUS PULPITIS

Chronic fibrous pulpitis is the most frequently met form of pulpitis being outcome of acute plpitis. Sometimes chronic fibrous pulpitis might be occurred without preliminary acute stage of inflammation by persons which organism' resisting is weak.

The patient complains of temperature and chemical irritants. The pain don't pass after removing irritants. The pain may be occurred of harsh temperature changing. Frequently the patient doesn't complain of any pain and the chronic fibrous pulpitis is revealed only by during examination. This fact is explained by presenting of good communication (communication with tooth' chamber) and by inaccessible localization of some carious cavities for irritants (for example sub-gingival).

From anamnesis past pain is revealed.

The spontaneously occurred pain in the presence of chronic fibrous pulpitis are absence and occurred only by intensifying of chronic fibrous pulpitis.

By examination the doctor detects the deepen carious cavity. The chamber is opened only in one point the probing of which is sharp – painful. In case of filling the painful communication between pulp chamber and carious cavity is revealed only after removing of filling. It has been prescribed that the opening point is located by vestibular horn of pulp (63,5%) rarely near of orally (24,09%) or between them.

The probing is painful and cause bleeding (in case of pulp chamber is unlocked).

Radiograph examination in 30% of cases reveals widening of periodontal fissure.

EOD in some cases may be normal but frequently is 35-40 mcA.

Chronic fibrous pulpitis should be differentiated from:

- deep caries ;
- acute local pulpitis;
- chronic gangrenous pulpitis.

CHRONIC GANGRENOUS PULPITIS

According to Barovski chronic gangrenous pulpitis may accompany as with unlocked as with locked pulp chamber. In last variant spontaneous pain may be present but this symptom is not constant.

The patient complains of ache pain caused by different irritants (mainly from hot irritant) not stopping after the removal. The pain sometimes occurs from temperature change.The patient complains of halitosis indicates to sharp pain occurred in the past which then had decreased or completely disappeared.

By examination deep caries cavity with widely opened tooth cavity is revealed.

Enamel sometimes has gray hue.

By examination the absence of reaction on probing is frequently revealed what indicates to necrosis of crown pulp but deep probing causes the pain.

Electric sensitivity of pulp is greately decreased (40-80 mcA).

In presence of locked tooth cavity hot irritant causes ache pain. Percussion sometimes is weak positive. By long existing inflammation widening of periodontal fissure sometimes with rarefication of bone is observed.

Chronic gangrenous pulpitis should be differentiated from:

- chronic fibrous pulpitis;
- chronic apical periodontitis.

CHRONIC HYPERTROPHIC PULPITIS

The chronic hypertrophic pulpitis has 2 clinic forms:

- granulation form (the growing of granulation tissue out of pulp chamber into the carious cavity);
- polypus form – the latest stage if this disease when the growing tissue of pulp is covered by oral epithelium.

The patient complains of bleeding out of the tooth and pain occurring by hitting of hard food into the cavity. Sometimes the patient complains of esthetic appearance of tiith ‘‘somewhatout of the tooth is swells up’’.

By examination the carious cavity filled with growing tissue is revealed. In presence of granulation tissue the color of tissue is scarlet, the bleeding is observed by easily probing, the moderate painful.

The polypus has pale – pink, by probing the bleeding is absence, the weak painful is presence, the consistent of pulp is dense. There are abundant sediments on this side because the patient has mercy on painful.

The reaction of temperature irritants is weak. The changing of periapical tissue as a rule is absence.

The chronic hypertrophic pulpitis frequently is occurred by children and juvenile.

Chronic gangrenous pulpitis should be differentiated from:

- papillitis;
- overgrowth of granulation tissue out of furcation (perforation of hole).

EXACERBATION OF CHRONIC PULPITIS

For exacerbation of chronic pulpitis attack like spontaneous pain is character. Sharp longtime pain caused by outer irritants with irradiation along the branches of nervus trigeminus or ache longtime pain in force by biting may occurs.

Dental history reveals past pain and signs of one of the chronic pulpitis.

Tooth cavity is frequently open. Probing of pulp is painful. Percussion is easily painful.

On radiograph or widening of periodontal fissure or rarefication of bone tissue in apex area is determined.

Exacerbation of chronic pulpitis should be differentiated from:

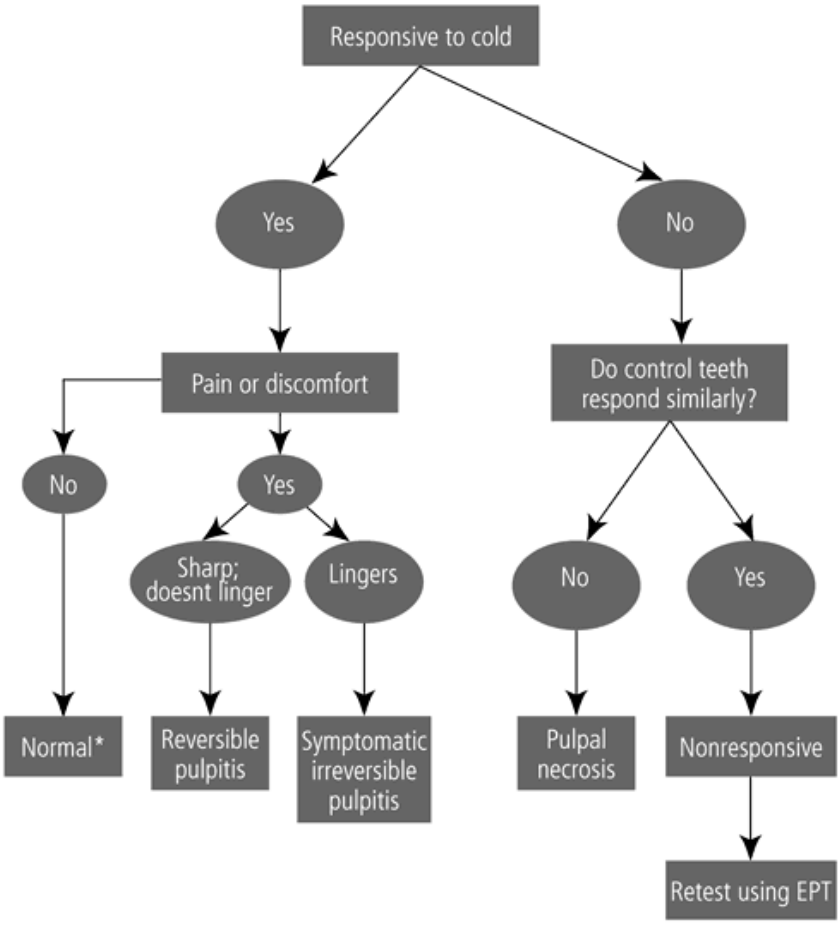
- acute pulpitis;
- acute and exacerbation of chronic apical periodontitis.

The distinguishing feature between reversible and irreversible pulpitis is the duration of the pain or discomfort. The condition of the tooth is a factor when determining excessive lingering. For example, discomfort that lingers

Pulp polyp

Pulpal acces a necrotic pulp chamber

CHAT 1

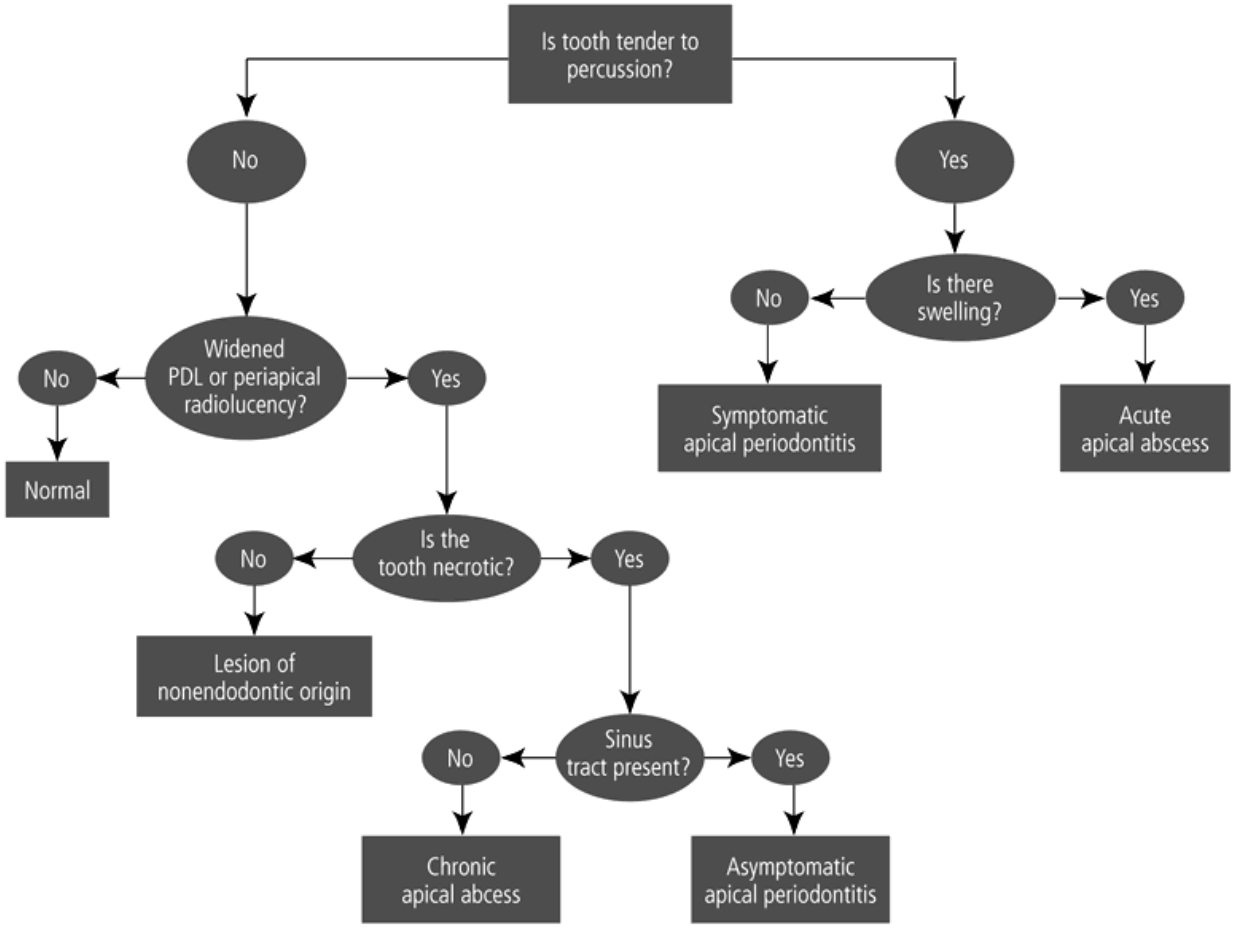


* Consider asymptomatic irreversible pulpitis if response is normal but inflammation produced by caries (excavation, trauma, and so forth) is present

Table 2. Characteristics of periapical diagnosis.

Periradicular diagnosis	Tenderness to percussion	Radiographic appearance
Normal	None	Periodontal ligament and lamina dura are uniform in width without any breaks
Symptomatic apical periodontitis	Discomfort or pain	Any
Asymptomatic apical periodontitis	None	Periapical lesion **must** be present
Chronic apical abscess	Little or no discomfort	Periapical lesion is typically present
Acute apical abscess*	Severe	Typically no radiographic changes

* Swelling must be present



A periapical diagnosis flowchart

ETIOLOGY OF APICAL PERIODONTITIS

By origin there are infectious, traumatic and medicine periodontitis.

Infectious periodontitis.

The microbes especially the streptococcus (non-hemolytic – 62%, hemolytic – 12%, greenish streptococcus – 26%) play an fundamental role in the development of infectious process. The toxins of microbes and necrotic pulp' penetrate into the periodont through the root canal and marginal pocket. But rarely, hemotogenic and lymph ways might be presence(fly, typhus, and etc.).

Thus, by the ways of penetrating the periodontitis might be divided into the intra – and extra dental.

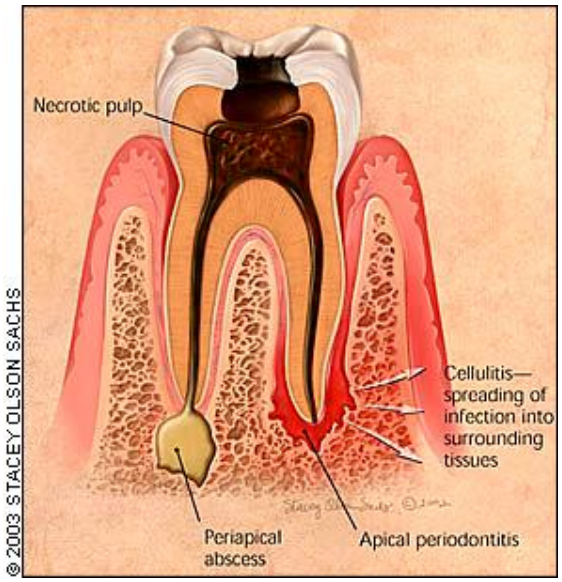
Traumatic apical periodontitis.

Occurs as a result of single acute trauma (injury, stroke) or repeated chronic micro – trauma (incorrect filling, anomaly if dentition, harmful habits).

By the acute trauma the apical periodontit develops very quickly accompanied with acute symptoms and haemorrhages. By chronic trauma the changing of periodont increases gradually: at the beginning the periodont it as adapted to the overloading but then the mechanisms of adaptation decreases and constant trauma causes the chronic inflammation process of periodont.

Medicine apical periodontitis.

This form is developed as a result of incorrect treatment of pulpitis when the powerful medicines or chemical or some drugs forms as arsenic acid, formaline, phenol, tricresol and other penetrate into the periodont and cause the periodontitis. The penetrating of these ones occur through root canal . Periodontitis might be occurred as a result of overfilling if root canals and leading out of filling materials through apex (cement – phosphate, points, resorsin – formalin paste). Some medicines as antibiotics or eugenol can cause the allergic reaction and as a result the periodontitis occurred.



CLASSIFICATION OF PERIODONTITIS

By clinical view may be acute form and chronic periodontitis.

a).Acute periodontitis

Acute serous

Acute purulent

b).Chronic periodontitis

Chronic fibrous periodontitis

Chronic granulate

Chronic granulomatous

c).Chronic apical periodontitis in acute condition.

ACUTE APICAL PERIODONTITIS

This form is characterized by acute and progressive inflammation of periodont with increasing of symptoms. The sharp localized constant pain is presence. The intensity of pain depend on redness, oedema (swelling) and character of exudates. At the beginning the non-sharp ache pain is presence. The pain is localized and appropriate to area of damaged tooth. Later the pame becomes more intensity, tearing, pulsate, some times irradiate along nerve trigmenus. Duration of acute apical process is lasted from 2-3 days till 2 weeks. The beginning forms of inflammation are very various than intensity later forms and require different treatment methods. Groshikov for best understanding of clinic of acute periodontitis divided this disease into 2 stages:

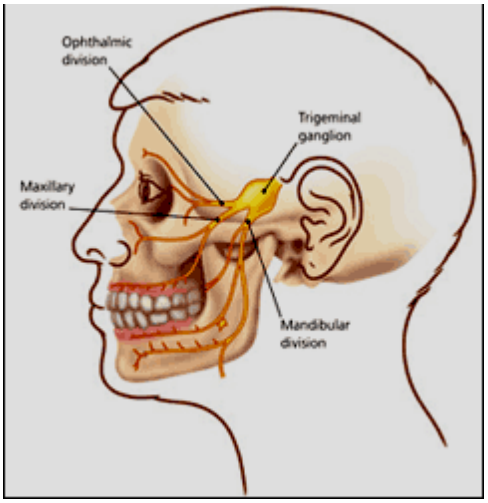
First stage – Intoxication.

The intoxication stage is observed in the beginning of inflammation, frequently after incorrect treatment of pulpitis. The character symptoms are the presence of long with out rest ache pains. Sometimes the tenderness of ooth br biting is joined to these symptoms. The gums in the projection of apex is normal, but percussion in vertical direction is painful. Regional lymph nodes might be easily increased and weak-painful.

Second stage - Exudate

This is the stage of intensity exudates process characterized by constant pain. Pain is hold on one level or may increase. The biting is very painful. Beside that even easily touching to damaged tooth is very painful. The percussion is sharp painful in vertical direction in the beginning of this stages but then in any direction .

The accumulation of exudates in apical area of periodont causes the feeling of tooth' lengthening and mobility. Mobility is caused by disturbances of function of periodont. The gum in the area of damaged tooth frequently is redness and swelling, the palpation of transversal pleat


Ophthalmic division
Trigeminal ganglion
Maxillary division
Mandibular division

The fibrous apical periodontitis can be caused as a result of acute apical periodontitis and as a result of treatment other form of chronic periodontitis (granulamatous and granulate). The fibrous chronic periodontitis can be exodus of early treated pulpitis and can be occurred by overloading of tooth by loosing of teethand traumatic articulation.

The diagnosis is put on the base of radiograph information where the deformation of periodontal glottis as an extension in the apical area is observed. The destruction of alveoli walls and cementum is absence.

The chronic granulate periodontitis.

This form usually is occurred as a result of acute periodotitis or is one of stage of development of chronic inflammation.

The granulate periodontitis is revealed as a uncomfortable feelings, sometimes weak pains(heavy feeling,bursting,awkwardness),the weak tenderness by biting might be presence. Sometimes the chronic granulate periodontitis elapses without symptoms.

Out of anamnesis it frequently is revealed that these pain feelings are periodically repeated and are accompanied with appearing of fistula which after some time is disappeared. Occasionally the patient notices the exuding of pus out of fistula.

By examination of mouth the redness of gum neart reasoning tooth is observed. By pressing to this area with dull ending of instrument the deepening is occur. This deepening doesn’t disappears immediately after removing of instrument (vasopares symptom). The palpation of gum causes uncomfortable feelings or pain.

The percussion of untreated tooth with granulate periodontitis as a rule causes increased tenderness or pain. Frequently the increasing and pain of regional lymph nodes (submental and subjaw) is observed.

The rarefying of bone in the apical area with non-clear contours limiting the granulation tissue from bone.

The granulate periodontitis frequently occurs than other forms and is accompanied with intensifying of inflammation process but by the presenting of fistula the condition of this form is favorable, without intensifying because of glottis’ drainage-tube.

The chronic granulomatous periotontitis or granuloma.

This form of periodontitis in most of cases clinically isn't revealed, except of intensifying periods. In some cases this form can gives the symptoms of granulate periodontitis with presenting of fistula, redness or swelling of gum. But frequently the clinic symptoms are absence. The diagnosis is put on the radiograph information. Radiographically the small oval or roundish rarefying hearth with size 0,5 cm is revealed. In some cases the presenting of periodically intensifying of process gives the adding helping for the putting of diagnosis.

Frequently the granuloma are localized on the upper jaw (63%), rarely on the lower jaw (37%). The most of granuloma are localized by molars (54%), then premolars (38%).

Chronic apical periodontitis in acute condition.

This form of periodontitis has many similar symptoms of acute periodontitis. Freguently it is more difficulty to separate first process from intensifying . Anamnesis is very important. Radiographic changing of bone by previously chronic process and acute condition as greasing of picture are observed.

Such symptoms as constant pain, collateral oedema of soft tissues, reaction of lymph nodes, mobility of tooth and painful palpation along the transitional pleat in the area of damage tooth a similar by chronic periodontitis on acute conditions. There maybe temperature rise, fever, weakness, leukocytosis and increasing of the speed of sedimentation of erythrocytosis. But presents of destructive alteration in the periodontium sometimes presents of fistula prevent the development of heavy inflammation of surrounding tissue.

The intensification of chronic form of periodontitis 37% lead to pery jaw abscess and phlegmon.

By x-ray picture on this stage the inflammation previous before the intensification is determined. The clearness of the border of bone resorption by intensification of chronic fibrous and granulamatous periodontitis is reduced.

CONTENTS

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