Crown and bridge Prosthodontics

Lecture: 9 , 10 **Dr.Adel F. Ibraheem**

Abutment tooth:

Tooth that give support to the bridge or part of the bridge, and to which the retainer is connected(cemented).

Requirements;

1) *Abutment must withstand the forces normally directed to the missing teeth; whenever possible the abutment should be vital tooth.*
2) *A tooth that has been endodontically treated & symptomatic with radiographic evidence of good seal & complete obturation of the canal can serve as abutment (Post & core for retention & strength).*
3) *The supporting tissue surrounding the abutment teeth must be healthy & free of inflammation, sever uncorrectable, periodontal disease is contraindicated For F.P.D*

Abutment evaluation (selection):

1. Health of abutment (caries or pulpal):

- *A sound abutment tooth permits ideal type of preparation. Caries tooth may be used as abutment provide that caries is removed the pulp protected (linning) and the tooth is restored to its original form by suitable filling material.*
- *If the caries far away from margin and small and the retainer design will extend beyond the caries area, cement or resin can't be used in state of metal.*
- *Extensive caries need extraordinary filling technique and preparation to conserve and support remaining tooth structure.*
- *Pulpless teeth can be used only after endodontic treatment.*

2. Axial relationship:

a) *Rotation, tilting, over lapping, mal-position might lead to decision of precluding of such a tooth to be used as abutment (because rotation or torque can damage supporting structure or cause retainer to become loose).*
b) *Also it may indicate the use of specific retainer (over reduction lead to weaken the tooth & endanger pulp health).*
c) *Rotation lead to either increase or decrease of space available for pontic (size of pontic planned).*

3. Size of the crown:

- ✓ *It determines the type of retainer to be used. For example: short, thin, conical, tapered teeth are poor indication for partial veneer crown.*
- ✓ *The height of the clinical crown is closely related to retention*.

4. Condition of supporting tissue;

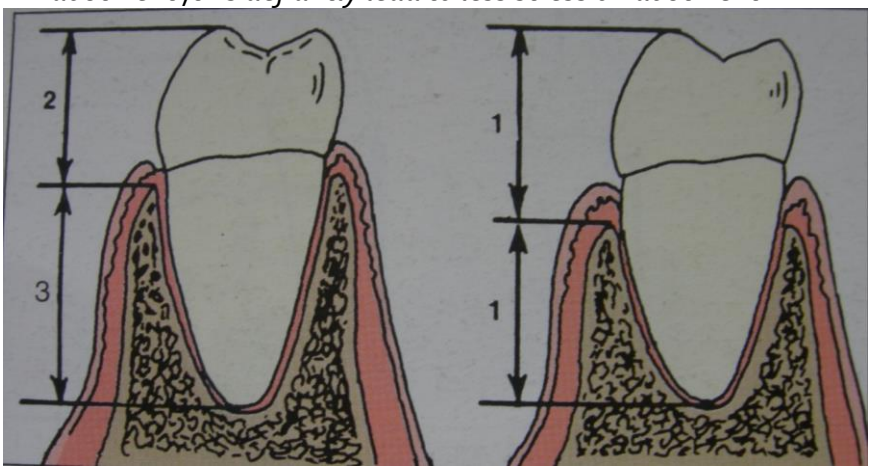
The roots & supporting tissue should be evaluated for the following:

A. *CROWN - ROOT RATIO*
B. *ROOT CONFIGURATION*
C. *PERIODONTAL AREA*

A. **Crown –root ratio:**

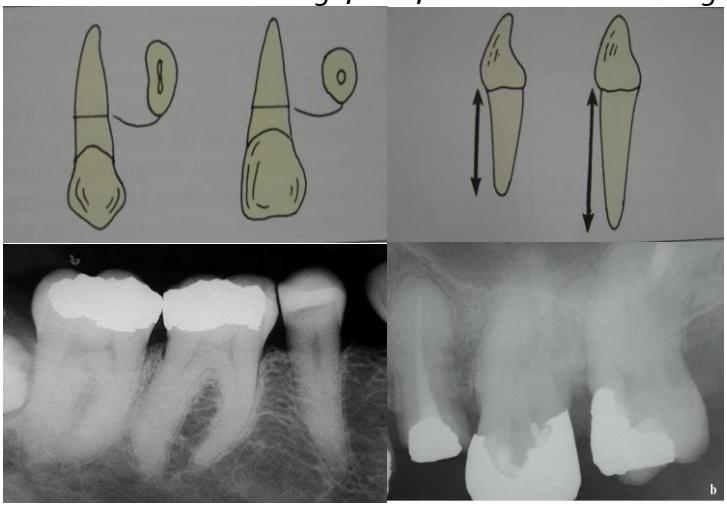
It is a linear measurement of the length of the crown (tooth) occlusal to the crest of alveolar bone.

- *2/3 crown/root ratio is the optimum for a tooth to be used as abutment for F.P.D.*
- *Minimum acceptable ratio is 1:1 crown/root ratio*
- *Greater than 1:1 might considered adequate in some cases such as periodontally involved mobile teeth (opposing) or if the opposing occlusion is composed of artificial teeth, which reduce occlusal forces that acting on abutment ,this defiantly lead to less stress on abutment .*



B. Root configuration; (*Root shape , angulation& length***)**

- ✓ Roots that are broad labio-lingually than they are mesio-distally are preferable roots that have round or circular in cross section.
- ✓ Tooth with conical root can be used as abutment for short span bridge. A single rooted tooth with irregular configuration or with some curvature in the apical third of the root is preferable to the tooth that have perfect taper.
- ✓ Multirooted teeth generally provide greater stability than single-rooted teeth .
- ✓ A multi rooted posterior teeth with widely separated (diveragent) roots will offer better periodontal support than root that converage, fuse, or have conical configuration.



C. **Surface area of the roots:**

The area of periodontal ligament attachment of the root to the bone.

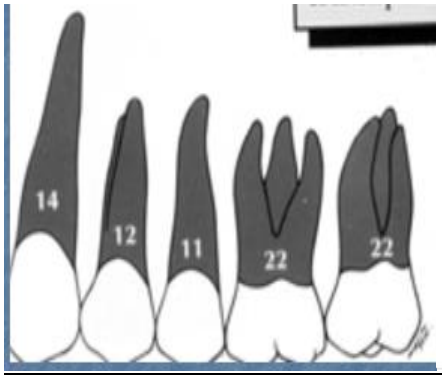


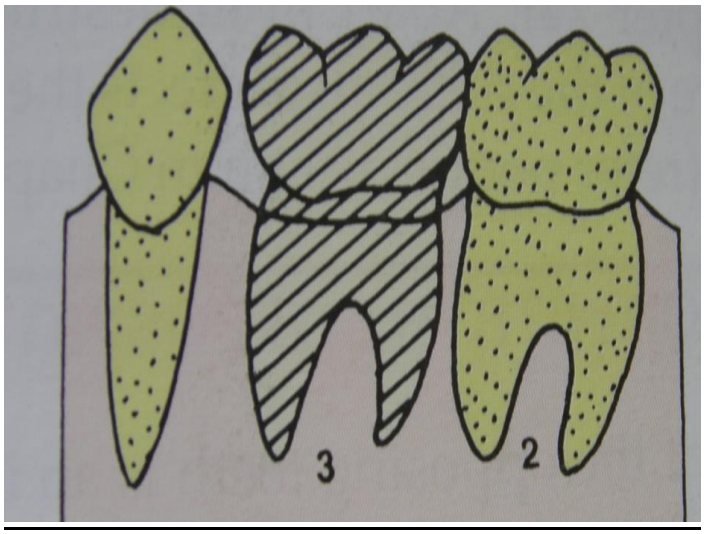
Table 3-1 ROOT SURFACE AREA OF ABUTMENT

	Root Surface Area (mm^2)	Percentage Root Surface Area in Quadrant
MAXILLARY		
Central	204	10
Lateral	179	9
Canine	273	14
First premolar	234	12
Second premolar	220	11
First molar	433	22
Second molar	431	22
MANDIBULAR		
Central	154	8
Lateral	168	9
Canine	268	15
First premolar	180	10
Second premolar	207	11
First molar	431	24
Second molar	426	23

Data from Jepsen A: Root surface measurement and a method for x-ray determination of root surface area. Acta Odontol Scand 21:35, 1963.

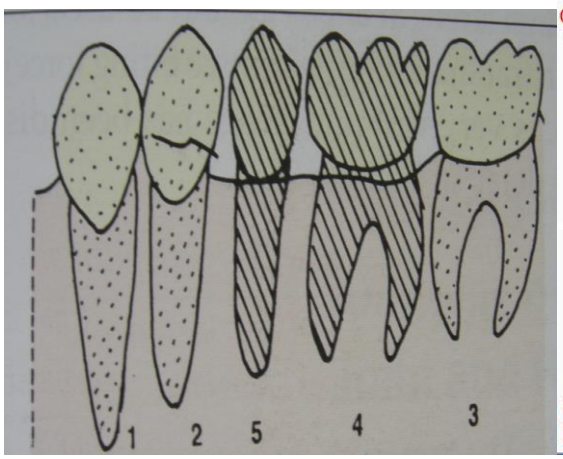
ANTE'S LAW:

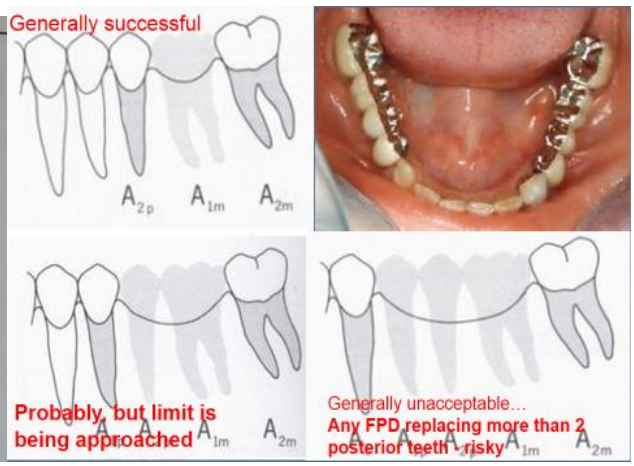
The root surface area of the abutment teeth *(embedded in bone) (periodontal ligament area/pericemental area)* must be equal or more than root surface area of teeth being replaced.



Example:

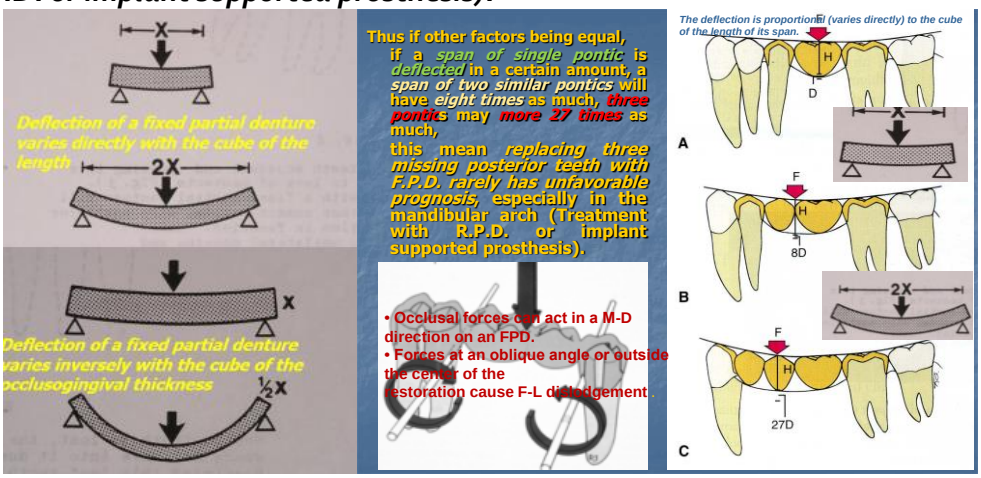
missing first molar second premolar, the root surface areas of both are equal to the root surface area of abutment (second & first premolar). So bridge can be done with risk.





Biomechanical Considerations

All F.P.D. flex slightly when subjected to a load, the longer the span, the greater the flexing. ***It is not linear relationship but varies with the cube of the length of the span.*** Thus if other factors being equal, if ***a span of single pontic*** is defected in a certain amount, **a span of two** similar pontics will have ***eight times*** as much, ***three pontics*** may move ***27 times*** as much, ***this mean replacing three missing posterior teeth with F.P.D. rarely has favorable prognosis, especially in the mandibular arch (Treatment with R.P.D. or implant supported prosthesis).***



- ***Excessive flexing under occlusal loads may cause failure of a long span F.P.D., It can tend to:***
    1) *Fracture of porcelain veneer*
    2) *Connector breakage*
    3) *Retainer loosening and caries*
    4) *Unfavorable tooth or tissue response.*

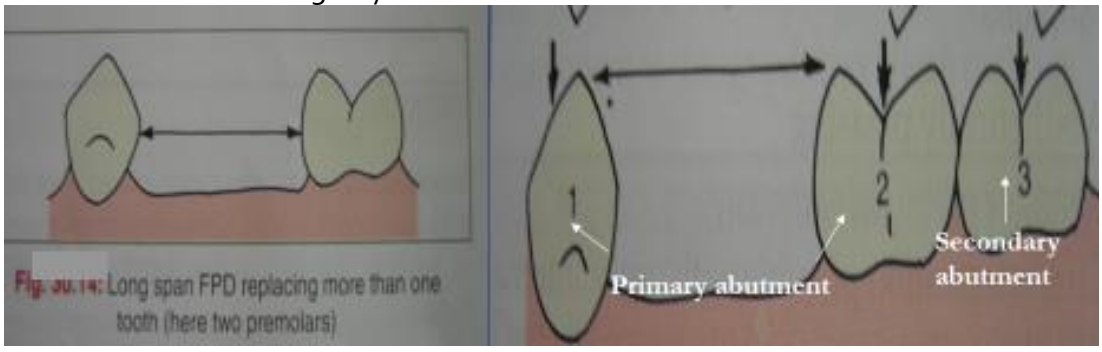
All these render prosthesis failure.

Span Length:

Distance between abutments affects the feasibility of placing fixed prosthes

- Ideal for 1-2 missing teeth
- loss of 3 adjacent teeth requires careful evaluation of other factors (crown-root ratio, root length and form, periodontal health, mobility, occlusal force and biomechanical factor)

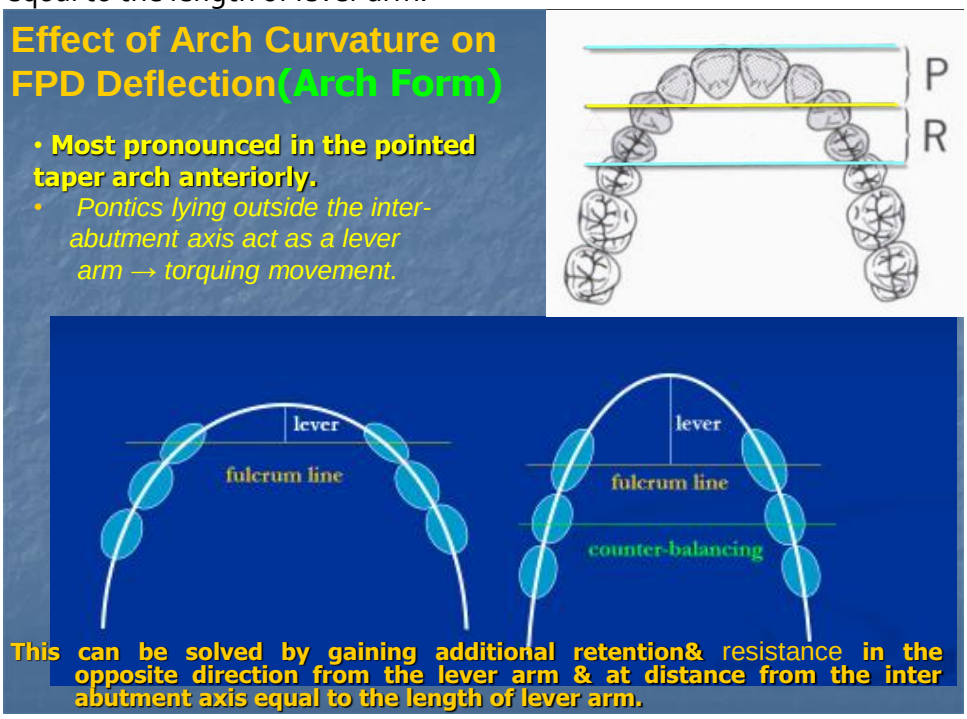
- **When long span F.P.D. fabricated:**
    1) Pontics & connectors should be made as bulk as possible to ensure optimum rigidity without jeopardizing gingival health.
    2) The prosthesis should made be of a material that has high strength & rigidity.



Arch curvature:

It imposes additional stress on F.P.D. It has effect on the stress occurring in F.P.D. when pontics lie outside the inter abutment axis line. The pontics act as lever arm, which produce a torqing movement.

This is common problem in replacing all four maxillary incisor with F.P.D. & most pronounced in the pointed taper arch anteriorly. This can be solved by gaining additional retention in the opposite direction from the lever arm & at distance from the inter abutment axis equal to the length of lever arm.

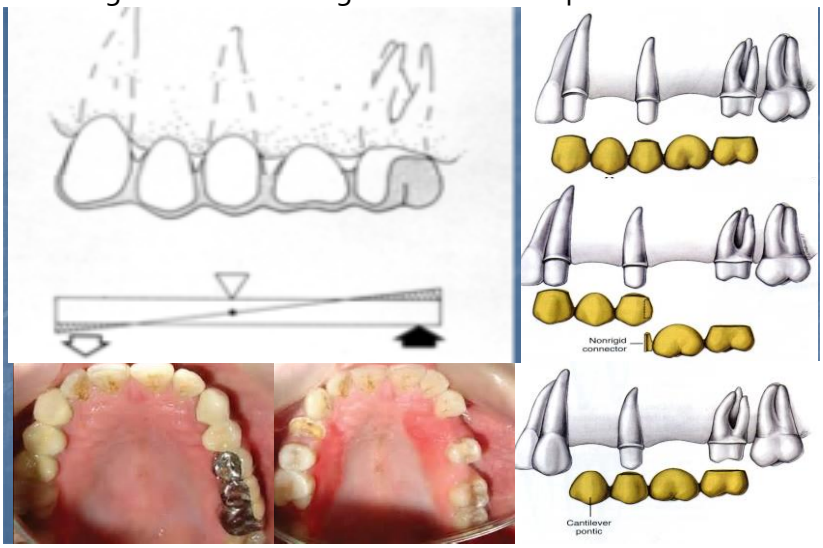


- **<u>Pier abutment:</u>**

Edentulous spaces can occur on both side of the abutment tooth creating alone free standing pier abutment. In such case the force transmitted to the terminal retainers as result of the middle abutment acting as fulcrum, & causing failure of weaker retainer.

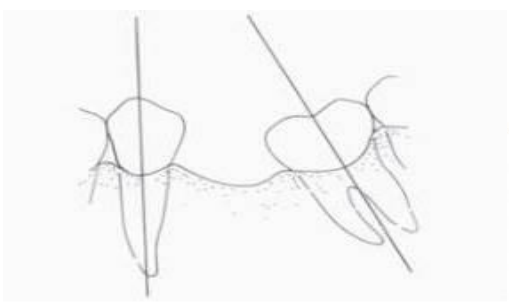
To overcome such complication:

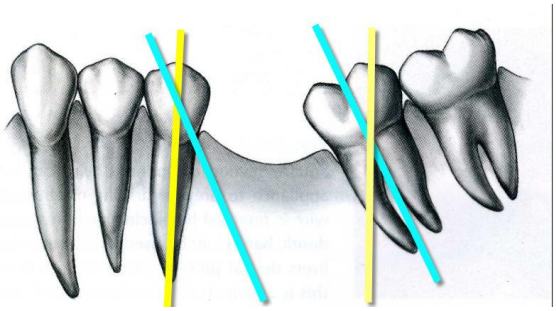
1) Such F.P.D. needs extremely retentive retainers.
2) Use of non-rigid connector.
3) When periodontal support is adequate, a much simpler approach would be to cantilever one segment of the bridge on one side of pier abutment.



- **Tilted molar abutment:**

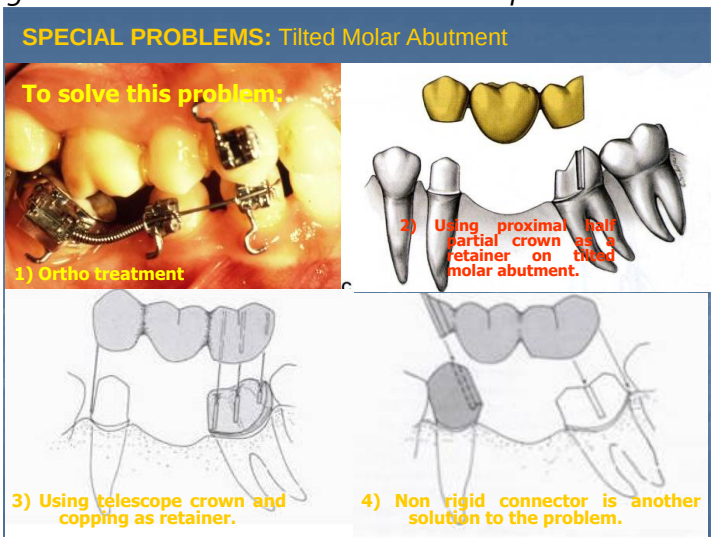
Tilted second molar lead to difficulty or impossibility to make satisfactory F.P.D. because the positional relationship no longer allow for parallel path of insertion without interference with adjacent teeth.





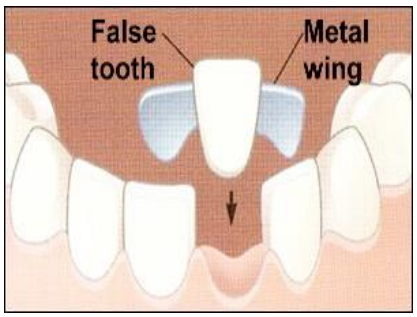
To solve this problem:

1) *Ortho treatment*
2) *Using proximal hall partial crown as a retainer on tilted molar abutment.*
3) *Using telescope crown and copping as retainer.*
4) *Non rigid connector is another solution to the problem.*



Adhesive bridge (Resin bonded bridge, acid etched bridge)

*Fixed dental prosthesis that is luted to the unprepared or minimum preparation surface of abutment teeth permanently by acid etching of enamel with some type of resin bonding agent.*It is alternative for the conventional bridge & most conservative methods It is involve attaching the pontic via a metal plate to the unprepared lingual surface of the abutment teeth,the attachment to the abutment is made by composite resin material after acid etch of the enamel.It is used when the abutment teeth have sufficient intact enamel, & usually used in younger patient.



Types:

1. **Direct:**

This type is made by using the crown of patient own tooth as a pontic, for example rapid replacement of a tooth that lost by traumatic injury. In order to increase the strength of the bridge (attachment) we add metal mesh or wire (temporary replacement).

2. **Indirect adhesive bridge:**

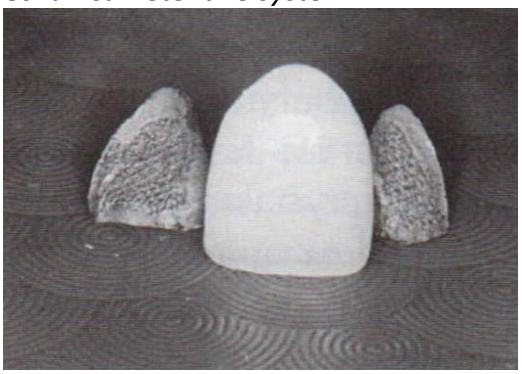
According to the mean or way of retention of the metal frame work to the abutment teeth we have different types:

a. Macro mechanical retention (Rochette):

In this types there is multiple undercut perforation in the cast metal frame of the retainer is used for retention & through which composite flow during cementation and make mechanical interlocking after setting (to obtain undercut the perforation inner diameter smaller then outer diameter i.e. perforations diverge from fitting surface to the outside).

b**. Medium mechanical retention (Virginia):**

Retentive feature cast as a part of the metal frame work (non undercut lumps, mesh, on the fit surface of the retainer). The size of the retentive feature is intermediate between macro mechanical & micro mechanical retentive system



c. Micro mechanical retentive (Maryland):

In state of perforations, the tooth side of the frame work is electrolytically etched, which produce a microscopic undercuts, the bridge attached with a resin luting agent that lock into the microscopic undercut of both the etched retainer & etched enamel.

d. Chemically retention (Panavia):

The resin adheres chemically to recently sand-blasted metal surface and is retained on the tooth by conventional acid etching of the enamel.