



ANATOMY AND PHYSIOLOGY OF SUPPORTING AND LIMITING STRUCTURES OF COMPLETELY EDENTULOUS ARCH

DR Roma Goswami
Prof & Head
Prosthodontics and Crown & Bridge
Subharti Dental College & Hospital
Swami Vivekanand Subharti University
Meerut UP



CONTENTS

- Introduction
- Biological considerations of maxillary impressions
 - macroscopic anatomy- supporting structures
limiting structures
 - microscopic anatomy- supporting structures
limiting structures
- Related anatomic structures
- Conclusion

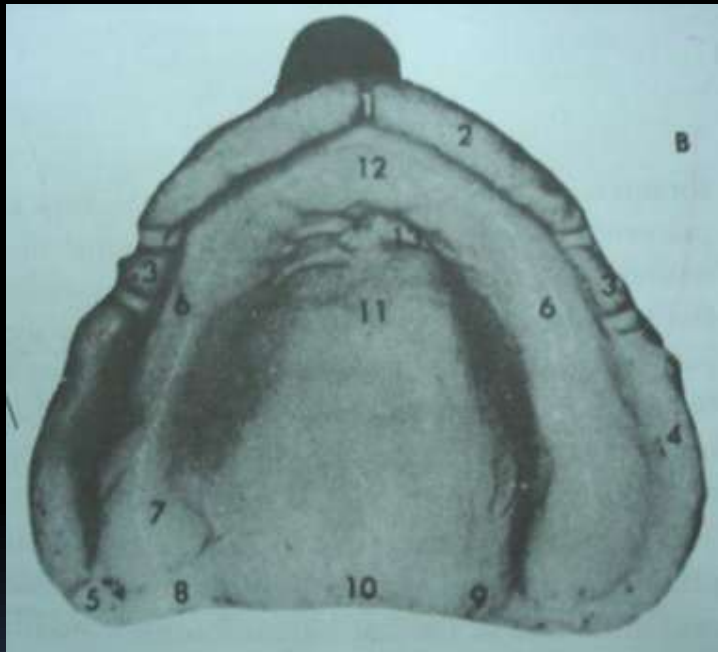


INTRODUCTION

- Complete dentures are artificial substitutes for living tissues that have been lost.
- The dentures must replace the form of the living tissues as closely as possible.
- The denture must function in harmony with the remaining tissues that both support & surround them.
- For this harmony of living tissues & dentures to coexist, the dentist must fully understand both the macroscopic & microscopic anatomy of the supporting & limiting structures.



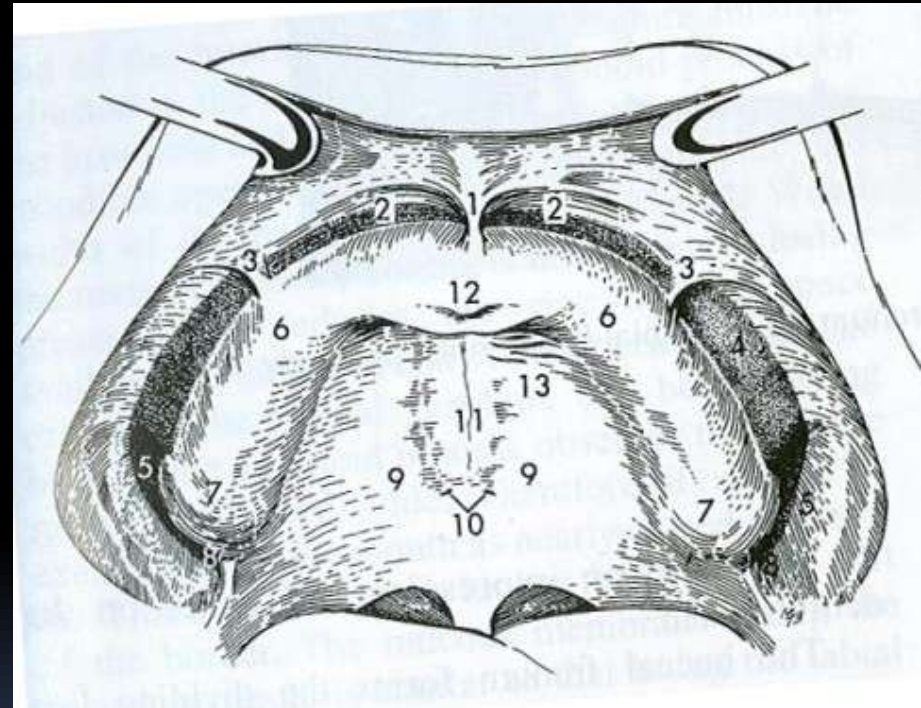
BIOLOGIC CONSIDERATIONS OF MAXILLARY IMPRESSIONS





Maxillary landmarks

1. Labial frenum
2. Labial vestibule
3. Buccal frenum
4. Buccal vestibule
5. Distobuccal sulcus
6. Residual Alveolar ridge
7. Tuberosity
8. Hamular notch
9. Hard palate (flat portions)
10. Fovea palatani
11. Mid palatine suture
12. Incisive papillae
13. Rugae area





Labial frenum

Incisive papilla

Buccal sulcus

labial sulcus

Rugea area

Palatine raphe

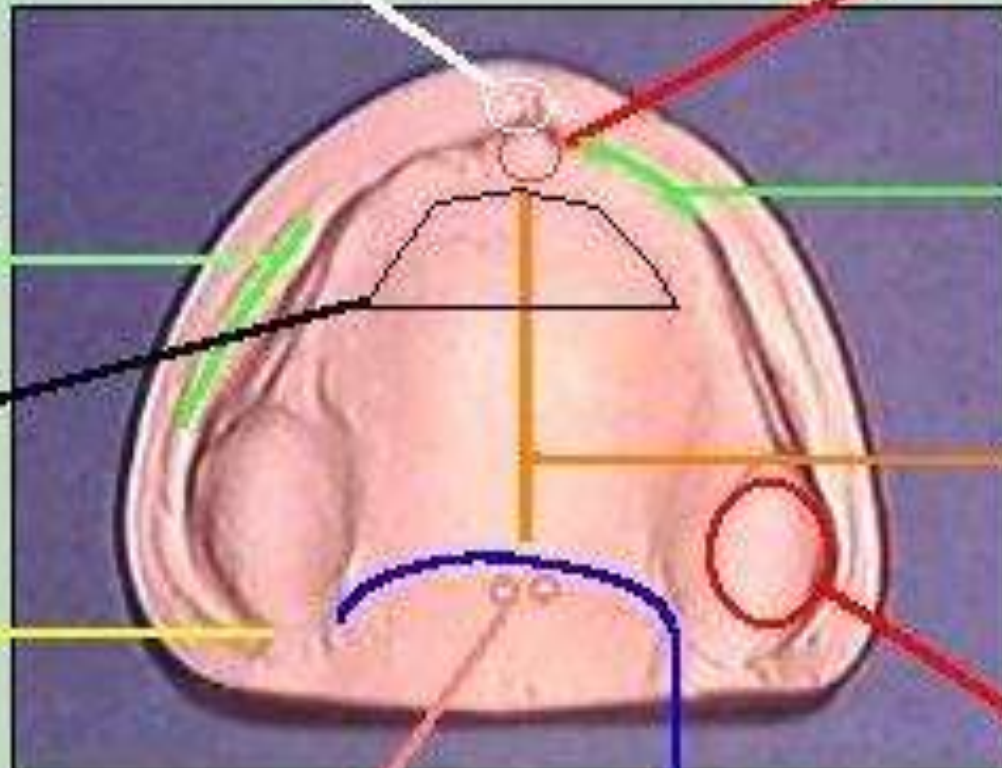
Hamular notch

Tuberosity

Palatine fovea

Vibrating line

(junction of hard





Foundation surface of maxillary denture primarily consists of:

- Stress bearing or supporting area
- Relief areas
- Peripheral or limiting area



MAXILLARY DENTURE SUPPORTING STRUCTURES INCLUDE

- RESIDUAL ALVEOLAR RIDGE
- RUGAE
- BONE OF THE BASAL SEAT:
 - INCISIVE PAPILLA
 - ZYGOMATIC PROCESS
 - MAXILLARY TUBEROSITY
 - SHARP SPINY PROCESSES
 - TORUS PALATINUS



ANATOMY OF SUPPORTING STUCTURES

- Foundation of maxillary denture is made up of:
 - Bone of hard palate
 - Residual alveolar ridge

The denture base actually rests on mucous membrane which serves as a cushion between denture base and the supporting bone



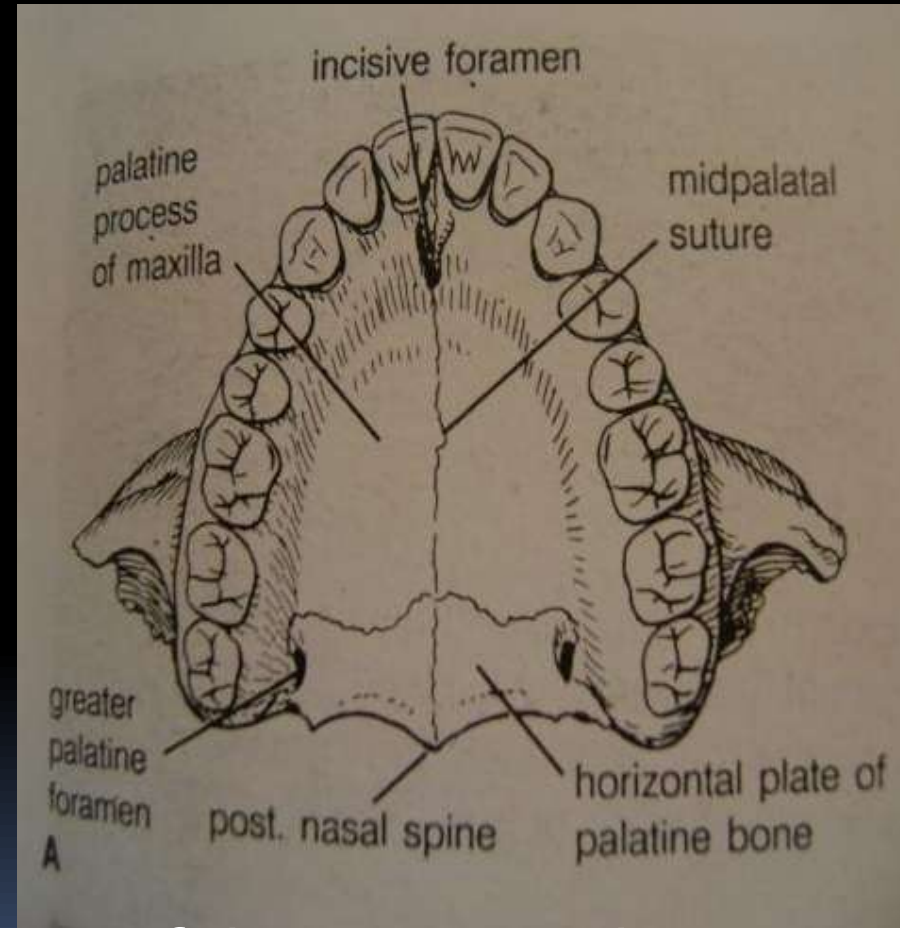
HARD PALATE

The palatine processes of maxilla & the palatine bone forms the foundation of hard palate & provides considerable support for dentures & also support the soft tissue which increases the surface area for the basal seat.



PALATINE PROCESS

- Arise as broad horizontal plates from the body of the maxillae.
- The two horizontal plates are united in the midline by the midpalatal suture.



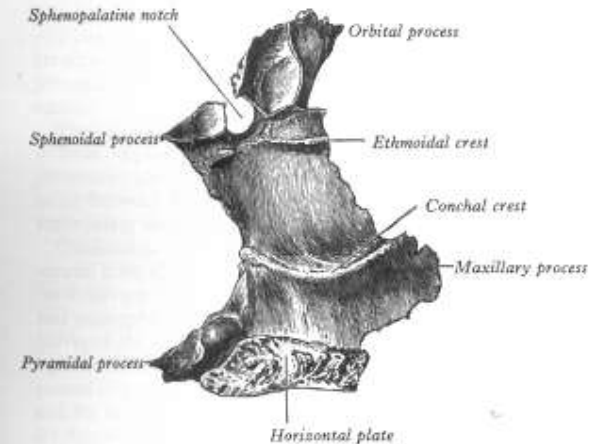
The horizontal palatine processes of the maxillary bones appear to resist resorption .



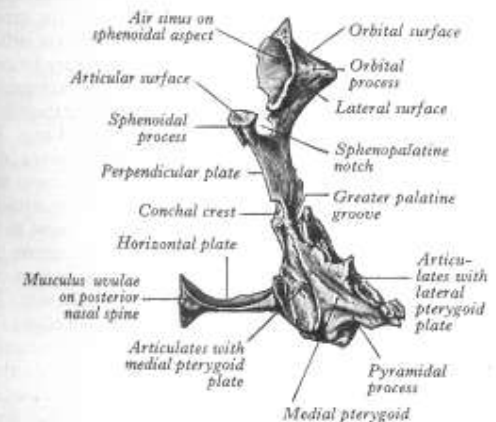
PALATINE BONE

- The horizontal plate, with its smooth superior or nasal surface and its rough inferior or oral surface, forms the posterior part of the hard palate.

THE ZYGOMATIC BONES



3.120 The left palatine bone. Medial aspect. (Enlarged.)



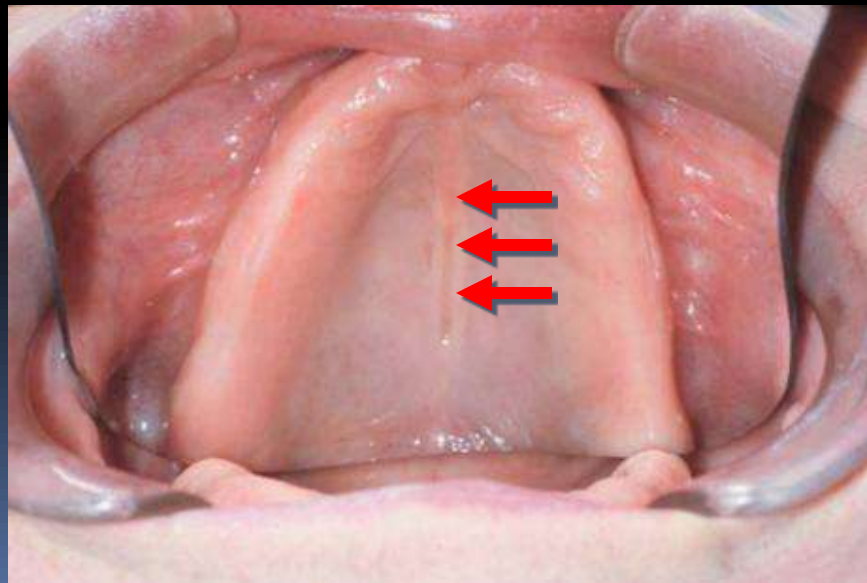
3.121 The right palatine bone. Posterior aspect.



- The horizontal plates of the palatine bones articulate with the posterior rough border of the horizontal palatal processes of the maxillae .
- Posterior border of the horizontal plates of the palatine bones unite in the midline to form the sharp posterior nasal spine.
- Posterior margins of the hard palate serve as the anterior attachment for the aponeurosis of the soft palate.



- Hard Palate
 - Median Palatine Raphe (midline palatine suture)
 - A bony midline structure
 - May require relief when covered by a denture





- So as the ridge resorbs, pressure increases over the palate and when it becomes prominent in the mid palatal region it acts as a fulcrum point around which the denture will rotate
- So, no stress to be placed on this region otherwise soreness , pain can occur and the denture tends to rock over the center of palate with this suture acting as fulcrum



Residual ridge:

CREST OF RIDGE:-

- According to Boucher's 9th EDITION- Primary stress bearing area
- According to Zarb Bolender – secondary stress bearing area





CREST OF THE RESIDUAL RIDGE

- covered with thick fibrous connective tissue
- Its mucous membrane is **firmly attached** to the periosteum of bone by connective tissue
- Stratified squamous epithelium is **highly keratinized**
- Submucosa contains dense collagenous fibers that are contiguous with the lamina propria
- Composed of **Compact bone**



- Since the crest of the ridge is subjected to resorption, there is lack of smooth cortical bone, so it is considered to be secondary supporting area



Rugae –

- Irregularly shaped rolls in the anterior part of the palate.
- This area resists anterior displacement of the denture and is a **secondary Stress bearing area.**(palate is at an angle to the residual ridge).
- **They serve no function.**

While making impressions they should not be distorted, since rebounding tissue tends to unseat the denture.





INCISIVE PAPILLA

- The incisive fossa is located in the midline of the palate, posterior to the maxillary central incisors (in edentulous mouth, slightly to the palatal side of the anterior palatal alveolar plate).
- Nasopalatine nerves & vessels exit to the palate at right angles to the margins of this bony fossa.





- In case of increased resorption of residual alveolar ridge ,the incisive foramen is nearer crest of ridge .
- The location of the incisive papilla(covering incisive foramen) in relation to crest of ridge gives an indication as to the amount of resorption of the residual ridge & thus is an aid in determining vertical dimension & the proper position of the teeth.



CLINICAL SIGNIFICANCE

- Considered as a relief area
- If not relieved, patient besides complaining of pain may also complain of a burning sensation in anterior palate



- Hence, even though the fossa is covered with a protective pad of fibrous conn. tissue called the incisive papilla, denture base should be relieved over this area.
- Incisive papilla can be used as a guide in arranging anterior teeth.
- Ant. Maxillary central incisors should be placed anterior to the incisive papilla regardless of the relation of the papilla to the existing residual ridge.



BONE OF THE BASAL SEAT

- Important components of the bone of the basal seat for the maxillary denture are:
 - Incisive foramen
 - Zygomatic process
 - Maxillary tuberosity
 - Sharp spiny processes
 - Torus palatinus



■ Incise foramen

location

with resorption. . .

relief area.

determining vertical dimension.





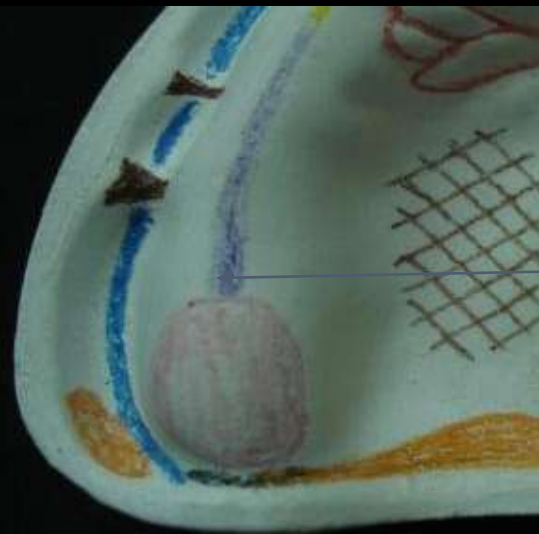
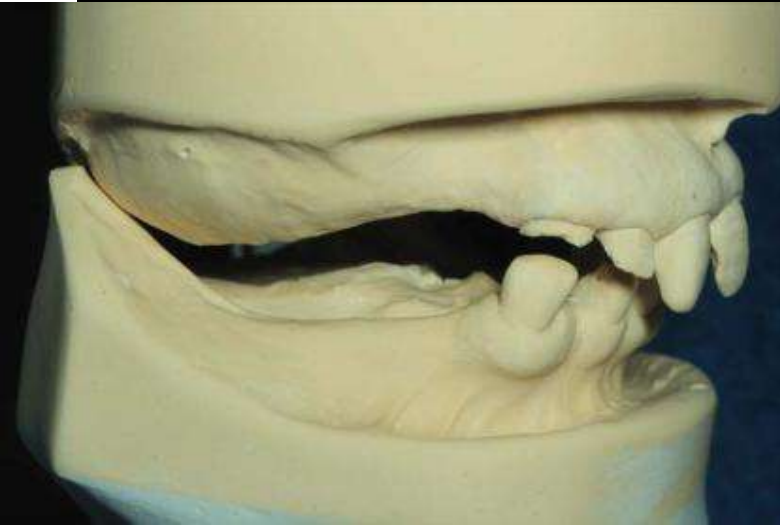
Zygomatic process:

- Located opposite the first molar region.
- One of the hard areas found in mouths that have been edentulous for a long time.
- Some dentures require relief over this area to aid retention & prevent soreness of the underlying tissues.



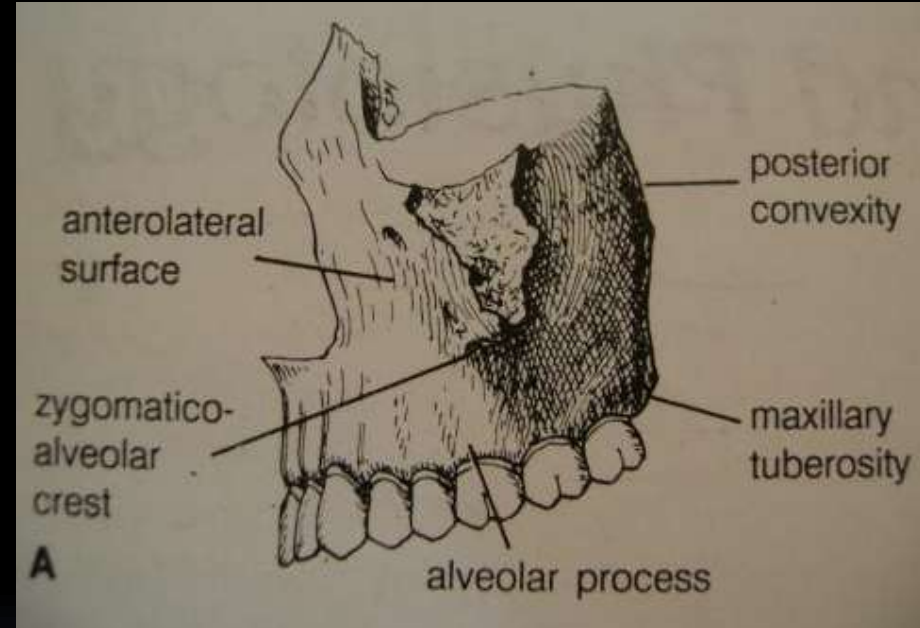


- Maxillary Tuberosity -



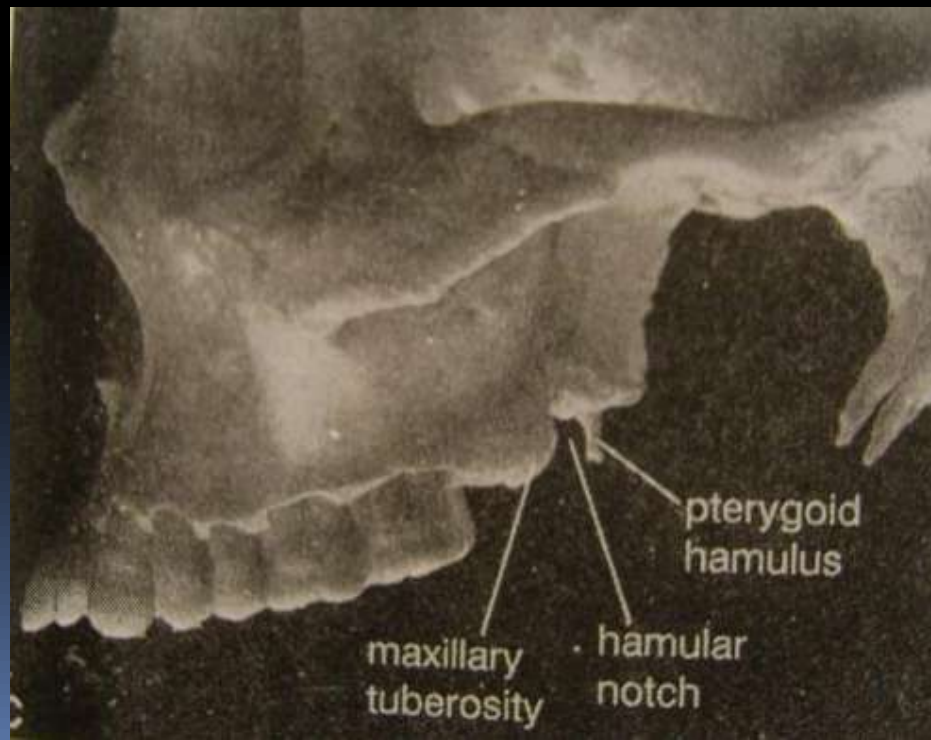


- The posterior surface of maxillary body ends inferiorly as a convexity termed the maxillary tuberosity.
- Maxillary tuberosity is an important structure for the support of the denture.
- The medial & lateral walls resist the horizontal & torquing forces that would move the denture base in a lateral or palatal direction.





- The posterior wall will resist movement in an anterior direction.
- To take advantage of this resistance to movement, the maxillary denture base should cover the tuberosities & fill the hamular notches.





- Overextension at the hamular notches will not be tolerated because of pressure on the pterygoid hamulus & interference with the pterygomandibular raphe .

When mouth is opened wide ,raphe is pulled forward.if denture is too long here,mucous memb. covering the raphe will be injured.

- Underextension hampers the stability & retention of the denture.(when distal end fits into the notch ,it prevents anteroposterior movement of the denture).



MAXILLARY TUBEROSITY

- Mostly fibrous but can be bony.
- Can pose a major problem if hanging low



This occurs when maxillary molars over erupt after the loss of their mandibular counterparts



Fibrous tuberosity



When maxillary prosthesis
against mandibular natural
teeth

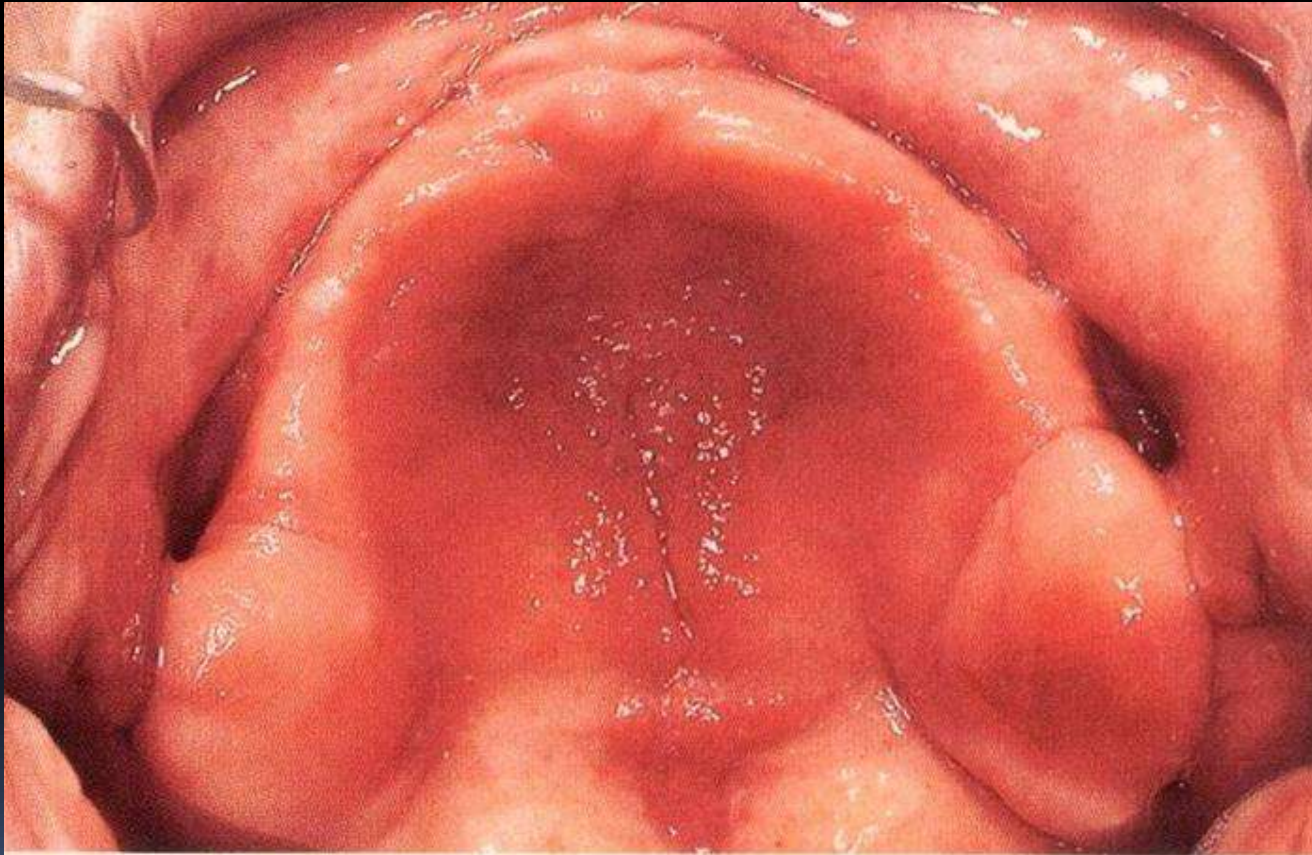
Bony overhanging
tuberosity



Seen after extraction of maxillary
molars that had supra erupted
due to loss of antagonists



Enlarged maxillary tuberosity

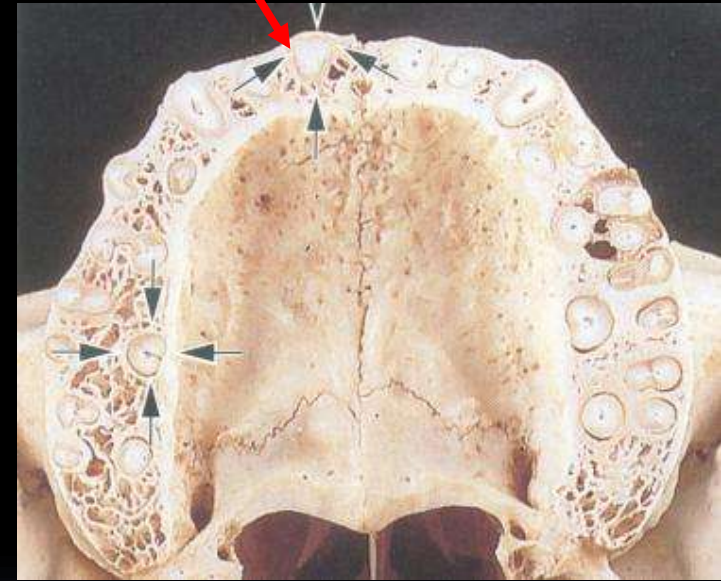




SHARP SPINY SPICULES

- Frequently encountered on maxillary or palatine bones
- Usually cause no problem except in individuals with considerable resorption (irritate soft tissues left between them & denture base).
- When pronounced spicules are present at the ridge, definitive treatment is

ALVEOLOPLASTY





- **Torus palatinus**: a hard bony enlargement that occurs in the midline of the roof of the mouth.
- Relief in the denture base is indicated for the less extensive tori, & surgical removal for the more extensive.





MICROSCOPIC ANATOMY OF SUPPORTING STRUCTURES



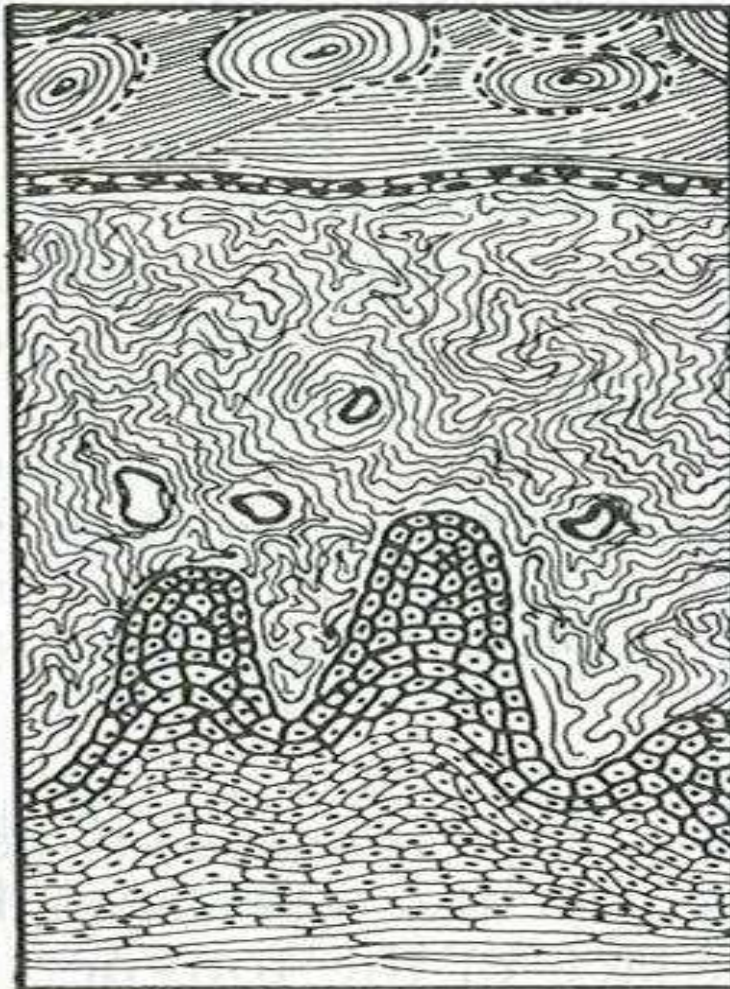


RESIDUAL RIDGE (MAXILLA)–

- EPITHELIUM – stratified squamous, thick , keratinized
- SUBMUCOSA – dense collagenous fibres & by this the mucous membrane is firmly attached to the periosteum of bone, devoid of fat or glandular cells



Histology of the mucous membrane covering the crest of residual ridge



Bone

Periosteum

Submucosa

Mucosa



SLOPE OF RIDGE:

Loosely attached mucous membrane.

- **Epithelium** - non keratinized.

- **Submucosa** – has loose connective tissue so cannot withstand the forces of mastication as well as crest of the ridge.

- Less stress is placed on the movable tissue of the slope of the ridge during the making of final impression.



HARD PALATE

- EPITHELIUM – thick , keratinized
- LAMINA PROPRIA – long papillae , thick dense collagenous tissue
- SUBMUCOSA – very thin , anterolaterally the submucosa contains adipose tissue and posterolaterally contains glandular tissue which is covered by the denture to aid in retention.(but it should not be expected to provide support for the denture)

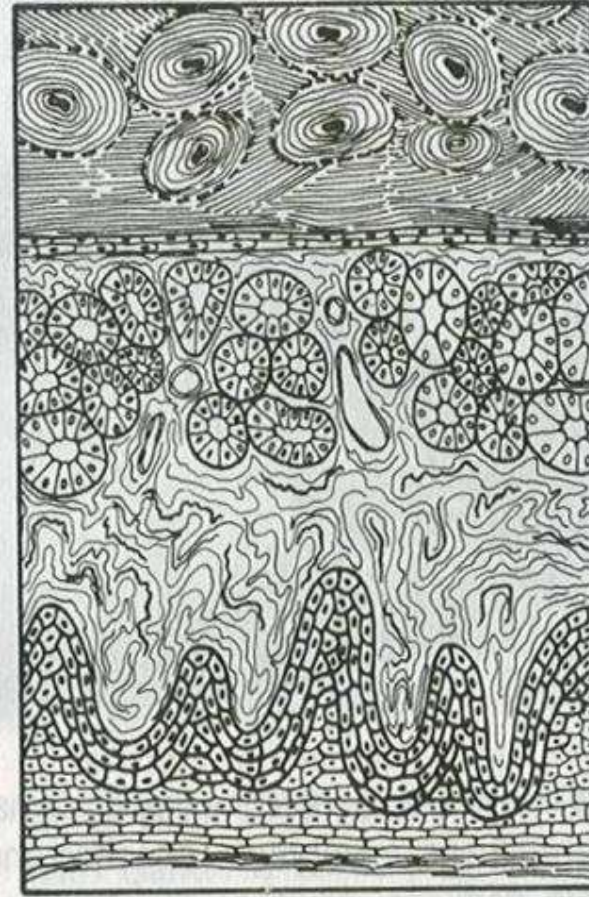


Compact bone

Adipose tissue

Submucosa

Mucosa



Compact bone

Gland tissue

Submucosa

Mucosa

Histology of the mucosa in the anterolateral and posterolateral part of the hard palate



INCISIVE PAPILLA –

- Thin stratified squamous epithelium, keratinized.
- Submucosa contains nasopalatine vessels and nerves
- So forms the primary Relieving area



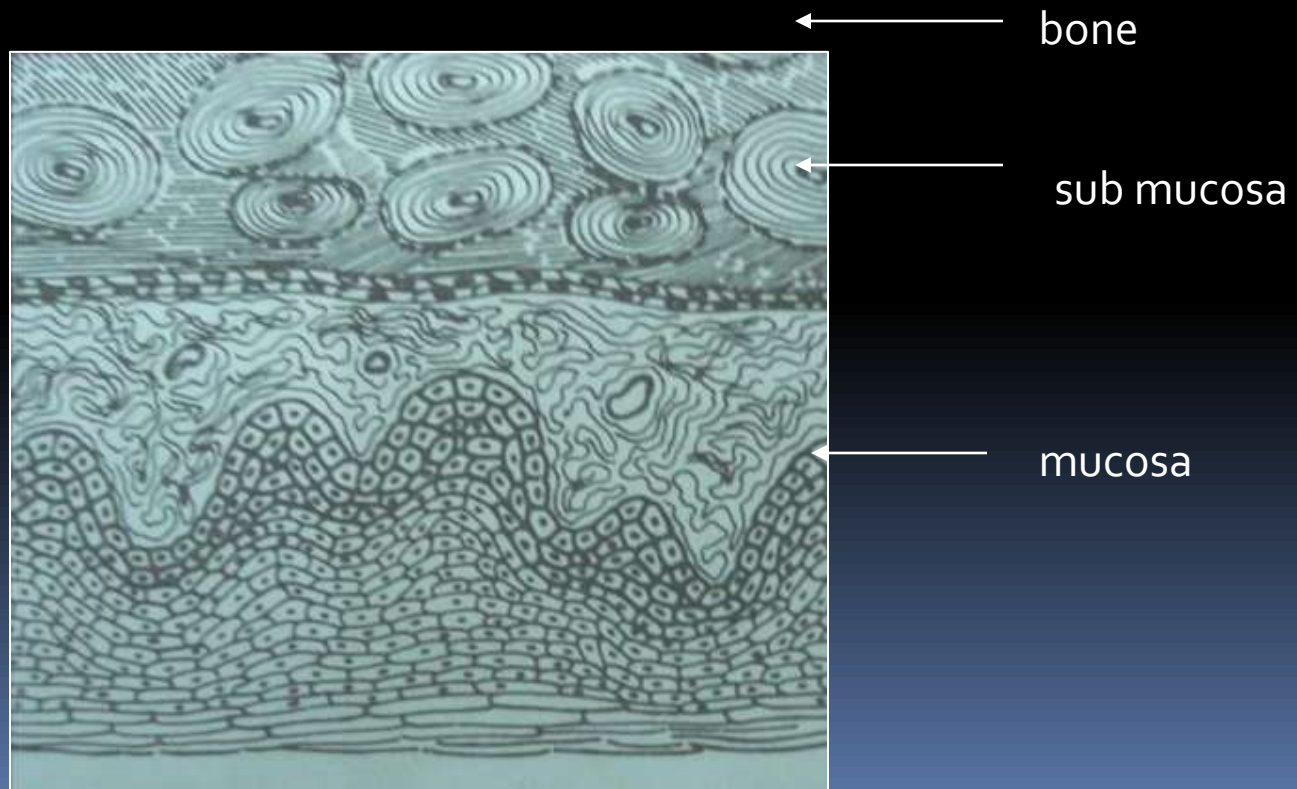
Median palatine suture:

Epithelium is stratified squamous.

thin sub mucosa

non resilient

bone is cancellous ,hence primary relieving area





DENTURE LIMITING STRUCTURES INCLUDE

- LABIAL FRENUM
- BUCCAL FRENUM
- LABIAL VESTIBULE
- BUCCAL VESTIBULE
- PTERYGOMAXILLARY NOTCH
- FOVEA PALATINAE
- VIBRATING LINES



ANATOMY OF PERIPHERAL OR LIMITING STRUCTURES

Limiting structures divided into

- Labial vestibule - runs from one buccal frenum to the other on labial side of the ridge
- Right and left buccal vestibules - from buccal frenum to hamular notch
- Vibrating line - extends from one hamular notch to another across the palate.



LABIAL FRENUM

- **Fan or 'V'** shaped fold of mucosa in the midline
- Has *No* muscle itself
- Starts superiorly from the inner aspect of the lip in a fan shaped manner and converges near its attachment to the labial side of the ridge
- It has no action of its own.



Clinical implications

- It is a relief area and recorded as labial notch in the impression failure to which can lead to irritation
- When the attachment is close to the crest of the ridge ,frenectomy may be indicated





LABIAL VESTIBULE

- Divided into left and right labial vestibule by labial frenum
- The main muscle of lip that forms the outer surface of labial vestibule is Orbicularis Oris

(it rests upon the labial flange & teeth of denture)

- The fibers of this muscle run horizontally through the lip and anastomose with fibers of buccinator



- As the fibers run horizontally this muscle has only an indirect effect on extent of impression and on denture





BUCCAL FRENUM

- Fold of mucous membrane found on the buccal side .
- It may be seen in

1. Single fold
2. Double fold
3. Broad and fan shaped

It is related to 3 muscles

1. Canninus {LAO} is attached below the frenum and affect its position
2. Orbicularis oris *pulls* the frenum forward
Buccinator *pulls* it backward



BUCCAL VESTIBULE

- Lies opposite to tuberosity
- Extends from buccal frenum to hamular notch
- Size **varies**
 - With contraction of buccinator muscle
 - Position of mandible
 - Amount of bone lost from maxilla





- Distal end of buccal flange of denture has to be adjusted, according to ramus and coronoid process of mandible and masseter muscle as they function during impression making procedure **(to make the denture stable during various mandibular movements)**
- **When masseter contracts under heavy closing pressure, it also reduces the size of space available for the distal end of the buccal flange.**



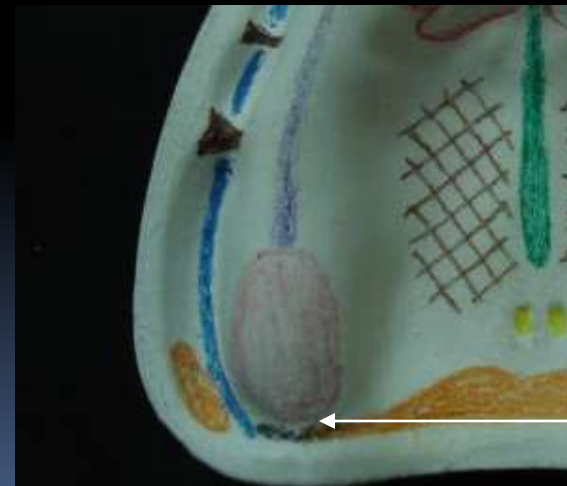
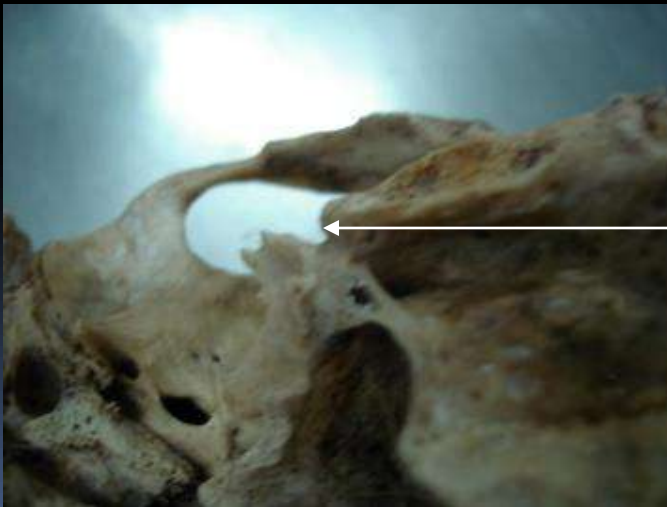
- **Coronoid bulge** - the patient is instructed to open wide, protrude and go into lateral movements. The width of the distobuccal flange will then be contoured by the anterior border of the coronoid process.





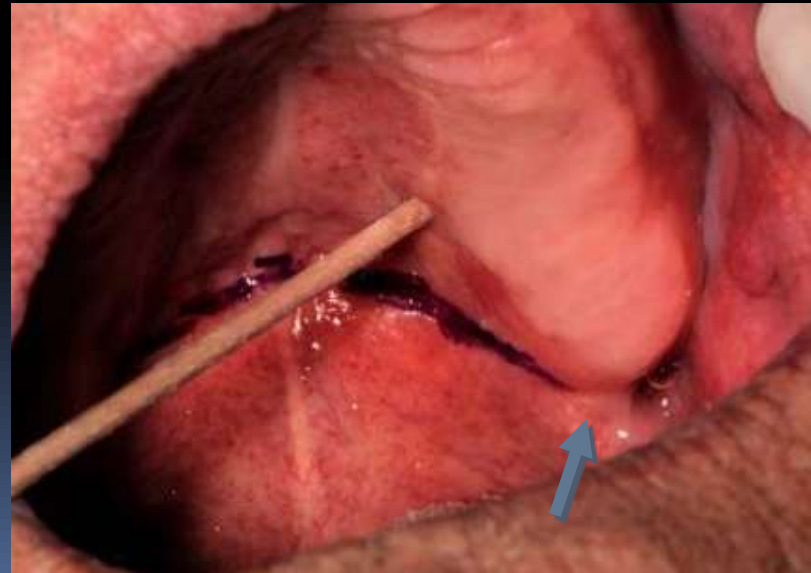
Hamular Notch - this narrow cleft extends from the tuberosity to the hamulus of medial pterygoid plate.

- This notch is used as a boundary of the posterior border of the maxillary denture back of the tuberosity.





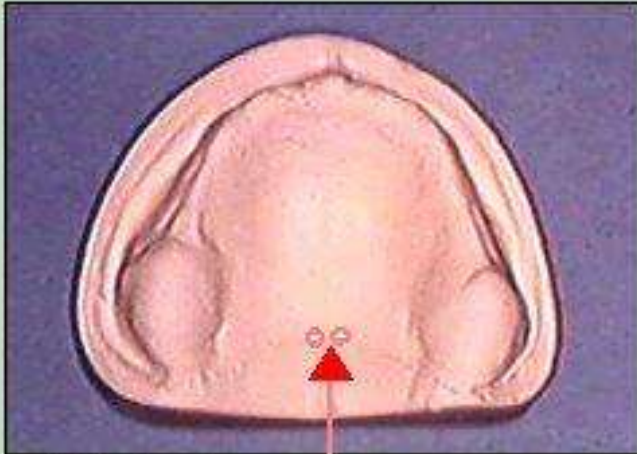
- The posterior palatal seal is placed through the center of the deep part of the hamular notch, since no muscle or ligament is present at a level to prevent the placement of extra pressure.





FOVEA PALATINE

- These are 2 small indentations near the midline of the posterior palate that are formed by joining together of several mucous gland ducts.
- The opening are close to the vibrating line and are always in the soft tissue, which make them an ideal guide for the location of posterior border of the denture



Palatine fovea



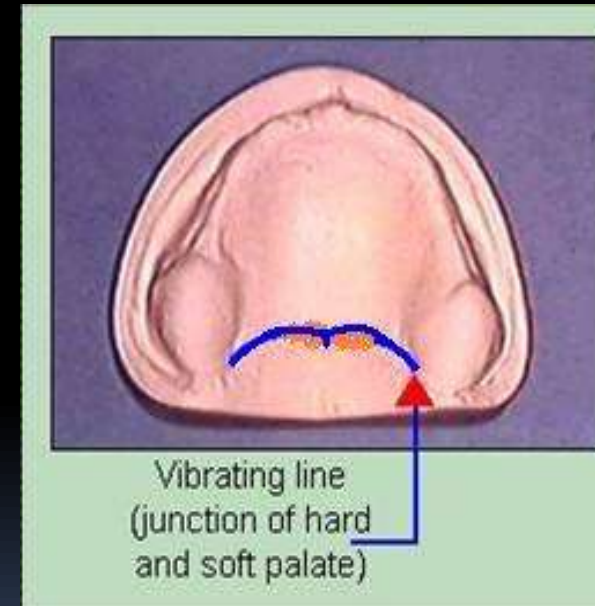


ANTERIOR AND POSTERIOR VIBRATING LINES

1. Anterior vibrating line - Imaginary line located at the junction of the attached tissues overlying the hard palate and the movable tissues

immediately adjacent to the soft palate

- This line is always on soft palate tissues
- It is *cupid's bow* shaped
- Recorded by Valsalva Maneuver
- Repeated 'ah' in short vigorous bursts





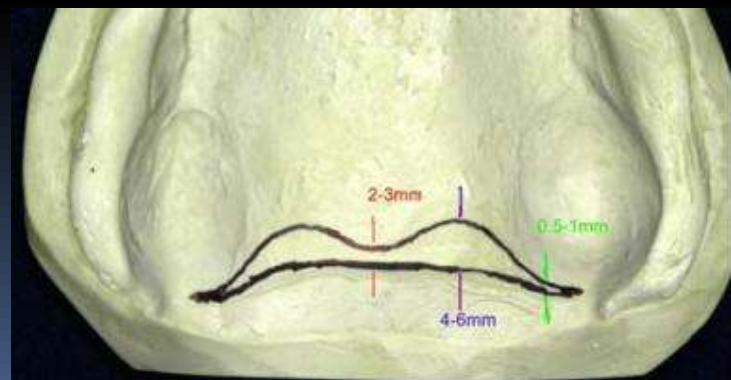
POSTERIOR VIBRATING LINE

- Marks the most distal extension of denture
- Demarcates part of soft palate with limited movement and part that is markedly displaced during function
- 'Ah' in short bursts normally



VIBRATING LINE:

- *The direction of the vibrating line usually varies according to the shape of the palate.*
- *The higher the vault, the more abrupt & forward the vibrating line.*
- *In a mouth with a flat vault, the vibrating line is usually farther posterior or has a gradual curvature, affording a broader pps area.*



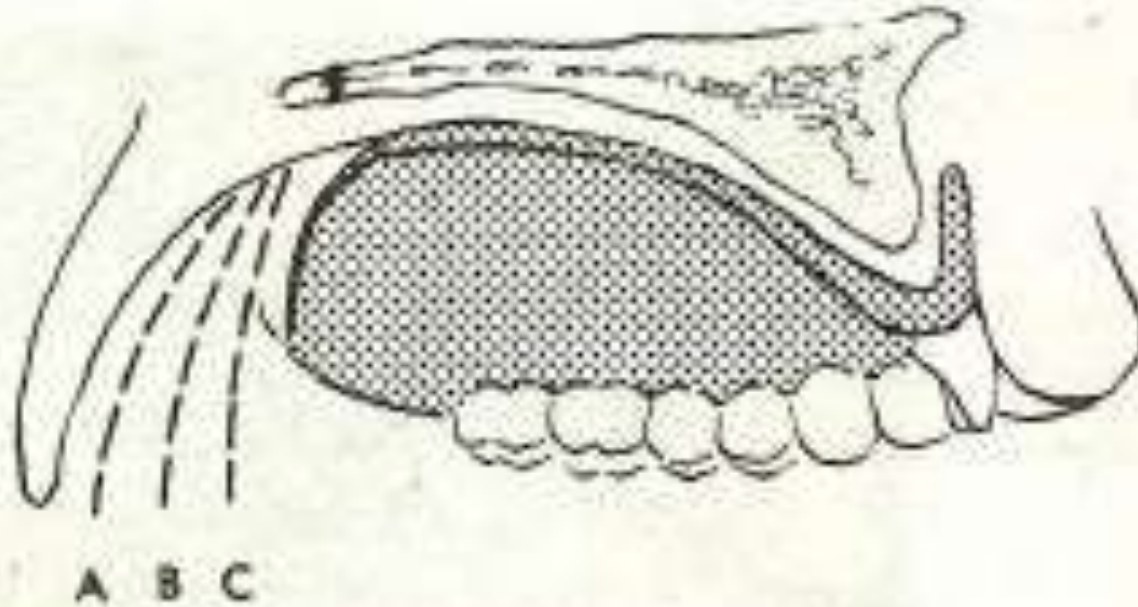
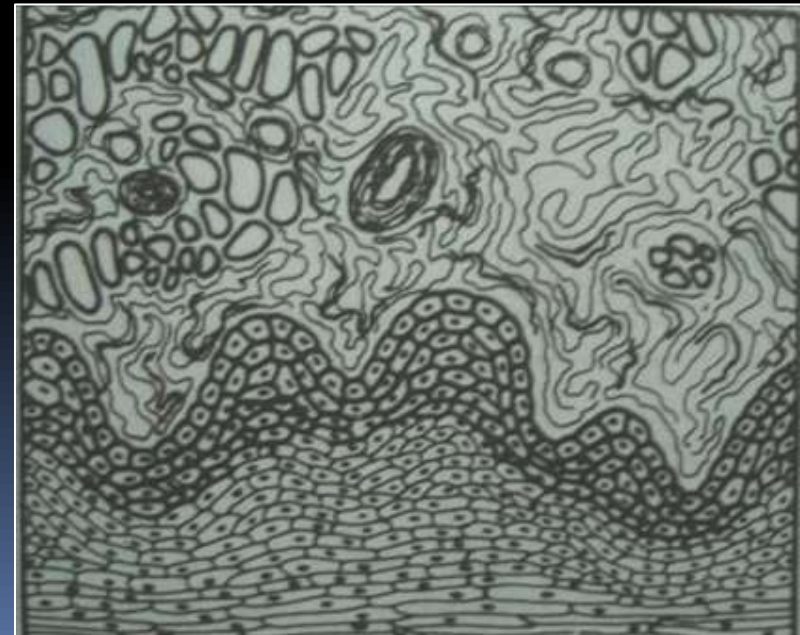


Fig. 7-13. A. Type of soft palate form that allows a broad posterior palatal seal area; B. type of soft palate form that allows a medium width of posterior palatal seal area; C. type of soft palate form that has a very narrow posterior palatal seal area.



Limiting structures: (microscopic anatomy)

- **Vestibular spaces:**
- Thin epithelium, nonkeratinized.
- Thick sub mucosa containing large amounts of areolar tissue & elastic fibres.
- The nature of the submucosa makes this tissue easily movable, so the labial or buccal flanges of upper impression can easily be overextended or underextended.





- **HAMULAR NOTCHES**
- Submucosa is thick made up of loose areolar tissue.
- Additional pressure can be placed on this tissue at the centre of the notch to complete the posterior palatal seal.
- No space provided in the final impression tray in this region.
- Thus the loose areolar tissue in submucosal can be displaced without trauma by the complete denture to improve PPS.



AREOLA
CONN
TISSUE



SUBMUCOSA IN REGION OF VIBRATING LINES

- Contains glandular tissue similar to posterolateral part of hard palate
- As the soft palate does not rest directly on bone, these tissues can be repositioned in a controlled manner in the impression procedure to improve posterior palatal seal



Ideal maxillary ridge:

- Abundant keratinized attached tissue
- Square arch
- Palate U-shaped in cross-section
- Moderate palatal vault
- Absence of undercuts
- High frenum attachments
- Well-defined hamular notches





CONCLUSION

- Scientific knowledge of denture supporting and influencing structures helps in accurate recording of these tissues , & meticulous fabrication of satisfactory dentures .

Thank
you