Sri Aurobindo College of Dentistry

Indore, Madhya Pradesh

INDIA

MODULE PLAN

- TOPIC :Impressions & Anatomical Landmarks
- SUBJECT:PROSTHODONTICS
- TARGET GROUP: UNDERGRADUATE DENTISTRY
- MODE: POWERPOINT – WEBINAR
- PLATFORM: INSTITUTIONAL LMS
- PRESENTER:**Dr. Kavita Maru**

Definitions

Impression:

1. A negative likeness or copy in reverse of the surface of an object, an imprint of the teeth and adjacent structures for use in dentistry (GPT8).

2. An impression is defined as an imprint or negative likeness of the teeth, of the edentulous areas where the teeth have been removed, or of both, made in a plastic material that becomes relatively hard or set while in contact with these tissues.

Preliminary impression: A negative likeness made for the purpose of diagnosis, treatment planning or the fabrication of a tray (GPT8); also referred to as 'primary impression'.

Preliminary cast: A cast formed from a preliminary impression for use in diagnosis or the fabrication of an impression tray (GPT8); also referred to as 'primary cast'.

Final impression: An impression that represents completion of registration of the surface or object, made for the purpose of fabricating a prosthesis; also referred to as 'secondary impression' or 'master impression'.

Definitive cast: A replica of the tooth surfaces, residual ridge areas and/or other parts of the dental arch and/or facial structures used to fabricate a dental restoration or prosthesis; called also final cast (GPT8); also referred to as 'master cast'.

Stock tray / Impression tray :

1. A metal prefabricated impression tray typically available in various sizes and used principally for preliminary impressions (GPT8).

2. A receptacle or device used to carry the impression material to the mouth, confine the material in apposition to the surfaces to be recorded and control the impression material while it sets to form the impression.

Custom tray : An individualized impression tray made from a cast recovered from a preliminary impression. It is used in making a final impression (GPT8); also referred to as 'special tray' or 'individualized tray'.

Border Molding : Border molding is the process by which the shape of the border of the tray is made to conform accurately to the contours of the buccal and labial vestibule.

Master Cast : A replica of the residual ridge areas and other parts of dental arch reproduced from the final impression on which the final prosthesis is made.

Introduction

- Complete denture are artificial substitutes for living tissues that have been lost.
- The denture must replace the form of the living tissue as closely as possible.
- Most importantly, the dentures must function in harmony with the remaining tissue that both support and surround them.

- Impression is a negative replica of the teeth and associated structures.

- Impression making is the first clinical working procedure in the fabrication of a complete denture. It helps the dentist in confirming the evaluation of patient, which was performed during diagnosis and treatment planning.

- It also helps in building confidence of the patient towards the dentist.

- A thorough understanding of the anatomy of the supporting and limiting structures is essential for proper extension and support of the denture.

- Impression techniques also vary depending on the clinical conditions.

- A preliminary impression is made following all the necessary mouth preparations and a preliminary cast is poured.

- If mouth preparation was not necessary, the diagnostic cast can be used as the preliminary cast. Hence, the procedures involved in making a diagnostic and preliminary impression, and in pouring a diagnostic and preliminary cast are similar.

- A custom tray is fabricated on the preliminary cast and a definitive (final) cast is made following final impressions.

- The clinical success of the complete denture depends largely on the accuracy and contours of the patient's definitive casts.

"Ideal impression must be in the mind of the dentist before it is in his hand. He must literally make the impression rather than take it"

Principles and objectives of impression making

Principles

An impression must adhere to the following principles:

1. Tissues must be healthy, before impression making.
2. Proper space must be provided for selected impression material.
3. Tray and impression material should be dimensionally stable.
4. For correct positioning of tray, a guiding mechanism should be provided.
5. Impression should be adequately extended to include the entire basal seat area as dictated by limiting and supporting structures.
6. A border molding must be performed in harmony with anatomical and physiological limitations of the oral structures.
7. Impression must be removed without damage to the oral structures.
8. The tissue surface of impression and intaglio surface of the denture must coincide.

Objectives

1. Retention
2. Stability
3. Support
4. Preservation of residual structures
5. Aesthetics

Retention

Definition: That quality inherent in the dental prosthesis acting to resist the forces of dislodgment along the path of placement (GPT8).

- It is related to forces that resist the forces of gravity, adhesiveness of food and opening of the jaws.
- The process of obtaining denture retention begins with impression making.
- Factors that attach the denture to the mucosa affect retention.

Factors affecting Retention

- Anatomical factors
- Physiological factors
- Physical factors
- Mechanical factors
- Muscular factors

Anatomical factors

- Size of the denture bearing area : Retention increases with increase in the size of the denture-bearing area . The average size of the maxillary denture-bearing area is around 24 cm^2 and that of the mandibular denture-bearing area is around 14 cm^2.

- Quality of the denture bearing area

Physiological factors

The amount and consistency of saliva affects retention.

- Thin, watery saliva affords best retention.
- Excessive saliva that is thick and ropy accumulates between the tissue surface of the denture and the palate leading to loss of retention.
- The absence of saliva (xerostomia) affects retention and can also cause irritation and soreness of the denture-bearing tissues.

Physical factors

(i) Adhesion

- Adhesion is defined as *the physical attraction of unlike molecules to one another*.

- Saliva is present in between the denture base and the mucosa, and its contact with both these surfaces creates adhesion. It is achieved by ionic forces between the salivary glycoproteins and surface epithelium or acrylic resin .

- It depends on:

a) Close adaptation of denture.
b) Size of denture-bearing area.
c) Type of saliva.

- Adhesion also takes place directly between the denture base and mucosa in case of xerostomia (lack of saliva), but this leads to ulcerations and abrasions in the mucosa.

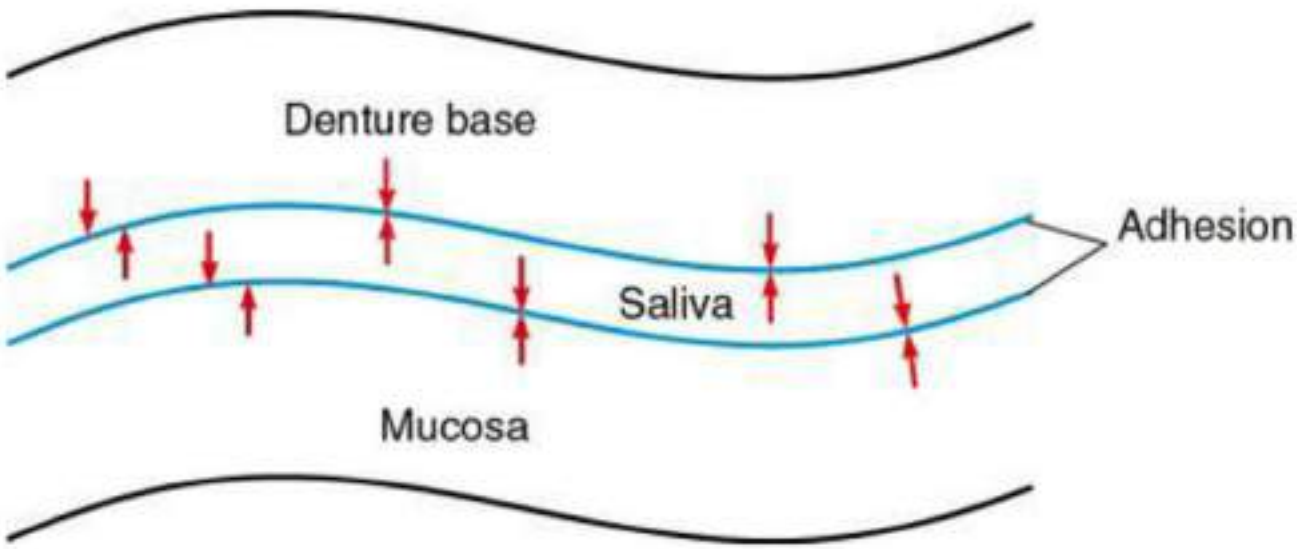


FIGURE 4.2A Adhesion (attraction of dissimilar molecules) takes place between saliva and denture base, and between saliva and mucosa.

(ii) Cohesion

- Cohesion is defined as *the physical attraction of like molecules to one another*.
- This occurs within the film of saliva and aids in retention.
- Normal saliva is not very cohesive; hence, retention from mucosa interface is more dependent on adhesion and surface tension.
- As viscosity of saliva increases, greater is the cohesion but very thick, mucous saliva can physically push the denture out, resulting in loss of retention.

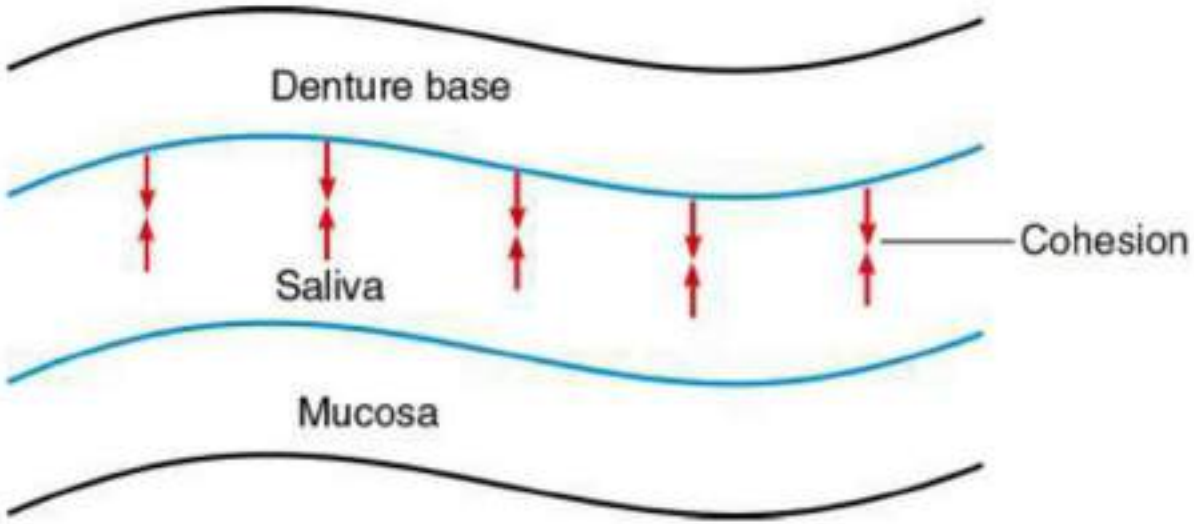


FIGURE 4.2B Cohesion (attraction between similar molecules) takes place within the molecules of saliva present between the mucosa and denture base.

(iii) Interfacial surface tension

- Interfacial surface tension is defined as *the tension or resistance to separation possessed by a film of liquid between two well adapted parallel surfaces*.

- It is dependent on the ability of the liquid to 'wet' the surfaces. The 'wettability' of the fluid is inversely proportional to the surface tension of the surfaces.

- These forces are found within the thin film of saliva that is present between the denture base and tissues. Saliva 'wets' the denture surface, to aid in retention. The oral mucosa has low surface tension and hence the saliva 'wets' it well, spreading out in a thin film. Denture base materials demonstrate less wettability than oral mucosa, with heat-cured resins showing better wetting than autopolymerized resins. But once coated with salivary pellicle, the surface tension of the denture base material decreases and contact increases. This is similar to trying to separate two glass plates with intervening liquid between them .

- Interfacial surface tension is also dependent on existence of a liquid/air interface at the boundary of the liquid/solid contact.

- If two plates with a fluid between them are immersed in the same fluid, then there is no interfacial surface tension and they can be separated easily.

- The external boundary of the mandibular denture is always filled (immersed) in saliva, thereby reducing the surface tension effect .

- Hence, interfacial surface tension plays a significant role in retention of only the maxillary denture.

The interfacial surface tension can be calculated by Stephan's formula:

$$F = \frac{4.7 \times kr^4}{h^3} \times v$$

Where,

F is surface tension,
k is viscosity of liquid,
r is radius of the contacting surfaces,
v is velocity of force,
h is the space between the surfaces.

This means the following:

- Greater the space ($h3$), interfacial surface tension (F) is less – closer the adaptation of the denture, greater is the interfacial tension and retention.

- Greater the radius ($r4$), greater is interfacial surface tension (F) – greater the area covered by the denture, greater is the interfacial tension and retention.

Other factors that aid in obtaining maximum interfacial surface tension are

- Thin and even layer of saliva.

- Adequate adhesion and cohesion.

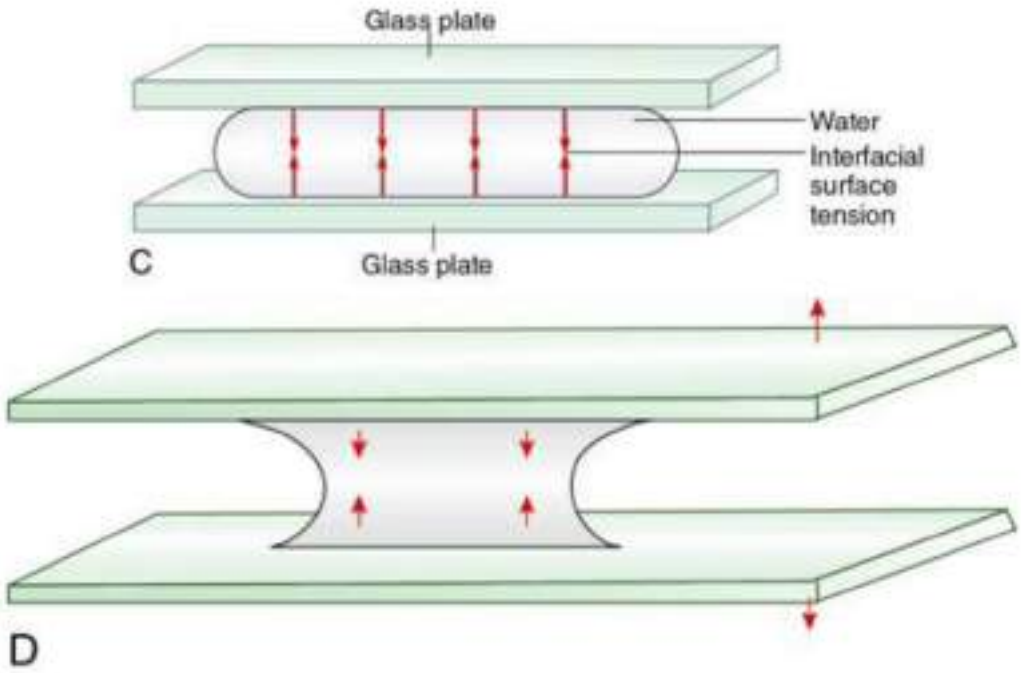


FIGURE 4.2C, D Interfacial surface tension acts only when the two glass plates are pulled apart. The cohesive forces between the molecules of the liquid, (intermolecular attraction) and the adhesive forces between the plate and the liquid will result in preventing the plates to move away from each other forming a concave meniscus.

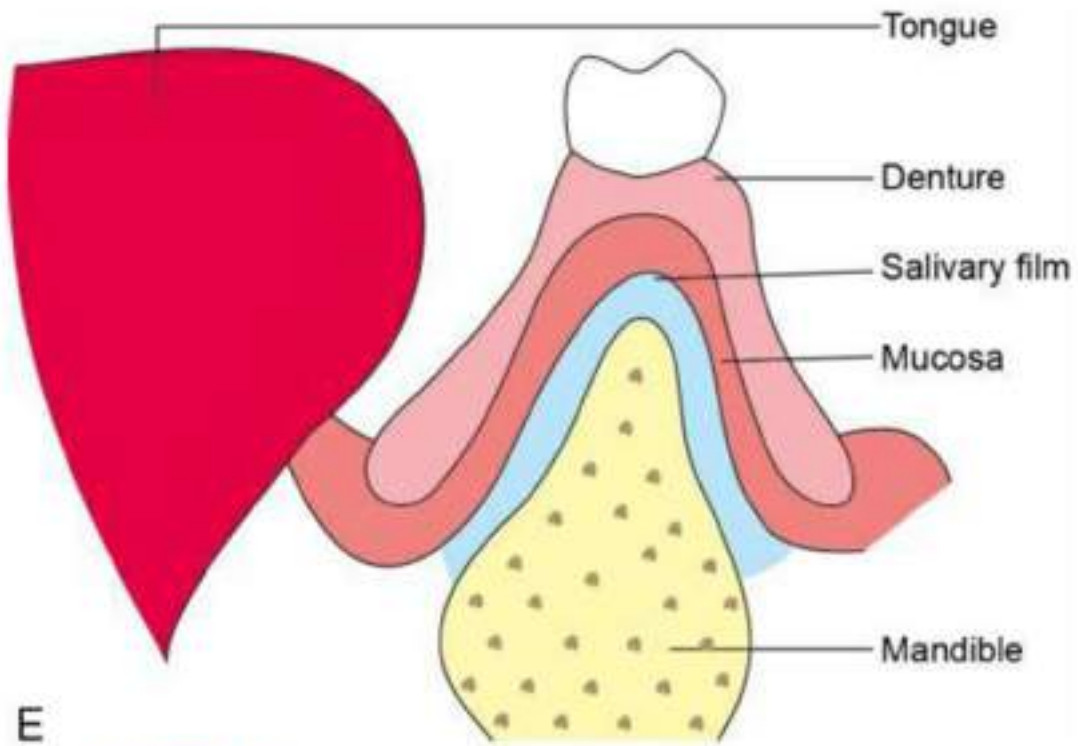


FIGURE 4.2E Surface tension lost in mandibular denture.

(iv) Capillarity

- *That quality or state, which because of surface tension causes elevation or depression of the surface of a liquid that is in contact with a solid.*

- Capillarity causes the thin film of saliva to rise and increase its contact with the denture base and the mucosa.

- Close adaptation of the denture base to mucosa is important for capillarity to provide effective retention.

(v) Atmospheric pressure

- This can help resist dislodging forces if the dentures have an effective border seal. Peripheral seal or border seal is defined as the contact of the denture border with the underlying or adjacent tissues to prevent the passage of air or other substances (GPT8).

- When a force is exerted perpendicular to and away from the basal seat of a denture which is properly extended and fully seated, pressure between the prosthesis and mucosa drops below the ambient pressure, resisting displacement. This has been previously referred to as ‘suction’ .

- Retention due to atmospheric pressure is proportional to the denture base area. Proper border moulding is essential for this retention mechanism to function.

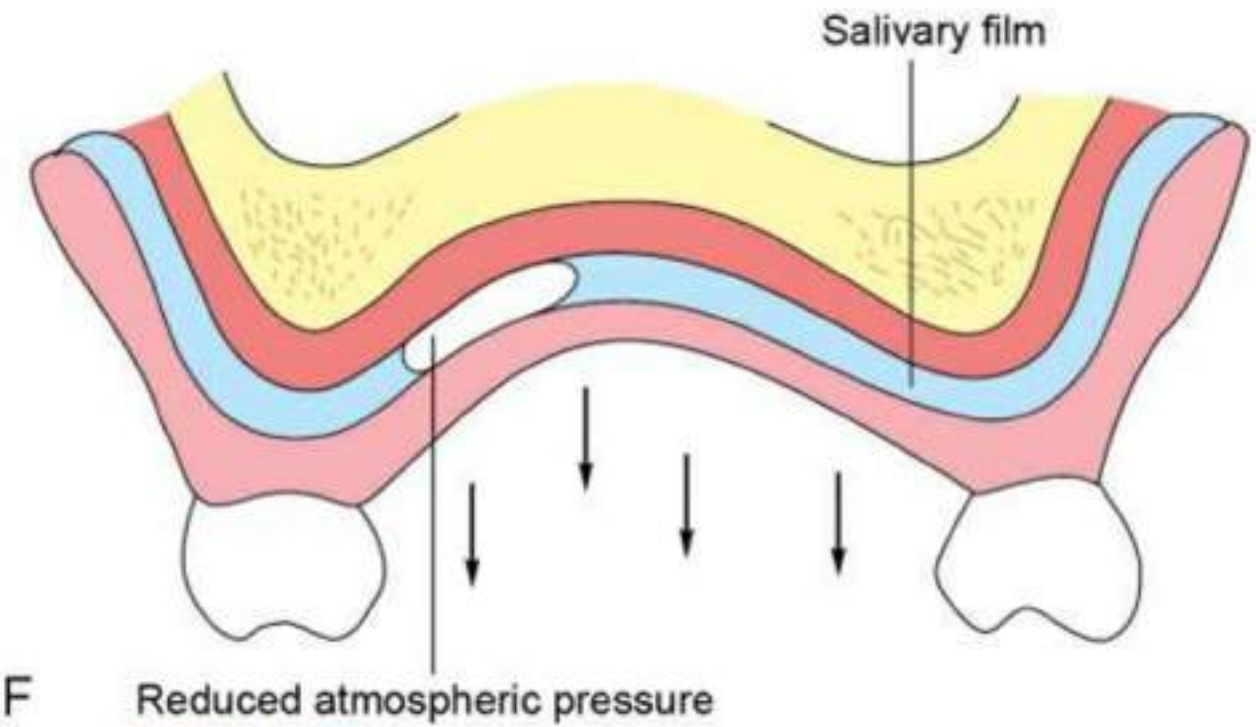


FIGURE 4.2F When dislodging forces act on a properly extended denture, pressure between the prosthesis and mucosa drops, contributing to retention.

(vi) Gravity

This natural force can aid in the retention of the mandibular denture especially when there is more weight and other retentive forces and factors are marginal.

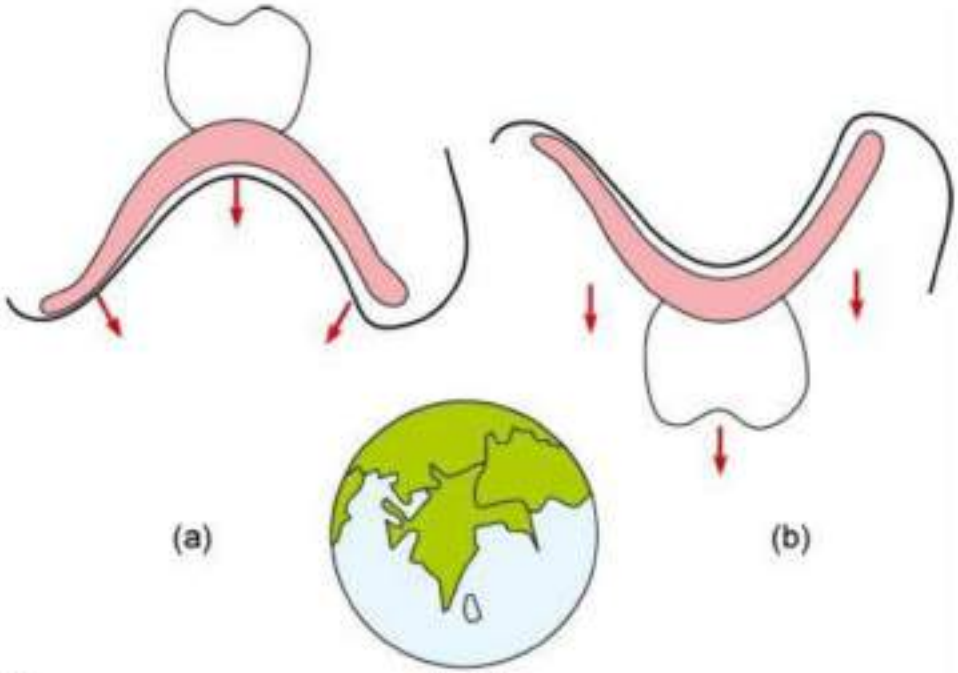


FIGURE 4.2G Gravitational force helps seat the mandibular denture (a), while it acts against the maxillary denture (b).

Mechanical factors

(i) Undercuts

- Moderate undercuts enhance retention because of the resiliency of mucosa. Examples are unilateral tuberosity undercuts, undercuts maxillary premolar area, distolingual areas and lingual to the midline of mandible.

- Severe undercuts covered with thin mucosa compromise retention and need to be surgically eliminated.

- Undercuts like those present in the retromolar areas and maxillary anterior ridge allow insertion of denture with a rotational path with the undercut area seated first . They provide good resistance to displacement in a vertical direction.

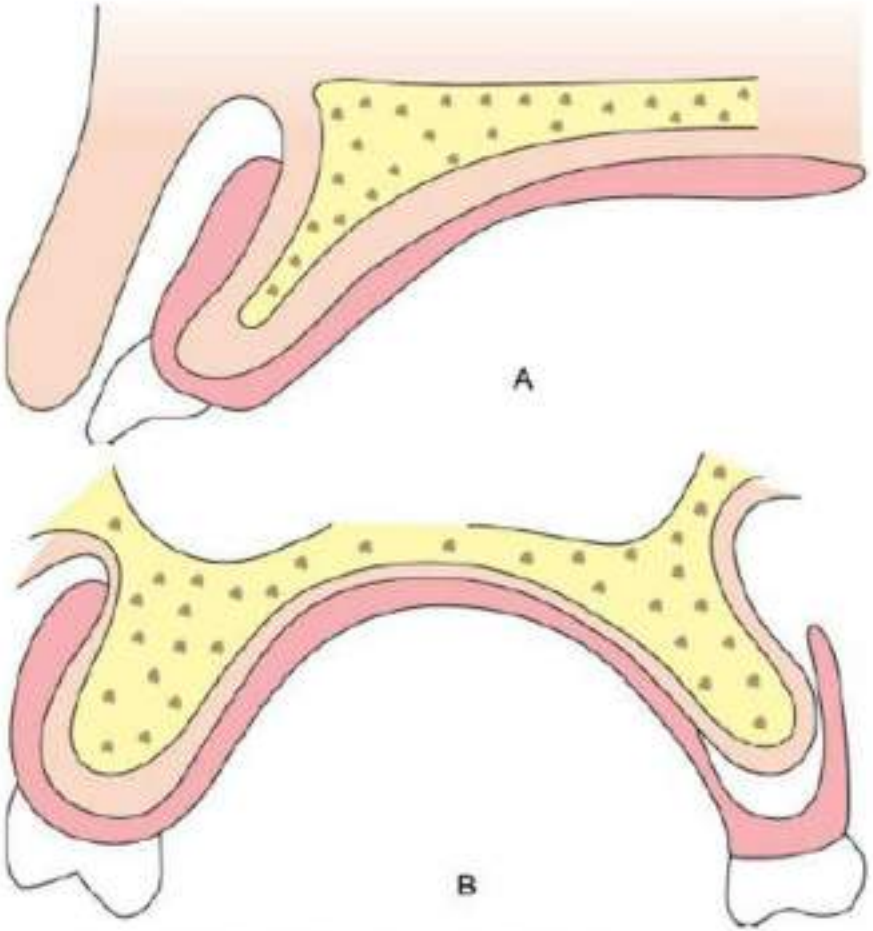


FIGURE 3.14 Ridge undercuts. **(A)** Undercut in anterior region can be tackled by changing the path of denture insertion. **(B)** Bilateral undercuts require surgical correction on

(ii) Denture adhesives

These commercially available products enhance retention by increasing adhesive and cohesive properties and by eliminating voids between denture base and basal seat tissues

FIGURE 4.3A A commercially available denture adhesive powder applied on denture.

(iii) Suction chambers and discs

These have been used to create a negative pressure in the palatal surface of the maxillary denture, thereby enhancing retention. They are best avoided due to their potential to cause papillary hyperplasias.

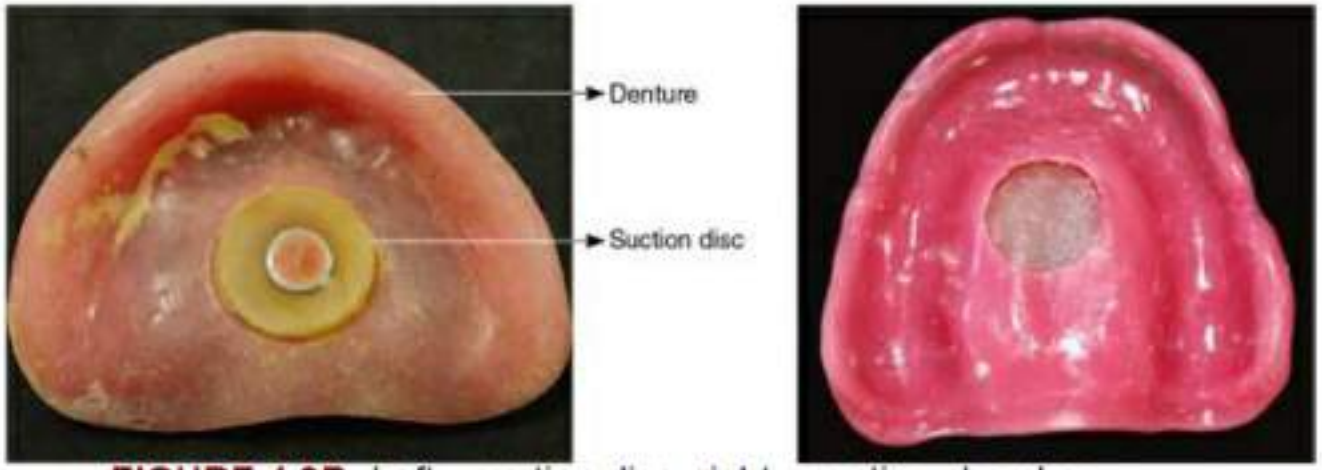


FIGURE 4.3B Left—suction disc, right—suction chamber.

Muscular factors

The oral and facial musculature and tongue supply supplementary retentive forces. For this to be effective:

- Teeth must be positioned in the ‘neutral zone’ between the tongue and cheeks.
- Polished surfaces of the dentures should be properly contoured.
- Denture bases must be extended to cover maximum area.
- Occlusal plane must be at correct level.
- The potential denture space or the neutral zone.

Stability

Definition: The quality of a removable dental prosthesis to be firm, steady, or constant, to resist displacement by functional horizontal or rotational stresses.

Factors affecting stability

Vertical height of the residual ridge

- Stability deceases with loss of vertical height of the ridges.

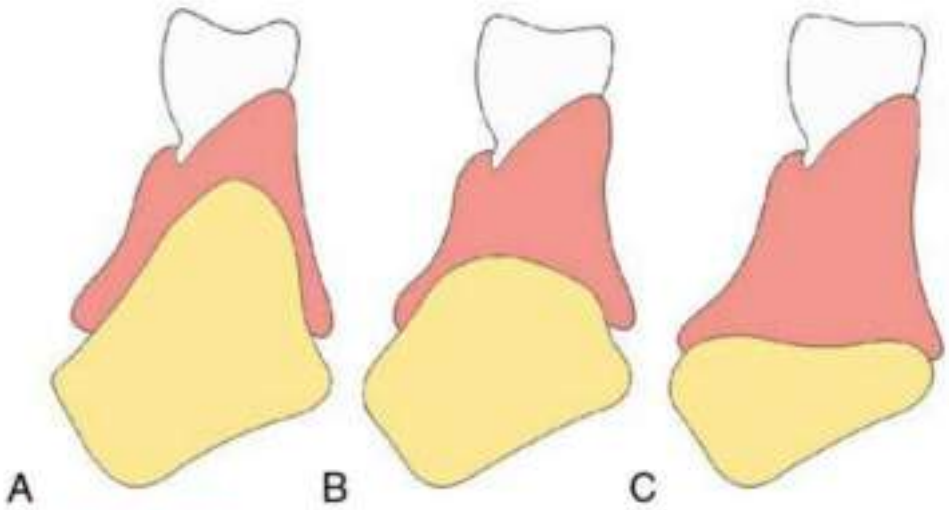


FIGURE 4.4 Stability: **(A)** good ridge height, **(B)** poor ridge height, **(C)** flabby ridge. Ridge with good vertical height contributes to better stability than poor ridges due to decreased leverage.

Quality of soft tissue covering the ridge

- Flabby ridges provide poor stability.

Adaptation of denture to the tissues

- Close adaptation of the denture to the basal seat tissues is very important to ensure proper stability. An accurate impression is essential to achieve this.

Occlusal plane

The occlusal plane should be oriented parallel to the ridges and should divide the interarch space equally. Inclined occlusal planes will promote sliding forces and cause instability.

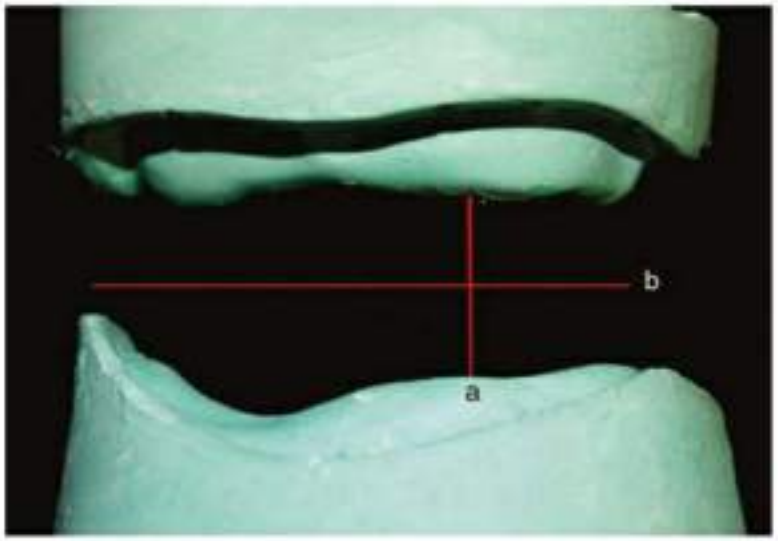


FIGURE 4.4D Occlusal plane (b) contributes to stability when the interarch space (a) is equally divided.

Teeth arrangement

Setting teeth in ‘balanced occlusion’ and in the ‘neutral zone’ promotes stability.

Contour of polished surface

The polished denture surface should be in harmony and with the functioning of oral muscles to promote stability.

Support

Definition: The resistance to the vertical forces of mastication, occlusal forces and other forces applied in a direction towards the basal seat tissues.

- To provide adequate support, the denture base should cover as much denture-bearing area as possible. This distributes the forces over a large area and is known as *snowshoe effect.*

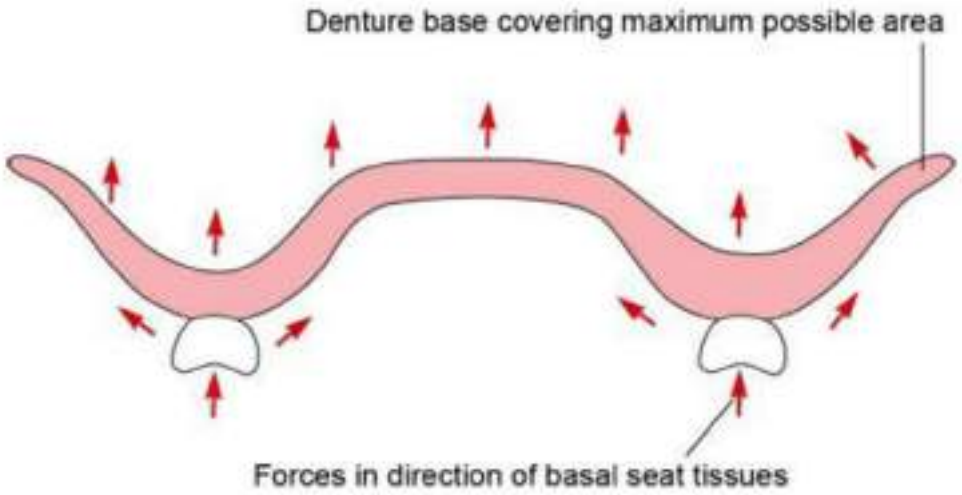


FIGURE 4.5 Forces distributed over a large area, by maximum extension of denture base, known as snowshoe effect.

Preservation of residual structures

- Preservation of remaining oral structures is vitally important to long-term success of the denture.
- Accurate impressions using a selective pressure impression technique that places pressure only on stress-bearing areas is important for this preservation.

Aesthetics

- Denture border and flange thickness are dependent on the amount of residual ridge loss and varies with each patient.
- Reducing or increasing the thickness of this area leads to poor aesthetics.
- Border moulding ensures adequate thickness in the region.

Biological considerations for maxillary impressions

For the harmony of living tissues and nonliving material (dentures) to coexist for reasonable periods of time, the dentist must fully understand both the macroscopic and microscopic anatomy of the supporting and limiting structures of the dentures.

It is convenient to regard the impression surface of a denture as comprising of two areas:

Basal seat areas:

Primary Stress-bearing areas

- Crest of the ridge

Secondary Stress-bearing areas

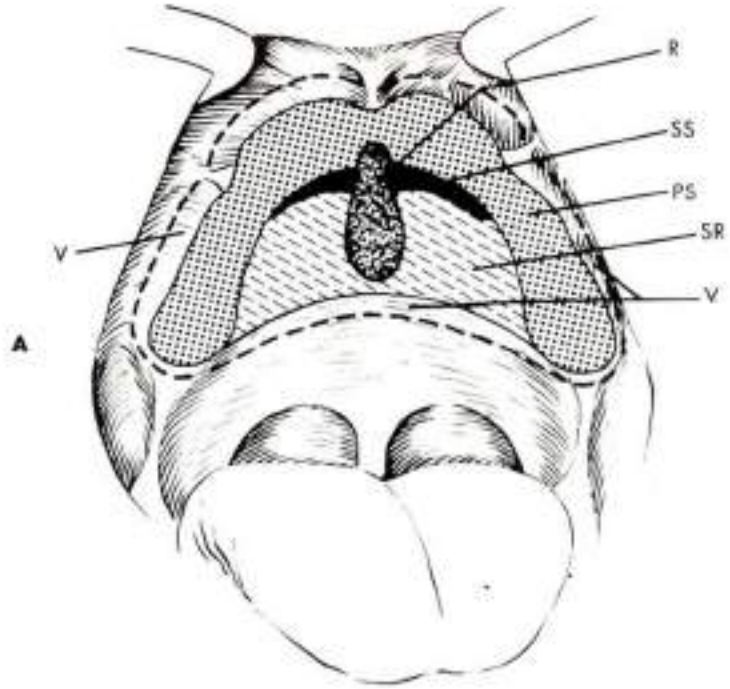
- Rugae area
- Slope of the ridge

Secondary retentive area

- Anterolateral part of the hard palate
- Posterolateral part of the hard palate

Relief area

- Incisive papilla
- Mid palative raphae
- Zygomatic process
- Sharp spiny process
- Torus palatinus



Maxillary Basal Seat Area

PS- Primary stress bearing area

SS-Secondary stress bearing area

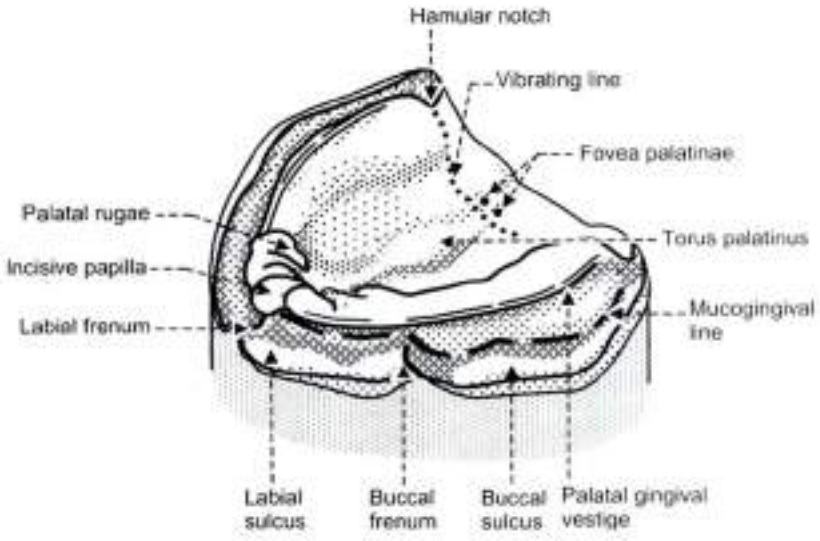
SR-Secondary retentive area

R – Relief area

V- Valve seal area

Peripheral or Limiting Areas :

1. Labial frenum
2. Labial vestibule
3. The Buccal frenum
4. Buccal vestibule
5. Hamular notch
6. Fovea palatina
7. Vibrating line



Surface Anatomy Of Upper Denture Bearing Area

MACROSCOPIC AND MICROSCOPIC ANATOMY OF SUPPORTING STRUCTURES

Residual ridge

(a) Crest of Residual Ridge
(b) Slope of the ridge

(a) Crest of Residual Ridge : -

Macroscopic Anatomy: - The shape and size of the alveolar ridges change when the natural teeth are removed, the resorption following extraction of the teeth is rapid at first, but it continues at a reduced rate throughout life.

- If the teeth have been out for many years, the residual ridge may become quite small, and the crest of the ridge may lack a smooth cortical bony surface under the mucosa. There may be large, nutrient canals and sharp bony spicules.

Microscopic Anatomy: -

- The mucous membrane covering the crest of the ridge in a healthy mouth is firmly attached to the periosteum of the bone by the connective tissue of the submucosa.
- The stratified squamous epithelium is thickly keratinized.
- The submucosa is devoid of fat or glandular cells and is characterized by dense collagenous fibers that are contiguous with the lamina propria.
- The submucosal layer, though relatively thin in comparison to other parts of the mouth, is still sufficiently thick to provide adequate resilience to support the denture.
- The outer surface of the bone in region of crest of the ridge is compact in nature being made of haversian system.

Applied Aspect:- This compact bone in combination with tightly attached mucous membrane makes it most favourable to provide primary support.

(b) Slope of the ridge:

- As the mucous membrane extends from the crest along the slop of the residual ridge to the reflection, it loses its firm attachment to the underlying bone and has non- keratinized or slightly keratinized epithelium.

- The sub-mucosa contains loos connective tissue and elastic fibers.

Applied Aspect: This loosely attached tissue at the slope of the ridge cannot withstand the force of mastication so less stress is placed on this tissue during the impression making.

Rugae Area

Macroscopic Anatomy

The rugae are irregularly shaped rolls of soft tissue in the anterior part of palate. In the area of the rugae the palate is set at an angle to the residual ridge and is rather thinly covered by soft tissue.

Applied aspect

The rugae area is considered to be the secondary stress-bearing area since it can resist the forward movement of the denture.The horizontal portion of the hard palate lateral to midline provides the primary support area for the denture.

Hard Palate

Macroscopic Anatomy

- The ultimate support for a maxillary denture is the bone of the two maxillae and the palatine bone.
- The palatine processes of the maxillae are joined together at the midline in the median suture.
- The two palatine processes of the maxillae and the palatine bone form the foundation for the hard palate and provide considerable support for the dentures. But more importantly, They support soft tissue that increase the surface areas of the basal seat.

Microscopic Anatomy

- Anterolaterally, the submucosa contains adipose tissue, and posterolaterally it contains glandular tissue.
- This tissue is displaceable, and should be recorded in the resting position.
- The epithilium is keratinized throughout.

Applied aspect

This tissue should be recorded in a resting condition because when they are displaced in the final impression they tend to return to normal form within the completed denture bases creating an unseating force on denture or causing soreness.

Incisive Papilla

Macroscopic Anatomy:-

- The incisive papilla covers the incisive foramen, which is situated on a line immediately behind and between the central incisors.
- It comes to lie nearer to the crest of the ridge as resorption progresses.
- Thus the location of the incisive papilla gives an indication as to the amount of resoption that has taken place.

Microscopic Anatomy:-

The incisive papilla covers the incisive foramen, the opening of the nasopaltine canal, which carries the nasopalatine vessesls and nerve.

Applied aspect:-

Relief for the incisive papilla should be provided in every denture to avoid any possible interference with the blood and nerve supply.

Mid-Palatine Raphae

Macroscopic Anatomy:-

The center of the palate may be very hard because the layer of soft tissues covering the bone in the region of the median palatal suture is extremely thin.

Applied aspect:-

- The hard palate is less resilient in this area and should be relieved to prevent a tendency of the denture to rock or the development of soreness in this region when vertical forces are applied to the teeth.

- The relief for the median palatal suture and its overlying raphae can be developed in impression making or denture-processing procedure or after the denture has been completed.

Maxillary Tuberosity

Macroscopic Anatomy:-

The tuberosity region can hang down abnormally low because, when the maxillary posterior teeth are retained after the mandibular molars have been extracted and not replaced, the maxillary teeth overerupt, bringing the process with them.

Microscopic Anatomy:-

The bone in the tubertosity may often be covered by thick fibrous connective tissue.

Applied Aspect:-

This excess tissue can prevent proper location of the occlusal plane and may interfere with the lower denture, if it is not surgically removed.

Zygomatic Process

The zygomatic or malar, process, with is located opposite the first molar region,is one of the hard areas found in mouths that have been edentulous for a long time.

Applied Aspect:-

Some denture require relief over this area to aid retention and prevent soreness of the underlying tissues.

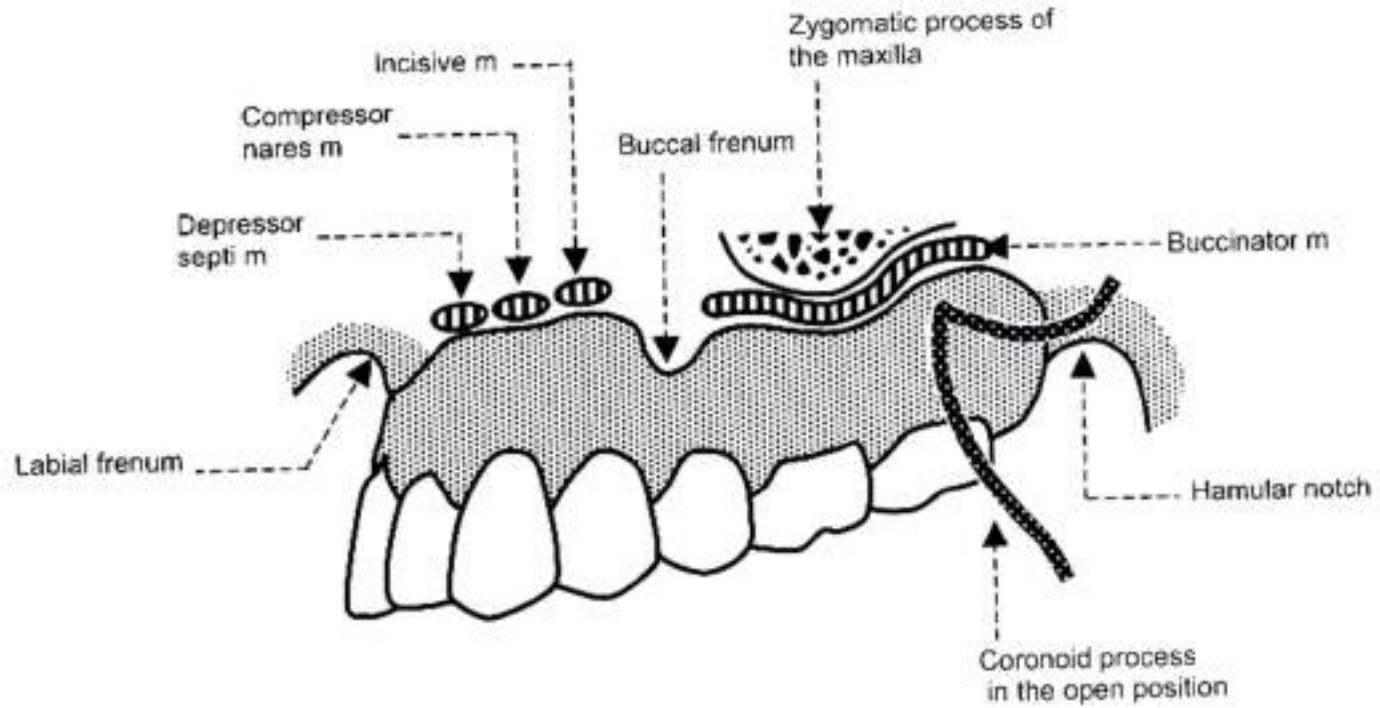
Sharp Spiny Processes & Torus Palatinus

- Frequently, there are sharp, spiny processes on the maxillary and palatine bones.
- The posterior palatine foramina often have a sharp spiny overhanging edge that may irritate the covering soft tissue as a result of pressure from the denture.
- In individuals with considerable resorption of the residual ridge, these sharp spines can irritate the soft tissue left between them and the denture base.
- Torus palatinus is a hard bony enlargement that occurs in the midline of the palate.
- It is covered by a thin layer of mucous membrane that is easily traumatized by denture base.

Applied Aspect:-

- Relief is provided on sharp spiny processes if required.
- Relief is provided on torus palatinus exactly conforming to its shape.

MACROSCOPIC AND MICROSCOPIC ANATOMY OF PERIPHERAL OR LIMITING STRUCTURES



The Peripheral Anatomical Relation Of The Upper Denture

Labial Vestibule & Labial Frenum

Macroscopic Anatomy:-

- Labial vestibule runs from one buccal frenum to the other on the labial side of the ridge.
- The labial vestibule is divided into a left and right labial vestibule by the labial frenum, which is a fold of mucous membrane at the median line.
- It contains no muscle and has no action of its own; it starts superiorly in a fan shape and converges as it descends to its terminal attachment on the labial side of the ridge.
- The labial notch in the labial flange of the denture must be just wide enough and just deep enough to allow the frenum to pass through it without manipulation of the lip.

Microscopic Anatomy:-

- The mucous membrane lining the labial vestibule has a relatively thin mucosa, with an epithelium that is nonkeratinized.

- The submucosal layer is thick and contains large amounts of loose areolar tissue and elastic fibers.

- It is normally devoid of a keratinized layer and is freely movable with the tissues to which it is attached because of the elastic mature of the lamina propria.

Muscle Of The Lip

- The main muscle of the lip, which forms the outer surface of the labial vestibule, is the orbicularis oris.

- Its tone depends on the support it receives from the labial flange and the position of the teeth.

- The fibers of the orbicularis oris pass horizontally through the lips and anastomose with the fibers run in a horizontal direction, the orbicularis oris has only an indirect effect on the extent of an impression and hence on the denture base.

Buccal Frenum

The buccal frenum forms the dividing line between the labial and buccal vestibules. It is some times a single fold of mucous membrane, some times double, and in some mouths, broad and fan shaped.

Muscle Attachment

The levator anguli oris muscle attaches beneath the frenum and consequently affects the position of the frenum.

The oribuclaris oris pulls the frenum forward.

The buccinator pulls it backward.
Hence, it requires more clearance for its action than the labial frenum does.

Buccal Vestibule

Macroscopic anatomy:-

The buccal vestibule lies opposite the tuberosity and extends from the buccal frenum to the hamular notch.

The size of the buccal vestibule varies with the contraction of the buccinator muscle, the position of the mandible, and the amount of bone lost from the maxilla.

Microscopic anatomy:-

The mucolus membrne lining the buccal vestibule has a relatively thin mucosa, with an epithelium that is non-keratinized.

The submucosal layer is thick and contain large amount of loose areolar tissue and elastic fibers.

Applied aspect:-

- The size and shape of the distal end of the buccal flange of the denture must be adjusted to the ramus and the coronoid process of the mandible and to the masseter muscle.

- When the mandible moves forward to the opposite side the width of the buccal vestibule is reduced.

- When the masseter muscle contracts under heavy closing pressures, it reduces the size of the space available for the distal end of the buccal flange.

- The extent of the buccal vestibule can be deceiving because the coronoid process obscures it when the mouth is opened wide.

- Therefore, it should be examined with the mouth as nearly closed as possible. This space usually is higher than any other part of the border.

Pteryo Maxillary (Hamular) Notch

Macroscopic Anatomy:-

The hamular notch, which forms the distal limit of the buccal vestibule, is l situated between the tuberosity and the hamulus of the medical pterygoid plate.

Microscopic Anatomy:-

The mucous membrane of the hamular notch consists of a thick submucosa made up of loose areolar tissue.

Applied Aspect:-

- This tissue, in the center of the deep part of the hamular notch, can be safely displaced by the posterior palatal border of the denture to help achieve a posterior palatal seal.

- Overextension at the hamular notches will not be tolerated because of pressure on the pterygoid hamulus and interference with the pterygomandibular raphe, which extends from the hamulus to the top inside back corner of the retromolar pad in the madible.

- When the mouth is opened wide, the pterygomandibular raphe is pulled forward. if the denture extends too far into the hamular notch, the mucous membrane covering the raphe will be traumatized.

Palatine Fovea

The fovea paltinae are indentations near the midline of the palate that are formed by a coalescence of several mucous gland ducts.

Applied Aspect:

The foveae are dose to the vibrating line and are always in soft tissue. Which makes them an ideal guide for the location of the posterior border of the denture.

Vibrating Line

- The vibrating line is an imaginary line drawn across the palate that marks the beginning of motion in the soft palate when an individual says "ah". It extends from one hamular notch to the other.

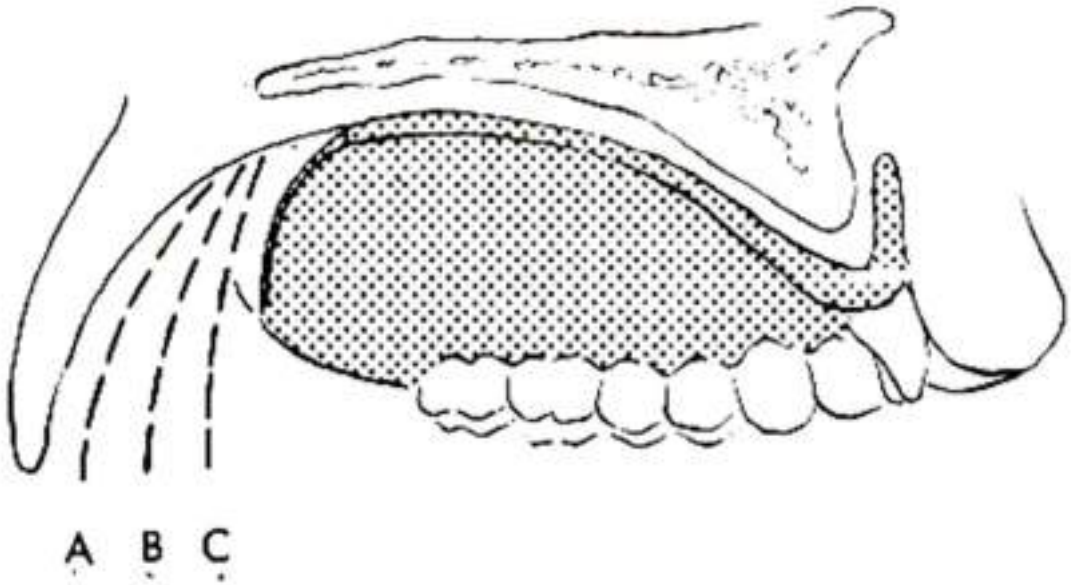
- At the midline, it usually passes about 2 mm in front of the fovea palatinae.

- The vibrating line is not to be confused with the junction of the hard and soft palate, because the vibrating line is always on the soft palate.

- It is not a well- defined line and should be described as an area rather than a line.

- The direction of the vibrating line usually varies according to the shape of the palate palate, the higher the vault, the more abrupt and foreward the vibrating line.

- In a mouth with a flat vault, the vibrating line is usually farther posterior and has a gradual curvature, affording a broader posterior palatal seal area.



A. Type of soft palate form that allows broad PPS
B. Type of soft palate form that allows medium PPS
C. Type of soft palate form that allows narrow PPS

Microscopic Anatomy

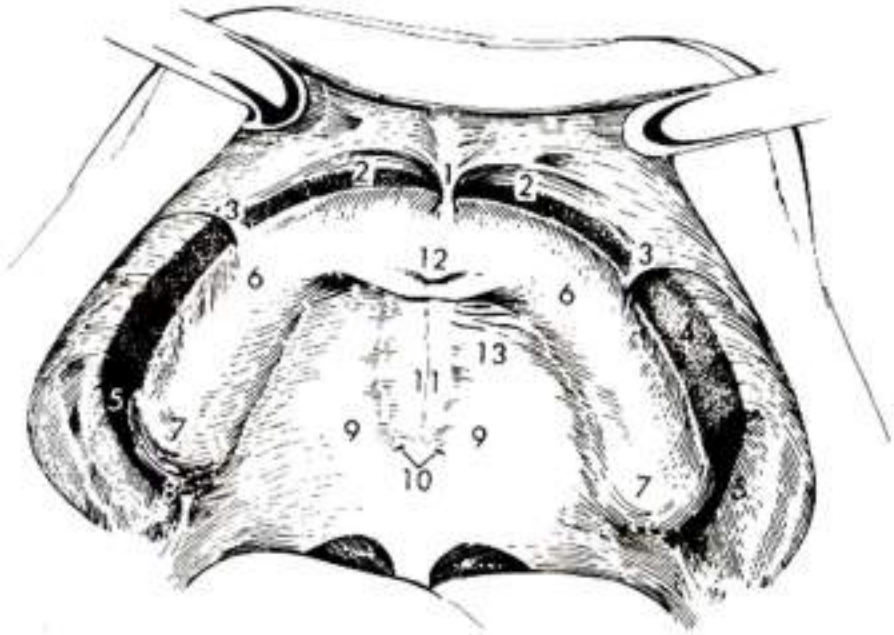
The submucosa in the region of the vibrating line contains glandular tissue similar to that in the submucosa in the posterolateral part of the hard palate.

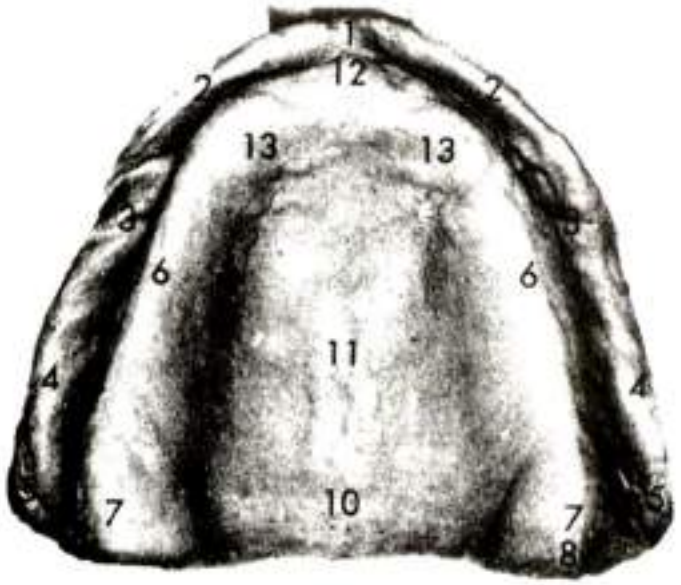
Applied Aspect

- The distal end of the denture should extend at least to the vibrating line. In most instance, it should end 1 to 2 mm posterior to the vibrating line.

- Because the soft palate does not rest directly on bone, the tissue for a few millimeters on either side of the vibrating line can be repositioned in the impression to improve the posterior palatal seal.

Interpreting anatomic landmarks as seen in maxillary impression



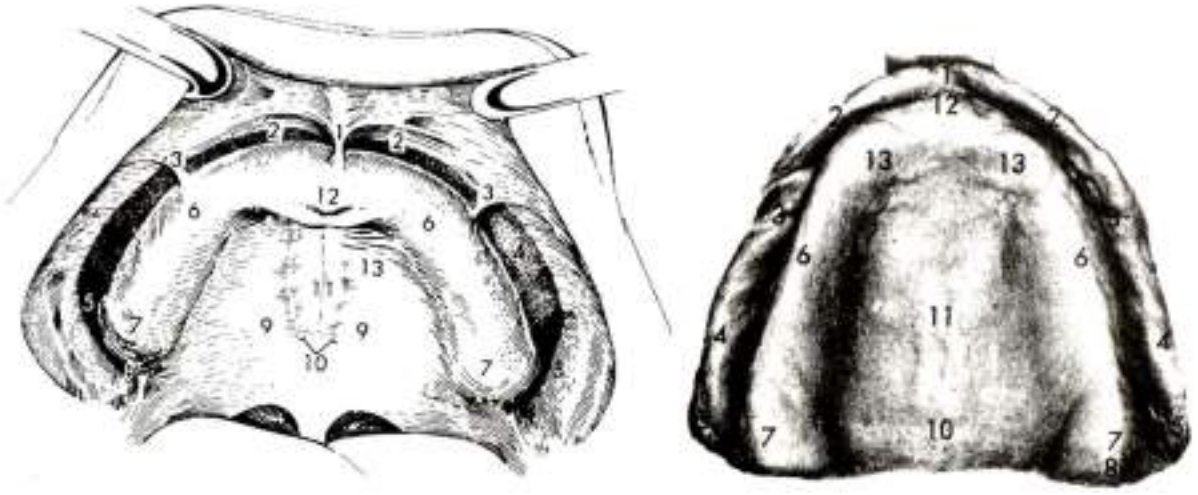


1 & **3** **Labial and Buccal frenum** appears as notches.

2 & 4 **Labial and Buccal vestibule-** Mucous membrane reflection in the labial & buccal vestibule are responsible for the impression being turned out toward the lips & cheeks. The reflections are smooth.

5 **Coronoid bulge-** If the patient is allowed to open wide, protrude and go into lateral movements ; the distobuccal flange in the distobuccal vestibule will be contoured by the anterior border of the coronoid process.

6 **Residual ridge** forms the alveolar groove.



7 **Maxillary tuberosity** produces a depression at the distal ends of the alveolar groove.

8 **Hamular notch**- If an extreme opening is allowed in making the impression, thepterygo-mandibular ligament will form an anteroposterior notch distal to the alveolar tubercles.

9 **Posterior palatal seal**

10 **Fovea palatina** usually form two small raised dots in the impression.

11 The **Median palatine raphae** forms an irregular groove anteroposteriorly in or near the middle of the vault.

12 The **incisive papilla** appears as a small round depression.

13 **Rugae** appear as small groove much the branches from a tree.

REQUISITES OF IDEAL IMPRESSION

The following concepts incorporated in any impression procedure will enhance the retention, stability, and support of a denture (which are all interrelated features) :

1. The impression extends to include all of the basal seat within the limits of the health and functions of the supporting and limiting tissues.

2. The boarders are in harmony with the anatomic and physiologic limitations of the oral structures.

3. A physiologic type of border-molding procedure is performed by the dentist or by the patient under the guidance of the dentist.

4. Proper space for the selected final impression material is provided within the impression tray.

5. Selective pressure is placed on the basal seat during the making of the final impression.

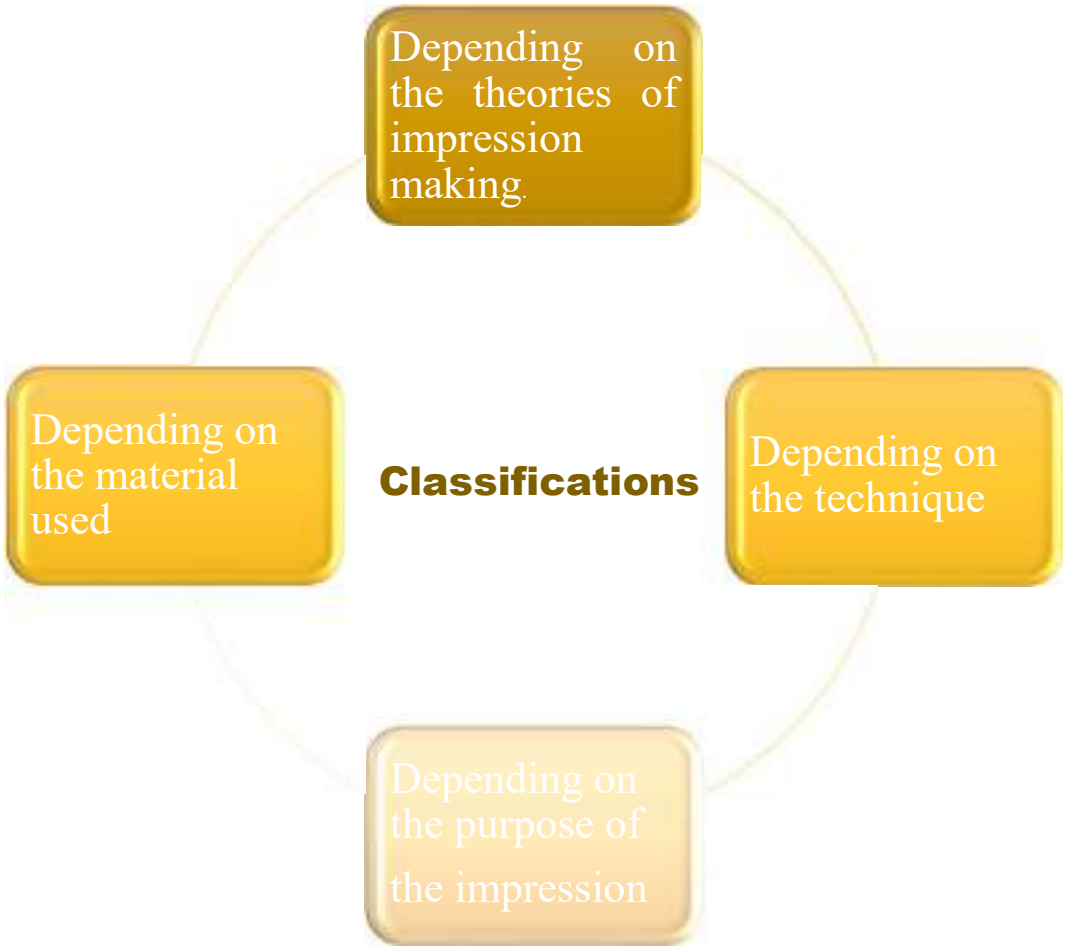
6. The impression can be removed from the mouth without damage to the mucous membrane of the residual ridge.

7. A guiding mechanism is provided for correct positioning of the impression tray in the mouth.

8. The tray and final impression are made of dimensionally stable materials.

9. The external shape of the final impression is similar to the external form of the completed denture.

Classifications of impressions



Depending on purpose of impression making

Diagnostic impression

- This is an impression made for the purpose of diagnosis, treatment planning and fabricating diagnostic casts .
- Materials used for diagnostic impressions – irreversible hydrocolloids.

Primary/Preliminary impression

- This is made for the purpose of making a preliminary cast on which a special tray is constructed.
- Materials used for making preliminary impressions – irreversible hydrocolloids, impression compound, putty and heavy body elastomeric impression materials.

Final/Secondary/Master impression

- This is made for the purpose of fabricating a master cast, on which the prosthesis is fabricated.
- Materials used for final impressions—zinc oxide eugenol (ZOE) impression paste, impression plaster, medium and light body elastomeric impression materials.

Depending on the amount of pressure applied (theories) impression making

Selective pressure technique

- These are made in trays that have more space in them for the final impression material in some places than in others.
- The places that have less space or relief will transmit more pressure from the denture in function to favorable parts of the bone and less pressure to unfavorable parts.
- This principle of impression making is based on the belief that the mucosa over the ridge is best able to withstand pressure whereas that covering the midline is thin and contains very little sub-mucosal tissue.
- It must be emphasized that this technique demands firm, healthy mucosal covering over the ridge.

Advantage

- The advantage of this group is its aim of achieving the required retension within the physiologic limits of tissue tolerance.
- It complies the biological as well as the physical factors of impression procedure.

Disadvantage

- The disadvantage of this group is the slight and unavoidable amount of tissue loss which follows slowly.
- The group of technique is well suited to eases with healthy, well formed ridges and is the most recommended of all techniques.

Pressureless or Minimal Pressure technique (Mucostatic Impressions)

- These are made with the least possible displacement of soft tissues covering the residual alveolar bone.
- They incorporate a large amount of space between the tray and the soft tissues of the basal seat and consequently require a very fluid type of impression material.
- This group has regarded adhesion by contact as a safer means of achieving retention rather than by atmospheric pressure obtained by muscle trimming and postdam.
- This technique is based on the principle of safeguarding the health of the denture supporting tissues by obtaining accurate tissue adaptation for adhesion.

- This technique is also referred to as mucostatic impression (as called by **Addision** 1944) as it records the ridge tissues in its passive form. It covers only that portion of the denture bearing areas where the mucosa is rigidly supported by bone.

- This technique is suited to those cases where the residual ridges are sharp, thin, flat or unhealthy and which cannot take up the normal load.

- Henry Page states that all soft tissues are comparable to fluid and so behave according to **Pascal's law** i.e. the soft tissues are confined under a dentures so that when pressure is applied to the denture it is transmitted undiminished in all directions.

- However the disadvantage of this is that stresses will not be distributed as broadly over the basal seat and that tissues health and dentures retention may be compromised.

- This technique advocated no flanges. However in 1947 Dykins recommended a short flange in order to resist lateral displacement.

Disadvantages:

- Produces overextended impressions.
- As the tissues are recorded in a compressed state, due to the rebound phenomenon of the oral tissues, there are chances that the dentures will dislodge when not in function (compression) – at rest or speaking.
- Increased residual ridge resorption is seen as the ridges are constantly under pressure from the overlying dentures.
- As the tissues are uniformly compressed, pressure is also transmitted to areas that are not capable to withstanding the stress.
- This often results in good initial retention but eventual resorption and loose dentures.

Definite Pressure, Pressure technique: Muco compressive technique

- Because denture retention is tested most severely during mastication, many dentists formerly considered it essential for the tissue to remain in contact with the denture during chewing.
- It appeared logical to them to make impressions that would press the tissues in the same manner as chewing forces, thus ensuring contact during the chewing strokes.
- However dentures made from such impressions did not fit well at rest because tissues so distorted tend to rebound.
- Many of the proponents of pressure impressions advocate the use of the closed mouth technique. Supposedly the patient can exert his own particular masticatory force on the impression material.

- Aside from the disadvantage of pressure impressions mentioned above, the closed mouth techniques do not allow for adequate muscle trimming of the periphery.

- Mac Millan (1947) stated that these impression techniques are the only one capable of adequately trimming the lingual borders of the lower denture.

- This statement is based on the belief that tongue movements are more forceful when the teeth are together than when the mouth is opened and the tongue is protruded.

- The C.M. theory believes that the peripheral tissues are different from the supporting tissues and must be recorded in a position that will cause the least interference with the denture so that it will form a peripheral seal rather than a displacing force.

- The rationale of this techniques is that the supporting tissues are recorded in a functional relationship. Here a pressure similar to that of mastication is created by the use of occlusion rims.

- A uniform contact of these rims will help eliminate the possibility of uneven pressure.

- Pressure impressions are those made in trays in which no space has been made for the final impression or those made with a material that has a very sluggish flow such as modelling compound wax.

- Drawback of this technique is that patients co-operation is required to carry out the various functional movements. Pressure may limit the blood supply of the hard and soft tissues and cause resorption.

Depending on impression technique

Open mouth

- This records the oral tissues in a static state with displacement.
- The amount of displacement depends on the ability of the different oral tissues to withstand pressure, the amount of space provided for the impression material and the consistency of the impression material.
- With the patient's mouth in open position, the dentist applies controlled pressure on the inserted tray to record the tissues in a static form.

Disadvantages:

- The tissues are not recorded in a functional state.

Closed mouth

- In this technique oral mucosa is recorded in a functional, compressed form. It is assumed that the occlusal loading during impression making is comparable to occlusal loading during function.
- Occlusal rims or teeth are attached to the impression trays and impression is recorded, while patient applies pressure and performs functional actions like swallowing, grinning or pursing the lips.
- Thus, the peripheries of the dentures are established during function.

- Impression materials used for this technique are waxes and soft liners.

- Indicated for atrophic ridges.

Disadvantages:

- Difficult to control the amount of pressure leading to pressure spots.
- Even occlusion is essential for recording, which may be difficult to establish.
- Can produce distorted impressions.

Depending On the Impression materials

Impression material that harden by chemical reaction are:

1. Plaster of Paris
2. Zinc oxide-eugenol paste
3. Irreversible hydrocolloid alginate
4. Rubber base impression material
    a. Polysulfide
    b. Addition silicon
    c. Condensation silicon
    d. Polyether

Thermo-plastic impression material:

Reversible hydrocolloid:- Agar-agar

Impression waxes

Ideal Requirements of impression matterials

1. Should be fluid enough to adapt to the oral tissues and viscous enough to remain content in a tray.

2. While in the mouth they should transform into a rubbery solid in a reasonable amount of time.

3. The set impression should not distort or tear when removed from the mouth. Material should remain dimensionally stable so that the cast can be poured.

4. Be capable of having additions made and of reinsertion in the mouth without distortion.

5. Be non injurious, non poisonous and non irritant.

6. Have a simple technique

Materials used for preliminary Impression

(a) Modeling compound.
(b) Irreversible hydrocolloid.

Modeling Compound

Modeling compound is a thermo plastic material composed of gum dammar, prepared chalk and other materials.

Types of Impression Compounds :-

-High fusing impression compound also called tray material which is used to make impression of edentulous ridge.

-Low fusing impression compounds used for border moulding of an acrylic custom tray.-available in cake form and stick form.

Advantages

- It can be used for compressing soft tissues.
- It can be added to and readapted.
- It can be used for any technique requiring a closed peripheral seal.

Disadvantages

- Failure to attain a complete hardening of the material before withdrawing the impression can result in a severe distortion of the impression.
- Linear contraction of impression compound on cooling from mouth temp to room temp varies between 0.3% to 0.4%.

- Relaxation can occur quite readily either during a comparatively brief time or with an increase in temperature resulting in warpage or distortion of impression.

- To minimize distortion the safest procedure are to allow thorough cooling of the impression before removal from the mouth and construct the cast or die as soon as possible after impression has been obtained at least within first hour.

Irreversible Hydrocolloids

- Irreversible hydrocolloids are those in which the sol is changed to gel by chemical reaction.
- The sol form is a soluble salt of alginic acid and gel is an insoluble salt.

Advantages -

- Simplicity of equipment needed.
- Ease of manipulation.
- Little discomfort to the patient.
- Short chair time.
- Accurate reproduction of undercut areas.

Disadvantages-

- The alginate deteriorate rapidly at elevated temp.
- If impression immersed in water swelling will occur by imbibition.
- When impression is exposed to air at room temp shrinkage occurs with syneresis and evaporation.

Materials used for Final Impression

Impression material that harden by chemical reaction are:

1. Plaster of Paris
2. Zinc oxide-eugenol paste
3. Irreversible hydrocolloid alginate
4. Rubber base impression material
   a. Polysulfide
   b. Addition silicon
   c. Condensation silicon
   d. Polyether

Thermo-plastic impression material:

1. Reversible hydrocolloid:- Agar-agar
2. Impression waxes

Plaster of Paris

- Plaster of paris, a gypsum product, to which modifiers have been added to regulate the setting time and control the setting expansion is used in impression making.

- Some impression plasters are flavoured or coloured.

- Sometimes potato starch is added to make them more soluble. Plaster of paris is more frequently used in an individualized tray of modeling composition or acrylic resin as a refining "wash".

Advantages:

1. Minimal tissue distortion
2. Accurate record of tissue detail
3. Quick flow
4. Absorption of palatal secretions during set
5. Speedy handling
6. Easy manipulation.

Disadvantages:

1. The pores in the plaster must be sealed before stone is poured in the impression to form the cast. The sealing of these pores obliterates some of the detail and sometimes results in inaccuracies.

2. The possibility of warpage in the palatal position if the plaster is used in an impression tray that will not allow the plaster to expand in the flange areas during setting.

3. Plaster is brittle and subject to breakage, therefore, it is not suitable for reinserting to adjust or check for the accuracy of fit.

4. Saliva washes the material and distorts the surface when a mandibular impression is made.

5. Although plaster of paris is easy to manipulate, it is untidy to handle.

6. .The resulting dehydration of the tissues allows the plaster to cling tightly to the tissues, and the impression may be inaccurate.

7. The separation of stone cast from the impression is tedious and time-consuming.

8. Plaster of paris will not record undercuts without breaking upon removal from the mouth.

Zinc oxide-eugenol paste

The basic composition of the zinc oxide-eugenol paste impression materials is zinc oxide and eugenol. Plasticizers, fillers, and other additives are incorporated to alter certain properties such as smoothness of mix, adhesiveness, hardness when set, and setting time.

Advantages:

1. Fluidity aids accurate recording of tissue detail.

2. Minimal tissue distortion results when the paste is allowed to flow with minimal pressure applied.

3. Ready flow.

4. Speed of handling.

5. Ease in beading and boxing for pouring a cast and in separating from the cast.

6. No significant dimensional change subsequent to hardening.

Disadvantages:

1. The setting time is not easily controlled by inexperienced operators.

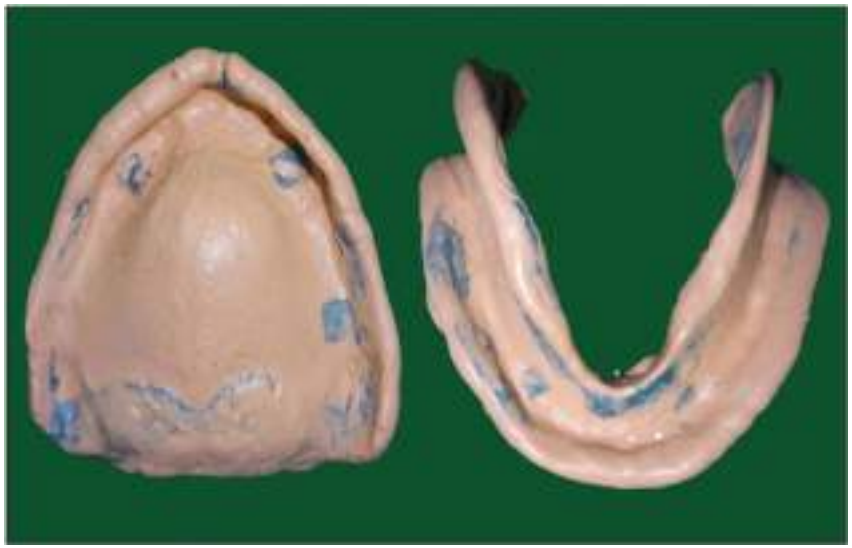
2. Temperature and humidity influence the setting time.

3. The paste does not absorb the secretions in the palate, and therefore if the secretions are profuse, distortion results.

4. It is untidy to handle.

5. Difficult to control at the borders.

6. May distort when removed from undercuts.



Reversible hydrocolloid

The reversible hydrocolloid is an impression material made from agar-agar. Hydrocolloid sols possess the property of changing to gels under certain conditions. The application of heat to a reversible colloidal gel returns the gel to sol condition. When the sol is cooled, it returns to the gel.

Advantages:

1. It has good elastic properties and reproduces most undercut areas correctly.
2. It has good recovery from distortion.
3. As it is not hydrophobic, it gives good model surface.
4. It is palatable and well tolerated by the patient.
5. It can be reused.

Disadvantages:

1. Gels are invariably subject to changes in dimension by syneresis and imbibition.
2. They are also easily distorted as a result of movement during the gelation period.
3. A rapid cooling may cause a concentration of stress near the tray during gelation; the releasing of this stress after removal from the mouth results in distortion.
4. Distortion may also result from varying thickness of material during gelation.
5. The reversible hydrocolloid requires special water-cooled trays and equipment, and the tray must be held rigidity in place during gelation.
6. The gel is not easy to manipulate, and beading and boxing are difficult.


Ticonium
TICOGEL
Hydrocolloid

Impression wax

The low fusing impression waxes are not sufficiently accurate for a final impression for complete dentures. As a corrective material for a small area and as a border refining material for a tray, they are extremely satisfactory.

Tissue conditioning material

Composition of individual conditioning material is not available, reports indicate that the liquids contain carboxylic esters or ethanol.

The powders are acrylic resin polymers. They are resilient and continue to flow under stress for periods of upto 24 hours.

They are useful for making functional impressions that record the basal seat and border tissues in their functional state.

Elastomeric impression material

Polymers of rubber base impression material are mixed with suitable fillers to a paste consistency. In making an impression, this paste is cured to a semi-solid rubber by combining it with a suitable catalyst.

Advantages:-

1) Rubber impression material accurately reproduce hard objects.
2) Dimensionally stable for about an hour.
3) Does not affect the hardness of the surface of stone.
4) Easy and tidy to handle.
5) Pleasant odour and colour.
6) Records undercuts accurately.

Disadvantages:-

1. The tray must be held rigidly for accuracy for from 8-12 min for setting.

2. Proper mixing is essential, if mass is not homogeneous the impression will distort.

3. Ratio of material is critical if it is not accurate the mechanical properties may change.

4. Complete adhesion to a prefabricated tray is essential, it necessitates use of tray adhesive.

The **polysulfide** are particularly useful for making impression of the high mandibular ridges with soft tissue undercuts.

The **polyether impression materials** are suitable to be used for single step border molding procedures because:-

- Have sufficient body is make up discrepancies between tray borders and the reflective vestibular tissues of upto 4 or 5 mm.

- Can be shaped by the fingers and

- Are accurate in reproducing details.

Disadvantage : Since these materials are opaque, it is more difficult to detect pressure spots in the impression.


Aquasil
Soft Putty/Regular Set