

Retention, stability and support of complete denture

Outcome of complete denture treatment depends largely, on the degree of retention and stability and support of the dentures. Good retention causes the denture to remain in place when the jaws are apart, as in laughing and speaking. Good stability prevents the dentures from skidding when the jaws are brought together, as in chewing or swallowing. Good support prevents the dentures from sinking toward the tissue under load of mastication.

Retention: Is the quality of a denture that resists movement away from the tissue.

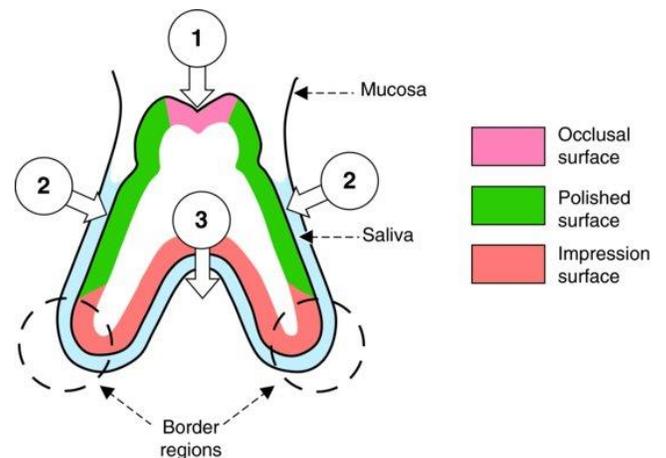
It is checked by firmly seating the denture in the mouth and trying to displace it with force at right angle to its occlusal surface, if the denture resist displacement it is said that it has retention.

There are three principal surfaces concerned in retention and stability of the denture:

1. Occlusal surface: that surface of a denture which makes contact or near contact with the corresponding surface of the opposing denture or dentition.
2. Polished surface: that portion of the surface of a denture which extends in an occlusal direction from the border of the denture and which includes the palatal surface. It is that part of the denture base which is usually polished, includes the buccal and lingual surfaces of the teeth, and is in contact with the lips, cheeks and tongue.
3. Impression surface: that portion of the surface of a denture that had its shape determined by the impression. It includes the borders of the denture and extends to the polished surface.

Retaining forces acting on a denture:

- (1) Force of the muscles of mastication acting through the occlusal surface.
- (2) Muscular forces of lips, cheeks and tongue acting through the polished surface.
- (3) Physical forces acting through the impression surface.



Factors effect on retention:

I. Muscular factor: These forces are exerted by the muscles of the lips, cheeks and tongue upon the polished surface of the denture and by the muscles of mastication indirectly through the occlusal surface. The successful muscular control of dentures depends on two factors:

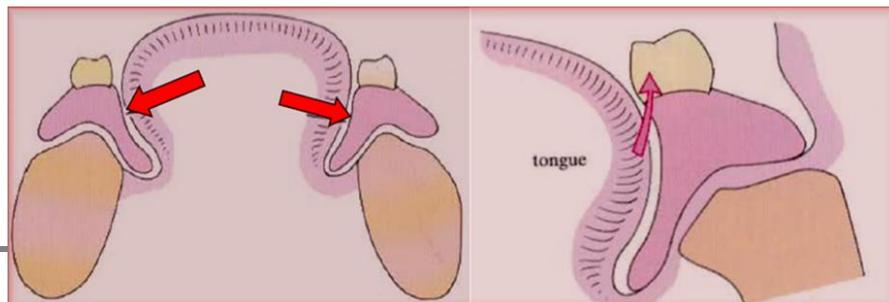
a. The design of the dentures: The oral and facial musculature supply supplementary retentive forces, provided:

1. The denture bases must be properly extended to cover the maximum area possible, without interfering in the health and function of the structures that surround the denture.

2. The polished surfaces of the dentures are properly shaped. The buccal flanges of the maxillary denture slope up and out from the occlusal surfaces of the teeth and the buccal flanges of the mandibular denture slope down and out from the occlusal plane, the contraction of the buccinators will tend to seat both dentures on their basal seats. The lingual surfaces of the lingual flanges should slope toward the center of the mouth so the tongue can fit against them and perfect the border seal on the lingual side of the denture. For Orbicularis oris muscle if we did not give the lower labial flange the correct thickness and shape (concave) to receive this muscle, it will try to dislodge the denture.

3. Occlusal plane is the average plane established by the incisal and occlusal surfaces of the teeth; it is not a plane but represents the planar mean of the curvature of the surfaces. The occlusal plane must be at the correct level; externally should it be with the relaxed lower lip level or with commissures of lips and internally with the lateral border of the tongue and slightly below the superior portion of the tongue. The position of occlusal plane in denture wearers should be as close as possible to the plane, which was previously occupied by the natural teeth. Such position of the occlusal plane provides normal function of the tongue and cheek muscles, thus enhancing the denture stability

4. The arch form of the teeth must be in the "neutral zone" between the tongue internally and the cheeks and lips externally. Conversely an incorrectly shaped denture results in the muscular force dislodging that denture. In short, the muscles can either help or hinder denture stability and retention.



b. Patient's skill: The patient's ability to acquire the necessary skills to control new dentures is related to biological age. In general, the older the patient, the longer the learning period. In the extreme case, the elderly or senile patient may not be able to acquire this skill at all and so new dentures may fail even though they are technically satisfactory. It is for this reason that replacement dentures for an older patient should be constructed in such a way that the patient's skill in controlling the previous denture shapes can be transferred directly to the replacements. This is achieved by *copying the old dentures* as closely as possible. When dentures are first fitted, muscular control takes some time to develop and is therefore likely to be inefficient. Thus, it is during this initial learning period that the physical forces of retention are particularly important.

II. Physical factor:

1. Interfacial force: is the resistance to separation of two parallel surfaces that is imparted by a film of liquid between them. These forces act to keep the denture inside the patient's mouth because of thin film of saliva between the denture and mucosa. Interfacial forces depends on:

a. Interfacial surface tension: is the tension or resistance to separation possessed by the film of liquid between two well adapted surfaces. This acts with the air-liquid interface acting between two surfaces where a thin film of liquid holds the surfaces on the either sides. Thin film of saliva resists the displacing forces, and this aids in retention.

It is dependent on the ability of the fluid to "wet" the rigid surrounding material. For retention to happen effectively, there needs to be a thin film of saliva, and as there is excess saliva in the borders of a mandibular denture, there is minimal interfacial surface tension seen.

Wettability: Wetting is the ability of a liquid to maintain contact with a solid surface, resulting from intermolecular interactions when the two are brought together. If the surrounding material has low surface tension, as oral mucosa does, fluid will maximize its contact with the material, so wetting it readily and spreading out in a thin film. If the material has high surface tension, fluid will minimize its contact with the material, with the result that it will form beads on the material's surface. Most denture base materials have higher surface tension than oral mucosa, but once coated by salivary pellicle they display low surface tension that promotes maximizing the surface area between liquid and base.

- ❖ The wetting characteristics may be described in terms of contact angle (high contact angle indicate poor wetting).

Capillary action, or capillarity: is the ability of a liquid to flow against gravity where liquid spontaneously rises in a narrow space such as a thin tube, or in porous materials such as paper. Is the penetration of liquids into narrow crevices, is what causes a liquid to rise in a capillary tube, because in this physical setting the liquid will maximize its contact with the walls of the capillary tube. When the adaptation of the denture base to the mucosa on which it rests is sufficiently close, the space filled with a thin film of saliva acts like a capillary tube in that the liquid seeks to increase its contact with both the denture and the mucosal surface in this way, capillarity will help to retain the denture. Surface tension at the periphery of the saliva film will produce a slight negative pressure beneath the denture.

b. Interfacial viscous tension: refers to the force holding two parallel plates together that is due to the viscosity of the interposed liquid. The viscous force increases proportionally to increases in the viscosity of the interposed fluid, and decreases as the distance between the plates (i.e., the thickness of the interposed medium) increases.

The interfacial viscous tension depends on saliva viscosity. Thick, high-mucin saliva is more viscous than thin watery saliva—but do not result in increased retention for the watery serous saliva can be interposed in a thinner film than the more cohesive mucin secretions.

- ❖ To obtain maximum interfacial surface tension: 1. Saliva should be thin and even
- 2. Perfect adaptation should be present between the tissues and denture
- 3. The denture base should cover a large area.

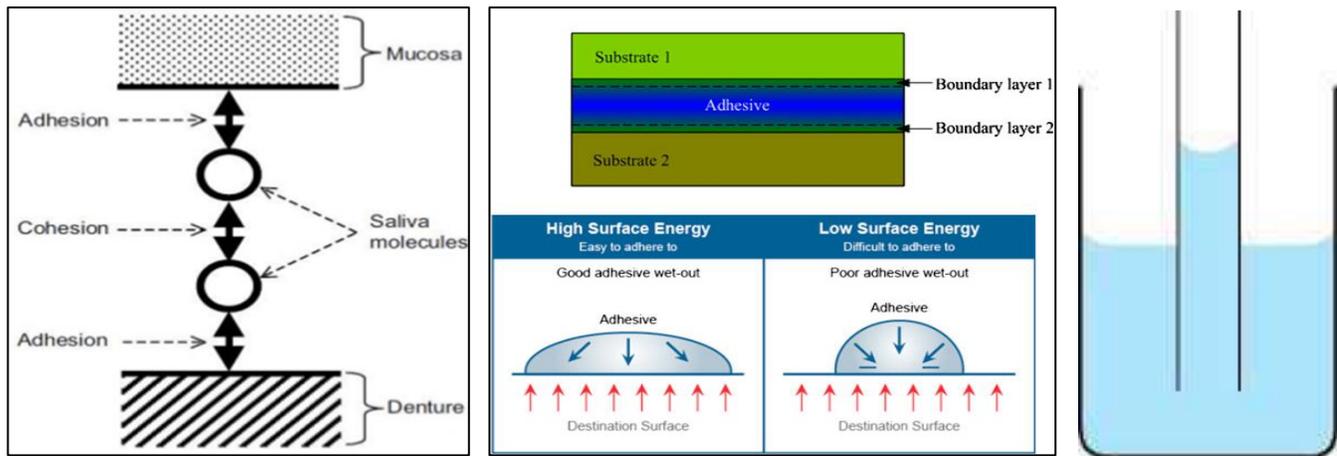
2. Adhesion: is the physical attraction of unlike molecules for each other. Adhesion of saliva to the mucous membrane and the denture base is achieved through ionic forces between charged salivary glycoproteins and surface epithelium or acrylic resin. By promoting the contact of saliva to both oral tissue and denture base, adhesion works to enhance further the retentive force of interfacial surface tension.

The most adhesive saliva is thin serous but contains some mucous components. Thick and ropy saliva is very adhesive but tends to build up so that it is too thick in palatal area and interferes with oral adaptation, in this situation patient should rinse out ropy saliva every two or three hours.

- ❖ The amount of retention provided by adhesion is depend on: Close adaptation of the denture base, type of saliva (viscosity and wet ability) and Area cover by the denture.

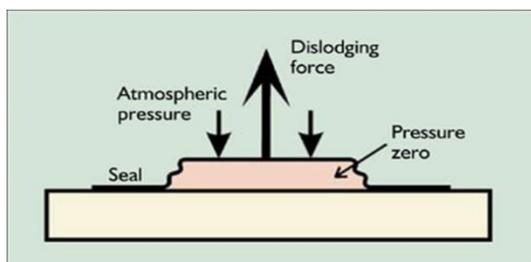
3. Cohesion: is the force of attraction between like molecules, which maintains the integrity of the saliva film. It occurs within the layer of fluid (usually saliva). That is present between the denture base and the mucosa, and works to maintain the integrity of the interposed fluid. Normal saliva is not very cohesive, so that most of the retentive force of the denture-mucosa interface comes from adhesive and interfacial factors unless the interposed saliva is modified as it can be with the use of denture adhesive.

- ❖ Factor affecting cohesion: Area covered by the denture, Thickness of the salivary film, Adaptation to denture base to mucosa, Interfacial surface tension.



4. Atmospheric pressure: can act to resist dislodging forces applied to dentures, if the dentures have an effective seal around their borders. This resistance force has been called “**suction**”. When a perpendicular force is exerted on a properly extended complete denture to dislodge it, pressure between the prosthesis and mucosa drops below the outside pressure thus resisting displacement. Retention due to atmospheric pressure is directly proportionate to the area covered by the denture base. For atmospheric pressure to be effective, the denture must have a perfect seal around its entire border. Proper border molding with physiological, selective pressure techniques is essential for taking advantage of this retentive mechanism.

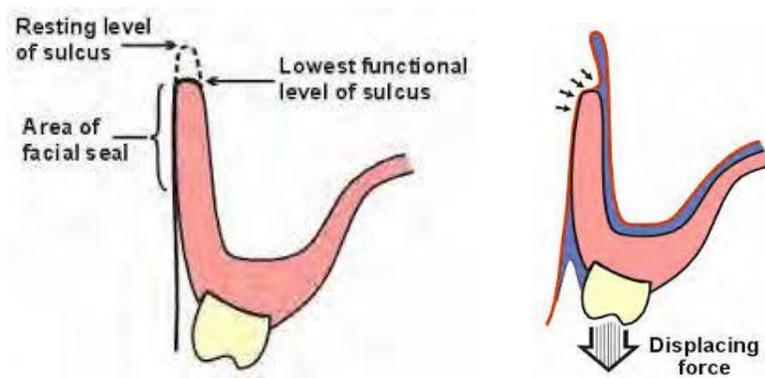
- ❖ In general, the retention force directly proportional to the surface area of the surfaces and inversely proportional to the distance or space between the surfaces.



The aspects of complete dentures that influence amount of physical retention obtained are:

a. Border seal: For optimum retention, the denture border should be shaped so that the channel between it and the sulcus tissues is as small as possible. It is not possible to maintain a close approximation between the border of a denture and the mucosal reflection in the sulcus at all times because the depth of the sulcus varies during function. The denture has to be constructed so that the border conforms to the shallowest point that the sulcus reflection reaches during normal function. This means that for some of the time when the patient is at rest the denture will be slightly underextended. If the denture were extended further in an attempt to produce a more consistent seal in this area, displacement might occur when the sulcus tissues moved during function.

The problem of achieving a constant border seal is overcome by extending the flanges of the denture laterally so that they contact and slightly displace the buccal and labial mucosa to produce a facial seal. Along the posterior border of the upper denture as it crosses the palate, another approach to creating the smallest possible space between denture and mucosa is adopted. A groove known as a post-dam is cut into the working cast so that the posterior border of the finished denture has a raised lip which becomes embedded a little way into the palatal mucosa. However, although an enhanced posterior seal is achieved with a post-dam it differs from the facial seal against the flanges in that even a small downwards movement of the posterior border of the denture is likely to break the seal with a resultant loss of retention. If the post-dam has width as well as depth the basic retention of the denture will be improved.



b. Area of impression surface: The degree of physical retention is proportional to the area of the impression surface. It is important therefore to ensure maximum extension of the dentures so that the optimum retention for a particular patient may be obtained.

c. Accuracy of fit: The thinner the saliva film between the denture and underlying mucosa, the greater the forces of retention; therefore it is important that the fit of the dentures is as accurate as possible. A poor fit will increase the thickness of the saliva film and increase the likelihood of air bubbles occurring within the film. These bubbles will further reduce the retention of the denture. In addition, as the pressure of the saliva film drops due to displacing forces acting on the denture, the air bubbles will expand and may extend to the border area, resulting in a breaking of the border seal.

5. Gravity: acts as retentive forces for the mandibular denture and displacement for the maxillary denture when patient is in upright posture.

Heavy maxillary prosthesis unseat if the other retentive forces are suboptimal.

Increasing the weight of the mandibular denture- beneficial when other retentive factors are marginal

III. Anatomical factors:

1. Arch size: Retention increase with increase in size of denture bearing area. The size of maxillary denture bearing area is about (24 cm²) & that of mandible is about (14 cm²).

2. Ridge form: 1) High and flat crest and well formed in recent extraction. The problem only is no space for setting of teeth.

2) Flat one difficult and no retention and stability so in taking the impression try to extend it beyond mylohyoid area to gain more stability and retention.

3) Ridge with undercut more common in upper (bilateral maxillary tuberosity) so we do surgery in one side and block out the other and we have to change the path of insertion.

Modest undercuts are very helpful in the retention of complete denture especially in the upper anterior region, less severe undercuts of the lateral tuberosities, maxillary premolar areas and lower distolingual areas, can be extremely helpful to the retention of the prosthesis.

4) Knife ridge difficult and cause lacerations and pain so we do relief.

5) Flabby ridge fibrous tissue and movable, no good seal so we either modified in the impression technique or do surgical correction.

6) Parallel wall prominent alveolar ridges with parallel buccal and lingual walls provide significant retention.

3. Volt Form: 1) - U shaped >>> good in retention and stability.

2) - V shaped >>> have retention but no stability and any pressure on it could break the seal.

3- Flat shaped no enough depth, so no retention and stability.

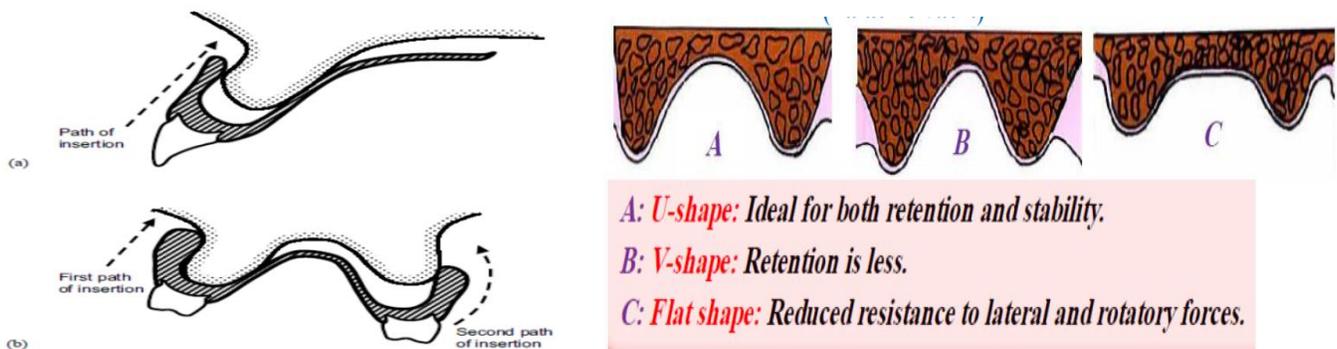
4. Arch Form: Squared, ovoid, tapered and the best one is the squared. This is because of:-
1-there is 4 point of contact with denture. 2- Resistant the lateral forces.

5. Arch relationship: Most of edentulous patient have class III >>> because of the pattern of bone resorption of the ridges. So the limited in movement only opening and closing. (No protrusive movement). Some have class II and it isn't favorable because it have small surface area, and difficult to get the upper and lower in contact.

6. Interarch distance: Small interarch space more retention

7. Tongue: If too big > it could interfere with denture, so dislodging of the lower and upper.

8. Mucosa: We need it Firm, compressible and even thickness. Not to be thick and flabby.

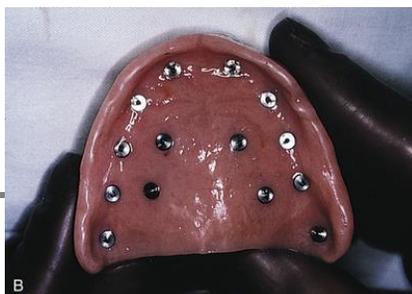


IV. Mechanical factors:

1- Engagement of undercut: Unilateral undercuts aids in retention while bilateral undercuts will interfere with denture insertion and require surgical correction. If bony undercuts exist, retention may be enhanced by designing a denture that utilizes these undercut areas. In order to achieve this without traumatizing the mucosa" on insertion and removal of the denture, special care is required in planning the path of insertion.

2- Mucosal implant: Intramucosal implant aid in increase retention of highly resorbed ridge.

Recently not used because pain and chronic trauma to patient.



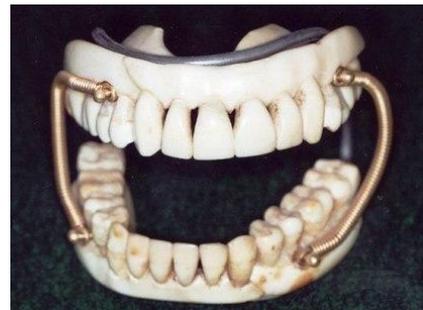
3- Vacuum device: -It's like a suction chamber, alternative name is rubber disk or palatal window in the past suction chamber in the maxillary dentures were used to aid in retention by create an area of negative pressure which increase retention . They are avoided now due to their potency for creating palatal hyperplasia.



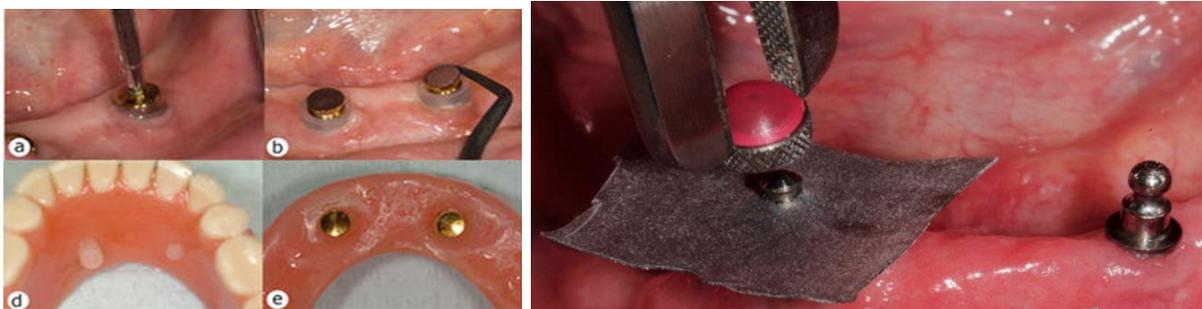
4- Springe: It is made up of coiled stainless steel or gold plated base metal. Ends of springs are attached to shrivel in the premolar region on both sides of upper and lower dentures. Thus, they are permanently attached to each other and are held in occlusion for insertion into the mouth. As soon as they are released the dentures are forced apart by the action of springs, which causes the denture to seat in place.

Disadvantages

- Restricted lateral movement
- Soreness of cheek mucosa resulting in irritation
- Increased alveolar ridge resorption



5- Implant and over denture attachment: Attachments are small mechanical devices, they are incorporated to provide retention and support, one part is connected to a root, tooth or implant (male part) and other part to a prosthesis (female part). Implant a prosthetic device implanted into the oral tissue beneath the mucosal or/and periosteal layer and/ or in the bone to provide retention and support for the prosthesis.



V. Surgical factors: Usually we use these factors to increase the retention of the dentures through various procedures, like vestibuloplasty, ridge augmentation, frenectomy & dental implants.

VI. Psychological factors: The role of psychological factor on denture retention depends on several considerations related to the patient himself which include :

1. Intelligence.
2. Expectations.
3. Apprehension.
4. Gagging reflex .
5. Previous denture experience.

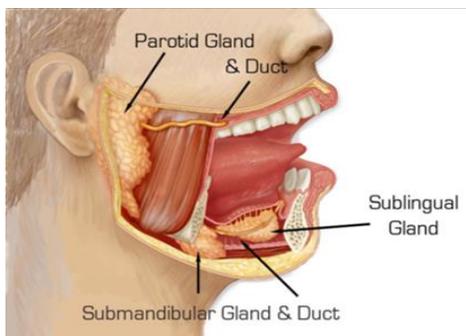
VII. Physiological factors: Saliva is clear fluid secreted by salivary glands, which are: serous secretions by the parotid gland, mixed but mostly serous secretion by the submandibular glands, mixed but mostly mucous secretions by the sublingual glands. Some other smaller glands are located in the mucosa of the tongue, lips and palate.

Viscosity of saliva determined retention, thick ropy saliva can cause some problems:

1. Very thick saliva can force the dentures out of their correct position.
2. Complicates impression making by forming voids in the impression surface while the impression material sets.
3. Causing the patients to gag while impression are made and after the new denture are installed.

On the other hand a lack of saliva (xerostomia) causes some problem:

1. Reduced retention of denture.
2. Sticking of cheeks and lips to the denture base in an uncomfortable manner.
3. Formation of sore spot under the denture which is very annoying to the patient.
4. Lack of oral hygiene.



VIII. Denture adhesive (Adjunctive factor): is a material used to adhere a denture to the oral mucosa. A commercially available, nontoxic, soluble material (powder, liquid or cream) that is applied to the tissue surface of the denture to enhance denture retention, stability, and performance.

There are two main types of denture adhesives:

1. The old generation : which is vegetable gums based adhesives such as(e.g. karaya, xanthan, and acacia) that display modest, non-ionic adhesion to both denture and mucosa and possessed very little cohesive strength ,in addition, gum based adhesives are highly water soluble particularly in hot liquids such as coffee, tea and soups, therefore wash out readily from beneath dentures. Allergic reactions have been reported to karayia, and formulations with karayia impart a marked odor indicative of acetic acid. Overall, the adhesive performance of vegetable gum-based materials is short-lived and relatively unsatisfactory.

2. The new generation which is a synthetic materials, the most popular product consist of mixtures of the salts of short acting Carboxy Methyl Cellulose (CMC) and long acting polymers(polyvinyl methyl ether maleate or gantrez). In the presence of water, Carboxy methyl cellulose hydrated and displays quick onset ionic adherences to both denture and mucosa, the original fluid increases its viscosity and carboxymethyl cellulose increases in volum, thereby eliminating voids between prosthesis and its basal seat. These two actions markedly enhance the interfacial forces acting on the denture. The long acting polymers (gantrez salts) are less soluble, it also displays molecular cross- linking resulting in a measurable increase in cohesive behaviour.

Indications:

- 1- Denture adhesives are indicated when well-made complete dentures do not satisfy a patient's perceived retention and stability expectations.
- 2- Patients who suffer from xerostomia.
- 3- Neurological diseases like stroke and Orofacial dyskinesia
- 4- Patients who have undergone extensive surgery for removal of Oral Neoplasia.

Contraindication:

- 1- Denture adhesive should not be used for patient with ill-fitting dentures
- 2- It should not be used with patient with worn out denture.
- 3- It should not be used as a substitute to a relining or tissue conditioner.
- 4- It should not be used for patient with physical inability to clean dentures.
- 5- Not be used in patient with temporary or immediate dentures where infections could result.
- 6- It should not be used in patient allergic to adhesive

Mode of action of adhesives: its enhance retention through the optimizing interfacial forces by: 1. Increasing the adhesive and cohesive properties and viscosity of the interposed medium

2. Eliminating the voids between denture base and its basal seat
3. Increases viscosity of saliva
4. Hydrated material swells up in the presence of saliva /water



5. Hydrated material formed by adhesives stick readily to the tissue surface and the mucosal surface of the denture

Forms of denture adhesive: A- Powder form Start its action immediately with maximum effectiveness & decrease with time.

B- Cream form Starts its action immediately with accepted effectiveness which increases to maximum within Time

Side effect of denture adhesive:

- High or Elevated Zinc Blood Levels.
- Symptoms of Nerve Damage.
- Numbness or Tingling in the Arms and Legs Paresthesia.
- Anemia.
- Bone Marrow Failure.



Stability

That quality of maintaining a constant position in the presence of forces that threaten it; the quality of a denture to be firm, stable or constant and to resist displacement by functional horizontal or rotational stresses & not to be subject to change of position when forces are applied.

There is a very interdependent relation between retention and stability because the factors that affect retention are also involved in the stability.

A stable denture is one that moves little in relation to the underlying bone during function. It is perhaps surprising that dentures stay in place at all, as they simply rest on mucous membrane and lie within a very active muscular environment.

The various factors that affecting the stability are:

Width of the occlusal table must be less than normal teeth to get good stability and retention.

1) Vertical height of the residual ridge: the residual ridge should have sufficient vertical height to obtain good stability .Highly resorbed ridges offer the least stability.

2) Quality of the impression: An impression should be as accurate as possible. The impression surface should be smooth and duplicate all the details accurately. It should be devoid of voids and any rough surfaces. The impression should not warp on removal. The impression should be dimensionally stable and the cast should be poured as soon as possible. An accurate impression has maximum coverage increase stability. Impressions should recorded the stress- bearing areas under stress and relief with no or minimum pressure.

3) Occlusal plane: should be oriented parallel to the ridge .if the occlusal plane is inclined then the sliding force may act on reduce its stability. The occlusal plane should divide the inter arch space equally.

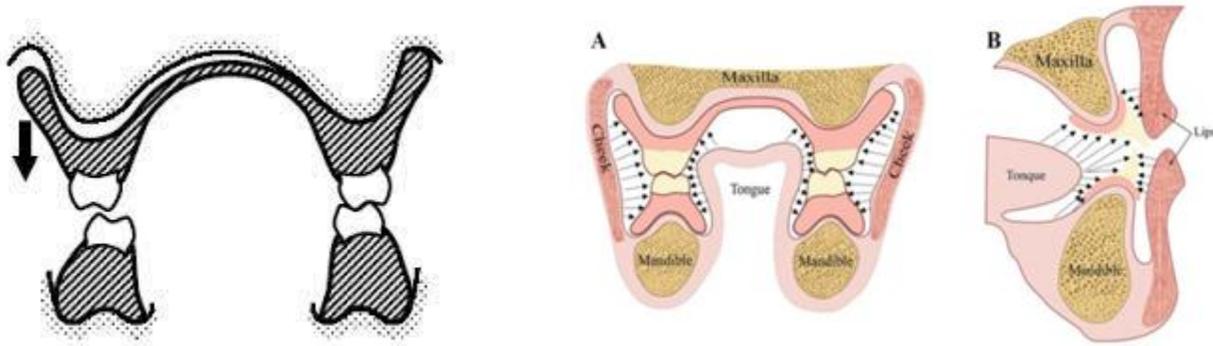
The occlusal plane should be the same as that present before the loss of natural teeth in the resting position the occlusal plane of teeth should be with the level of the lateral border of the tongue which is determined by the junction of the specialized and non-specialized mucosa.

If the occlusal plane is higher than that level of the tongue it will interfere with the stability at the denture because the tongue will move too far high to bring the bullous of food between the teeth from the lingual vestibule which lead to dislodgment of the denture.

In this situation the tongue will need a big amount of movement in upward and forward direction to get freedom during speech or eating which result in elevation of the floor of the mouth (alveolingual sulcus) and finally displacement of the denture.

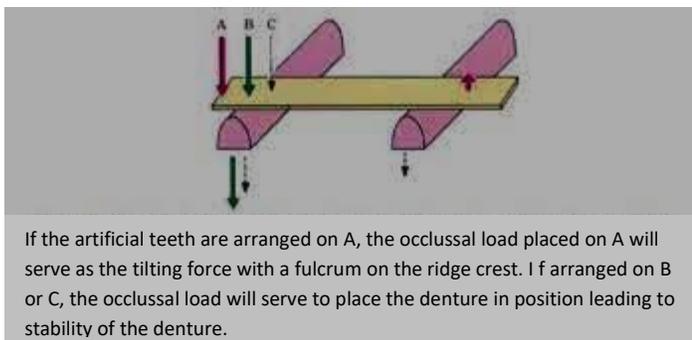
4) Teeth arrangement (balanced occlusion and neutral zone): The position of the teeth and their occlusion play an important role in the stability of the denture. Balanced occlusion facilitates the even distribution of force across the denture. Absence of the balanced occlusion may produce unbalanced lever type of force of any one side of the denture leading to loss of stability. The teeth in the denture should arrange in the neutral zone.

Neutral zone: the potential space between the lips and cheeks on one side and the tongue on the other. Natural or artificial teeth in this neutral zone are subjected to equal and opposite force from the surrounding musculature.

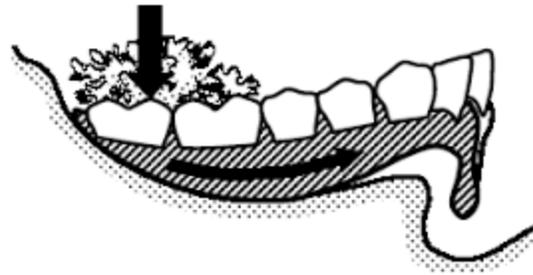
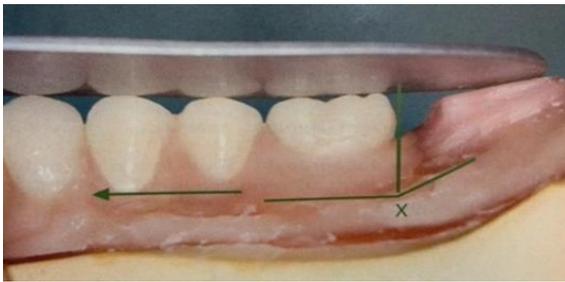


Although the natural teeth were situated in the center of the alveolar ridge, following their loss much bone resorption occurs and the position of the crest of the residual ridge may bear little relation to that of the original alveolar ridge. It is suggested that optimum denture stability is obtained when the artificial teeth are placed on, or lingual to the residual ridge.

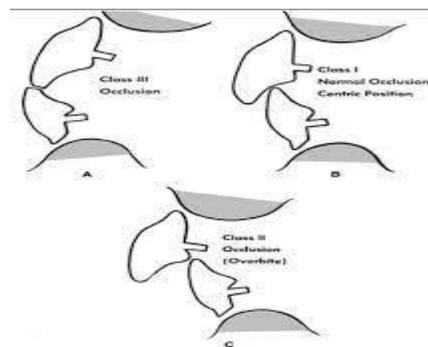
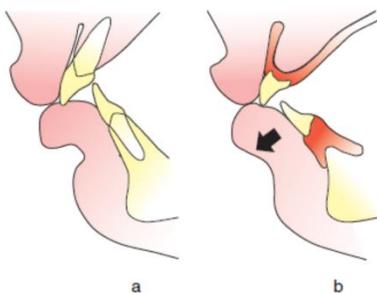
As a general guide to (lower) complete denture stability, the palatal cusps of the maxillary premolar and molar teeth should lie over the mandibular ridge, the central fossae of the lower posterior teeth should overlie the crest of residual ridge.



Stability of the lower denture can be improved by careful consideration of the posterior extension of the occlusal table. If that table extends to the steeply sloping part of the ridge posteriorly, pressure from the bolus will cause the denture to slide forwards. Therefore the occlusal table should terminate on the relatively horizontal part of the ridge where effective support is available and displacement prevented. It may be necessary to use smaller teeth or reduce the number of posterior teeth to achieve this aim.



Occasionally, the problem of occlusal displacement can create a conflict of interests between the requirements of optimum appearance and denture stability. Upper anterior teeth placed close to the crest of the ridge where strong incising forces can be applied with minimal leverage effects, despite the fact that lip support and appearance would be compromised. No matter what skeletal relationship exists, the labial surface of the mandibular incisors should not protrude beyond the labial vestibule. This horizontal limit applies even in a severe Class II jaw relationship with large overjet of the maxilla, unless, of course, the patient insists that the aesthetics advantages of protruding incisors are more valuable than the stability of the lower denture.



Thus patients are instructed about the above mentioned mechanism and told not to bite with the anterior teeth, cutting food into smaller pieces before inserting them into the mouth, chewing on both sides of the dental arch simultaneously and starting with softer 'easier' foods before progressing to more challenging morsels. Sticky foods tend to move the dentures away from the mucosa.

5) Contour of the polished surface: The polish surface of the denture should be harmonious with the oral structures. They should not interfere with the action of the oral musculature.

The area which is situated laterally and slightly above the corner of the mouth known as the **muscular node or the (modiolus)**, which is a concentration of many fibers of this group of muscles. Here the labial flange of the maxillary denture should be reduced in thickness, so as not to effect the stability of the upper denture. At times, the mandibular first premolar should be arranged properly on the crest of residual ridge to avoid interference with this modiolus.

When masseter activated it push the buccinators muscle medially against denture border in the area of the retro molar pad ,so the denture should be contoured to accommodate this interaction between these two muscle. This contour is known as **masseter groove**.

6) Shape of palatal vault: A steep palatal vault may enhance stability by providing greater surfaces area of contact & long inclines approaching .a right angle to the direction of force
Hard palate: can be classified as : 1 -U-shaped: ideal for both retention and stability.

2-V-shaped: retention is less as the peripheral seal is easily broken.

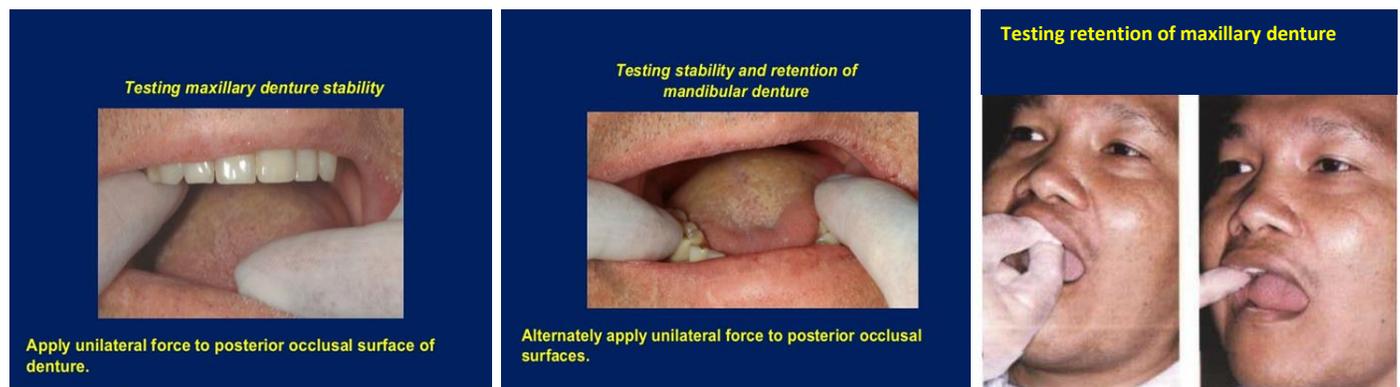
3-round: reduced resistance to lateral and rotator force

Stability decrease with 1-Loss of vertical height of the ridge,
 2- Increase in the movement of flabby tissue.

Checking the stability

Pressure is applied with the ball of finger in premolar and molar region of each side alternatively. Pressure must be at right angle to occlusal surface.

If pressure on one side causes the denture to tilt and raise on other side it indicates that the teeth on the side to which pressure is applied are outside the ridge.



Support

The resistance to the forces of mastication, occlusal forces & other forces applied in a direction towards the denture bearing area.

The resistance to vertical forces of mastication, occlusal forces & other forces applied in a direction towards the denture bearing area.

Initial denture support is achieved by using impression procedure that provide optimal extension & functional loading of the supporting tissue

Nature of the Supporting tissue: The soft tissues should be:

1- In the edentulous person, the mucosa covering the hard palate and the crest of the residual ridge, including the residual attached gingiva, is classified as masticatory mucosa. It is characterized by a well-defined keratinized layer on its outermost surface that is subject to changes in thickness depending on whether dentures are worn and on the clinical acceptability of the dentures.

2-The submucosa is firmly attached to the periosteum of the underlying supporting bone and will usually withstand successfully the pressures of the dentures. (The thickness and consistency of the submucosa are largely responsible for the support that the mucous membrane affords a denture because in most instances, the submucosa makes up the bulk of the mucous membrane. When the submucosal layer is thin, the soft tissues will be no resilient, and the mucous membrane will be easily traumatized. When the submucosal layer is loosely attached to the periosteum or it is inflamed or edematous, the tissue is easily displaceable, and the stability and support of the dentures are adversely affected).

3- Hard tissue should be Relatively resistance to remodeling & resorptive changes. Consideration must be given to the maintenance of alveolar ridge height in the conventional complete denture patient. Minimizing the pressure in those region most susceptible & directing the forces toward those region relatively resistance to resorption can maintain healthy residual ridge. There are two types of osseous tissue that form bones.

Cortical bone: It is harder, stronger and stiffer than cancellous bone.

Cancellous bone: is less dense, softer, weaker, and less stiff. It typically occurs at the ends of long bones.

Mandibular anatomical consideration:

1-Buccal shelf area: The surface of the mandible from the residual alveolar ridge or alveolar ridge to the external oblique line in the region of the lower buccal vestibule. It is covered with cortical bone. Buccal shelf area is the *primary support area* for the mandibular denture because: 1) it's usually covered by mucosa with an intervening sub mucous layer containing glandular connective tissue & buccinators muscle fibers

2) It is parallel to occlusal plan.

3) It lined by cortical bone.

2. Mandibular residual ridge: It is covered by a keratinized layer and is attached by its submucosa to the periosteum of the mandible. The extent of this attachment varies considerably. In some people, the submucosa is loosely attached to the bone over the entire crest of the residual ridge, and the soft tissue is quite movable. In others, the submucosa is firmly attached to the bone on both the crest and the slopes of the lower residual ridge. The ridges are reserved as *secondary support areas*.

1) The lack of the muscle attachment 2) Presence of cancellous bone

3. The **retro molar pad** is covered by a thin non-keratinized mucosa .It should not be used as support and it should be relieved by taking impression mucostatically in that region.

Maxillary anatomic consideration:

1) Horizontal portion of the hard palate is consider as *primary stress bearing area* -It have keratinized masticator mucosa overlies a distinct Sub mucosa layer everywhere.

2) In the region of the **medial palatal suture**, the submucosa is extremely thin, with the result that the mucosal layer is practically in contact with the underlying bone. For this reason, the soft tissue covering the medial palatal suture is nonresilient and may need to be *relieved* to avoid trauma from the denture base.

3) 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. This area contributes to the *stress-bearing role*, though in a *secondary* capacity.

4) The **incisive papilla** should usually be relieved because it covers the emerging nasopalatine nerve and vessels.

5) **Crest of maxillary ridge:** The crest of the edentulous ridge is an important area of support. However, the bone is subject to resorption, which limits its potential for support, unlike the palate, which is resistant to resorption. Because of this, the ridge crest should be looked on as a *secondary supporting area*, rather than a primary supporting area. The inclined facial surface of the maxillary ridge provides little support, Although the peripheral tissues should be contacted to provide a border seal. The configuration of the bone that provides the support for the maxillary denture varies considerably with each patient.

Factors that influence the form and size of the supporting bone include:

- (1) Its original size and consistency;
 - (2) The person's general health;
 - (3) Forces developed by the surrounding musculature;
 - (4) The severity and location of periodontal disease (a frequent cause of tooth loss).
 - (5) Forces accruing from the wearing of dental prostheses.
 - (6) Surgery at the time of removal of the teeth.
 - (7) The relative length of time different parts of the jaws has been edentulous.
- In addition, a number of anatomical features influence the shape of the hard palate and residual ridge.

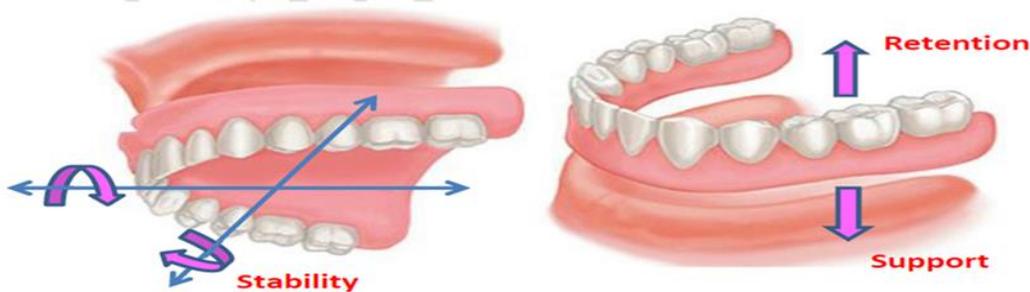
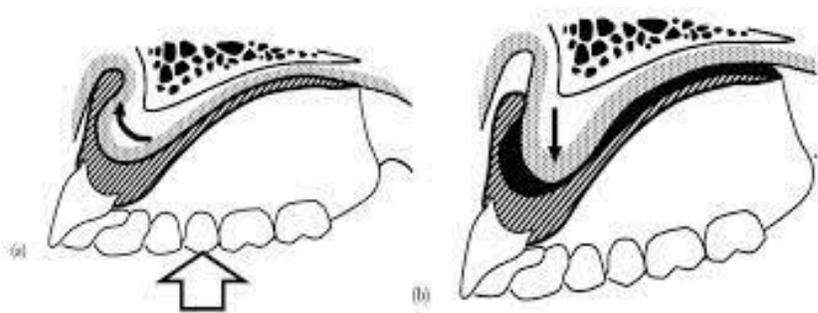
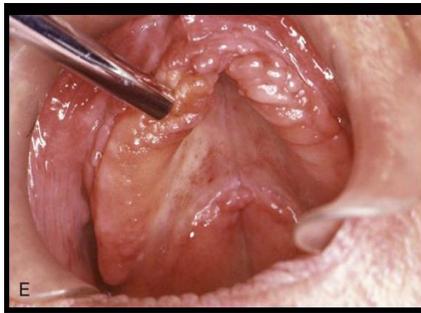
Methods used for improving the retention stability and support:

- a. Dental implants improve the support, retention and stability of a full or partial denture reducing the slip and movement while speaking or eating.
- b. Mini-implants have become a common treatment option for improving retention of lower dentures.



A reduction in support promotes instability, as indicated in the following examples:

1. Instability of an upper denture follows resorption of the supporting bone. This resorption is largely confined to the region of the alveolar ridges, as there is remarkably little resorption of bone in the centre of the palate. Thus, after a period of time, the denture will be well supported by the hard palate, but there will be limited contact between the impression surface of the denture and the alveolar ridges. In these circumstances, occlusal contact readily produces tipping, with the denture pivoting about the mid-line of the palate.
2. Support will be inadequate if the ridges are small because resistance to lateral displacing forces will be poor.
3. Support will be reduced if the ridges are flabby, the denture will move considerably during function even though the retention may be good and contact with the mucosal surface is maintained.



Retention = Denture base + Soft tissue.

Stability = Denture base + Bone.

Support = Denture base + Bone + Soft tissue.

