Alveolar Ridge Atrophy

➤ Definition
➤ A diminution in the size of a cell, tissues of the organ, it may be
evident in both external form and internal structures.
➤ Atrophy of the alveolar ridge is irreversible process.

➤ Etiology
- Anatomic factors
- Functional factors
- Metabolic factors
- Prosthetic factors

➤ Anatomic factors
➤ Include type of the bone, size, shape, and density of the ridges.
➤ The thickness and character of the mucosa covering the ridge.
➤ The ridge relationships.

➤ Type of bone
➤ Cortical bone will resorb of bone slower than cancellous bone.
➤ Well formed broad ridge will show less resorption than narrow
thin ridge because there is more bone to be resorbed per unit of
time and the less force received per unit area.

➤ Density of the bone
➤ The denser the bone the slower the rate of resorption because
there is more bone to be resorbed per unit of time.
➤ The reduction of the lower ridge (anteriorly) approximately four
times as greater as of the upper ridge.
Pronounced resorption in patient with marked mandibular base bend and less in patient with flattened mandibular base.

**Biologic & Metabolic factors**
- Include all of the multiple nutritional, hormonal, and other metabolic factors which influence the cellular activity of the bone forming cells (osteoplast) and the bone resorbing cells (osteoclast).
- Age, sex, and general health, such: blood dyscrasia or DM.
- Treatment for certain diseases, by radiation therapy or hormonal drugs.
- Loss of teeth as result of periodontal problems, lead to more amount of RRR.

**Functional factors**
- Include the frequency, intensity, duration, and direction of forces applied to the bone which are translated into cellular activity, resulting in either bone formation or bone resorption depending on the patient individual resistance to these forces.
- For example patient with history of bruxism show significant bone loss.
- Also if there is not sufficient interocclusal distance the frequency and duration of forces on the residual ridge may be increased to a pathologic degree.

**Prosthetic factors**
- Include the techniques, materials, concepts, principles and practices which are incorporated in the prosthesis.
For example:

- Functional closed mouth, versus mucostatic impression.
- Porcelain teeth, versus acrylic teeth.
- Cusped teeth, versus flat teeth.
- Wide teeth, versus narrow teeth.
- Teeth setup over the ridge, versus natural placement.
- Flat plane, versus curved planes.
- Balance in all position, versus balance in centric position only.

➢ For patients with previous RPD, it also related to:

1. Long-term wearing of dentures without serviceability.
2. Improperly constructed dentures with improper vertical dimension of occlusion, centric relation, non-balanced occlusion and incomplete coverage of basal seat area.
3. Continuous wearing of the dentures without rest to the underlying tissues.
4. Porcelain teeth and/or anatomic teeth with high cusp angles transmit more force to the underlying ridge.

➢ Managements:

➢ Vestibuloplasty:

It is a surgical procedure designed to restore alveolar height and/or width by detachment of buccal or labial tissues from lingual tissues. These tissues are positioned at a level that obtains maximum height of the residual alveolar ridge.

➢ Vestibuloplasty can be achieved by:

➢ Mucosal advancement vestibuloplasty "submucous resection"
➢ Vestibuloplasty with secondary epithelization
➢ Vestibuloplasty with epithelial graft
a. Mucosal advancement
The sub epithelial CT, mucosa and muscle insertion are undermined & separated from the periosteum then advanced to line both sides of the vestibule & hold in its new position by an overextended border of a carefully made surgical stent.

b. Secondary epithelization
An apically repositioned flap is sutured to the periosteum at one side of the vestibule, the other side let to be heals with secondary epithelization (this may take long time may be 2 years). A surgical stent lined with tissue conditioning material is helpful in retaining the flap in position and promoting rapid healing.

c. Vestibuloplasty with epithelial grafts
Similar to the secondary epithelization procedure except that the denuded tissue is covered with a free epithelial graft:
- Skin (which is better for bearing the denture).
- Buccal or palatal mucosa so is not left to heal by secondary intention.

Vestibuloplasty With Split-Thickness Skin Grafting
A combination of split-thickness skin grafting with the vestibuloplasty procedure provides greater patient comfort and better stability. The skin graft was harvested from the lateral aspect of the patients’ thigh. The donor site was covered with an adhesive dressing for patient comfort and infection prophylaxis. The skin graft was then placed and secured with a dermal in a relined, previously constructed acrylic splint.
II. Trimming mylohyoid ridge

to allow extension of the lingual flange of mandibular denture.

IV. Bone Grafting

- Ridge augmentation
- Sinus lift and graft procedure
- Nerve repositioning

a. Ridge augmentation

In severe cases of ridge resorption bone graft is placed to increase the ridge height and/or width

b. Sinus lift and graft procedure

This procedure involves elevating the sinus membrane and placing the bone graft onto the sinus floor allowing implant to be placed in the back part of upper jaw.

Sources of Bone Grafts:

1- Auto genus materials:
   A- Intraoral
   Chin, third molar region
   B- Extra oral
   Hip, outer aspect of the tibia at the knee, iliac crest or rib

2- Allograft material:
   Derived from cadaver bone of the same species.

3- Alloplastic materials:
   Derived from synthetic sources.

4- Xenografts:
   Derived from the inorganic portion of animal bone.
Classification of bone based on source, form & composition:

V. Distraction implants
it contains mobile endosteal part that allows heightening of the ridge up to 6 mm. the prosthesis is loaded 4-6 months after distraction

VI. Osseo-integrated implants
Placement of 2 or more of implants in the area anterior to the mental foraminae, increase the horizontal stability and retention of the prosthesis.
It can be used with or without bone augmentation.

How To Overcome The Problems Prosthetically

Impression Making

An ideal impression should provide:

- Maximum extension without muscle impingement.
- Intimate contact with the tissue area covered.
- Proper form of the borders including the posterior border of the maxillary denture.
- Proper relief of hard and sensitive areas.

Impression Techniques

Primary impressions
# Conventional prim. imp. tech.

Definitive impressions
# Conventional final imp. tech.
# Muco-compressive imp. Tech.
# Butterfly imp. technique.
# Dynamic & Functional imp. tech(s).
Primary Impressions / Conventional technique:
Deficiencies of Lower impressions in the retromolar pads and the functional forms of the floor of the mouth and the retromylohyoid fossae result in an unstable denture.

Definitive Impressions (secondary impression)
1. Conventional Impression Technique / Open mouth tech.
   a. Alginate impression material
   b. ZOE
   c. Rubber base impression material.
By using modified acrylic resin special tray

- a. Alginate impression material
Spacing is required between the tray and the primary cast, e.g. 3 mm spacing is recommended for irreversible hydrocolloids where large undercuts are present.

- b. Metallic oxide paste (Zinc oxide eugenol impression paste + Green stick impression compound) / close fitting tray.

2. Muco-compressive impression technique.
   - Primary impression is made with impression compound using suitable stock tray.
   - Special trays: occ. Blocks at accepted VD
   - Border molding of the periphery using green stick compound Final impression is made using zinc oxide and eugenol impression paste while the patient is closing on the occluding rims (closed mouth technique)
3. Butterfly imp. technique
This technique is indicated in case of advanced resorbed ridge with projecting sublingual glands.

➢ A primary impression is made covering the sublingual crescent area using alginate impression material.

➢ An acrylic resin special tray is fabricated with a butterfly extension over the sublingual crescent area and an occlusion rim is added to simulate the height and position of the anterior and posterior teeth.

➢ The borders are adjusted.

➢ Three applications of the tissue conditioning material are used with closed mouth technique.

➢ Two applications of a viscous tissue conditioning material. Each application is allowed to remain in the mouth for 8-10 minutes pressure areas are corrected after each application.

➢ Third wash is made using either a soft tissue conditioning material or a light-bodied rubber base impression material.

4. Dynamic impression technique
This technique is used to record the range of muscle action as well as spaces into which the denture can be extended without displacement.

➢ The upper denture is set up conventionally to the prescribed occlusal vertical dimension (OVD).
Opposing the upper set-up is a resin base with “three vertical stops” joined by a wire bent in a sinusoidal manner.
Final impression is made using a thin mix of alginate impression material.
Then, the patient is asked to close slowly until the mandibular rests firmly contact the maxillary arch and keep his tongue in contact with the tongue rest.
The patient is instructed to swallow 3-4 times and forcefully protrude the lips forwards.
The resulting impression covers the maximum possible basal seat area and the borders are in harmony with the adjacent moving tissues.

5. Functional impression
Two variations are commonly used for functional impressions.
(a) Neutral Zone Impression Techniques
(b) Local areas of modification

a. Neutral Zone Impression Technique:
Indications:
- It is designed for patients with poor track records of (lower) denture stability.
- A large tongue or other anatomical anomaly.

The neutral zone concept
Is based on the belief that the muscles should be functionally mold not only the borders and the artificial teeth, but also the entire polished surface.
Facial and lingual forces generated by the musculature of the lips, cheeks and tongue are balanced.
• **Technique of neutral zone impression using ViscoGel material**
  > Primary impressions of the upper and lower jaws are taken in impression compound.
  > Upper wax rims and a lower special tray are constructed.
  > The special tray is a plate of acrylic without a handle, with spurs or fins projecting upwards towards the upper arch. These help with retention of the impression material.
  > A lower acrylic special tray with metal sprues to aid retention of the impression material
  > Occlusal pillars have been built up in green stick to the correct occlusal height
  > Establishing the correct occlusal height
Thick mix of viscoGel is then placed around the rest of the lower special tray distally, and mesially to the occlusal pillars.
After about 5-10 minutes the set impression is removed from the mouth and examined. The viscoGel material would have been

• **Functional Neutral Zone Impression Technique / recorded in PVS putty:**
  > These exercises provide an indication of where inward-directed forces from the buccinator muscles are equaled or 'neutralized' by outwardly-directed lingual forces ie the zone of minimal conflict.
  > A plaster index used to locate the teeth to the neutral zone.
Local areas of modification:

Functional impression using: "chair-side resilient lining material".

- In these cases, the application of a thin mix of a chairside resilient lining material (eg Visco-Gel) may be used.
- The mixed material is added to the fitting surface of the denture and the patient is instructed to wear the denture for one hour.
- After one hour of functional moulding the denture is then removed from the mouth and the conventional relining process completed.

Jaw Relation

- Jaw relation registration is carried out using check bite technique.
- Occlusal plane is adjusted nearer to the flat ridge to decrease the lever arm.

Setting up of teeth

- Cross-linked cuspless acrylic teeth are used to decrease the lateral component of force and improve denture stability.
- Decrease the occlusal table to increase the cutting efficiency, so decrease the transmitted forces.
- Setting up of teeth in the neutral zone would help to achieve denture stability.

- The teeth positioned in the neutral zone leaving plenty of tongue space. The occlusal table has been reduced significantly by reducing the length and width of the posterior table.