

PROSTHODONTIC MANAGEMENT OF COMPROMISED RIDGES AND SITUATIONS

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Abstract :

Prosthodontic rehabilitation of a patient with compromised edentulous ridges in a conventional manner is a difficult task. Modifications in the treatment procedures should be considered to fulfil the patient's functional and esthetic desires. This article reviews the various compromised situations commonly encountered in a routine clinical practice and the possible management of each of them.

Keywords : Compromised ridges, abused tissues, impression techniques

Introduction:

Complete denture therapy is undoubtedly among the age old forms of dental treatment used to rehabilitate an edentulous patient. The key to successful denture therapy lies in precise execution of the treatment plan formulated by evaluation of a complete comprehensive history and through examination. Such a treatment plan must be based on Devan's principles concerned with rehabilitation that is, preservation of what already exists than the mere replacement of what is missing. Ridge atrophy poses a clinical challenge towards the fabrication of a successful prosthesis. Extreme resorption of the maxillary and mandibular denture bearing areas results in sunken appearance of cheeks, unstable and non retentive dentures with associated pain and discomfort.

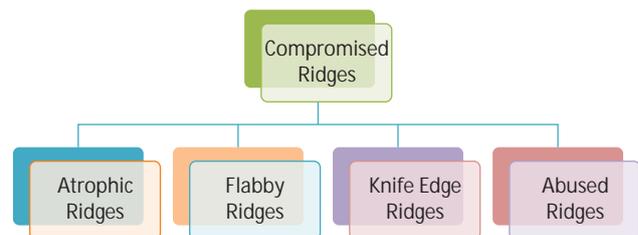
Residual ridge resorption is a complex biophysical process and a common occurrence following extraction of teeth. Ridge atrophy is most dramatic during the first year after tooth loss followed by a slower but more progressive rate

of resorption thereafter. The impression technique plays the key role.

The main aim of the impression procedure is to gain maximum area of coverage with minimum

pressure by obtaining, a fairly long retromylohyoid flange for a better border seal and retention and to educate and train the patient to maintain tongue position; i.e. forward and resting on top of lower anterior ridge when the mouth is open.

Compromised ridges may be broadly classified as :



Atrophic Ridges

Severe ridge atrophy results in increased inter-arch space, unstable and non retentive dentures with inability to withstand the masticatory forces. Treatment of atrophied ridges is a clinical challenge faced by dental professionals worldwide as severely resorbed ridges present difficulty in fabrication of an adequate prosthesis. Severely atrophied ridges are a more common finding with the mandibular residual ridges than the maxilla. This is because the mandible resorbs at a faster rate than the maxilla.

A good impression holds the key to a successful treatment in cases of resorbed mandibular ridges where we have minimum tissue to fulfil the fundamental requirement of

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retention, stability and support. No matter how good the prosthesis is constructed, it will not function as intended if it was not made on an accurate impression.

Flabby Ridges

The alveolar mucosa over the ridges in completely edentulous patients is with unusual thickness and mobility. In some areas, it is thick from 2 to 4 mm. In other areas where the atrophy of the alveolar process was rapid and sophisticated, the mucosa has no bone support and becomes loose and flabby¹. Such mucosa is more than 4 mm thick. It can be seen in either of the arches but commonly associated with the the frontal part of the ridges and floating tubers maxillae². The flabby ridge or movable tissues are frequently seen in maxillary anterior ridge when the edentulous maxilla is opposed by natural teeth in the mandibular anterior region. Kelly³ in 1972 reported that mandibular anterior teeth cause trauma to maxillary anterior ridge as all occlusal forces are directed on to this area. This results in loss of bone from the anterior maxilla with subsequent fibrous tissue hyperplasia. The mucosa is highly movable and loosely attached to underlying periostium of the bone. The presence of displaceable denture-bearing tissues often presents a difficulty in making complete dentures. Soft tissues that are displaced during impression making tends to return to their original form, and complete dentures fabricated using this impression will not fit accurately on the recovered tissues. This results in loss of retention, stability discomfort and gross occlusal disharmony of the dentures⁴.

Several impression techniques have been recommended by various authors, all of them aiming at recording the flabby tissue in an undisplaced or in an undistorted manner.

Window Technique

Here a custom impression tray with a window opening in the anterior region is made uncovering the flabby portion of the ridge. Zinc oxide eugenol impression paste is first used for making impression and then impression plaster is painted onto the displaceable tissue. Impression plaster is a Mucostatic impression material and produces little

pressure, but it is difficult to handle and difficult to pour and offers little advantage over low viscosity polyvinyl siloxane materials. Light body polyvinyl siloxane is also a Mucostatic material. It is dimensionally most stable and elastic material.⁵

Technique :

1. A preliminary impression of the edentulous arch using Irreversible hydrocolloid impression material in a metal stock tray or patient's old denture.
2. Mark the flabby ridge area on the cast. Fabricate a special tray in chemically cured acrylic resin with proper spacer and stoppers on the preliminary cast simultaneously providing a window for marked flabby ridge area. Window may be created after the border moulding procedure. The border of the special tray should be kept 2mm short of the sulcus.
3. Border mold the tray with low fusing modelling plastic impression compound (green stick) in Segments or in single step by using medium body polyether or polyvinyl siloxane elastomeric impression material.
4. Apply the tray adhesive on the border and whole of the tissue surface of the tray. Let the adhesive dry for 10 minutes and Load the impression tray with light body and immediately place the tray over the edentulous ridge and leave it in mouth for 3-5 minutes.
5. Remove the impression tray from the mouth, Trim away any excess impression on the periphery or over the window opening with a scalpel blade.
6. Place the impression tray back into patient mouth and inject polyvinyl siloxane impression material over the window opening. Place the material in most passive manner to prevent the distortion of the soft tissues.
7. Allow the impression material to polymerize according to the manufacturer's recommendations. Remove the impression and evaluate carefully.
8. Remove, disinfect and box the impression with conventional boxing procedure using boxing wax or using a mix of plaster and pumice.



Fig 1 : Special tray with the locating rod



Fig 2 : 3 mm wax spacer over the flabby region



Fig 3 : Pick up tray covering the first part of the special tray



Fig 4 : Border moulding of the 1st tray



Fig 5 : Border moulding of the 2nd tray



Fig 6 : Wash impression using Zinc oxide eugenol



Fig 7 : Light body elastomeric impression in the pickup tray

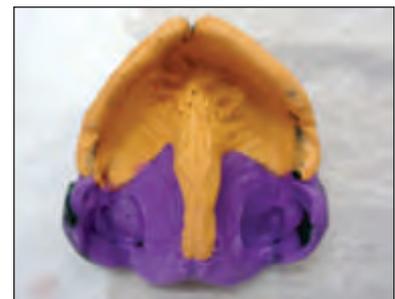


Fig 8 : Final Impression

Dual-Tray Technique

1. A primary impression was made of both the maxillary and the mandible edentulous arches using irreversible hydrocolloid impression material so that the tissues can be recorded with minimum distortion.
2. The extent of flabby tissue was marked on the maxillary cast. Single uniform thickness of dental wax (1.5 mm) is adapted over the entire denture bearing area to act as spacer except the flabby tissue area.
3. A special try is fabricated over the wax spacer and locating rod is located in the centre of palate during fabrication (Fig. 1). This helped to accurately locate the second part special tray using a stop, thereby allowing for a pre planned even thickness of impression material.

4. Double thickness wax spacer (3 mm) is adapted over flabby region. (Fig 2)
5. Special tray along with double spacer wax over flabby area. A pick up tray is fabricated after applying petroleum jelly to all the surfaces, covering the first part of the special tray (Fig 3).
6. Border moulding for the special tray and pick up tray is done using green stick compound to record the depth of the functional sulcus (Fig 4,5)
7. Wash impression is made using zinc oxide eugenol paste material. Special tray is removed and examined and checked for any overhanging material that would interfere with the placement of the pickup tray.
8. Multiple holes are made in the pickup tray in the flabby

area. Light body elastomeric impression material is placed on the area covering the window portion and then while the first tray is still in the mouth the pickup tray is positioned over it and border moulding movements are repeated (Fig 6,7).

9. After the setting of the impression material the pickup tray along with the first tray is removed as whole with the help of the locating rod. The impression surface is then examined for any voids or extensions (Fig 8).

Other treatment modalities used for managing these patients are surgical excision of the flabby tissues and the use of dental implants. Surgical approach may be contraindicated owing to the fact that many complete denture patients are elderly or have complex medical histories. Bone loss, the excision of flabby tissues and resultant 'shallow' ridge may provide little retention or resistance to lateral forces on the resultant denture. The use of dental implants in such cases is very difficult because of excessive bone resorption. Although Bone augmentation is a remedy for this problem, the prognosis of such treatment would be questionable. Furthermore, there are a group of patients who due to some clinical or medical reasons are unsuited for dental implant treatment and also some patients who do not wish to undergo surgically invasive procedures⁶.

Knife Edge Ridges

A sharp bony ridge is a frequent problem among the edentulous patients and commonly occurs in the mandible in the edentulous patient. If present should be identified during the initial assessment by palpation of residual edentulous ridges. When it is conventionally loaded, the overlying mucosa is pinched between the denture base and the bone which leads to pain over the ridge⁷.

Effect in the underlying bony structure of the residual ridge may be the cause of chronic pain under dentures especially during mastication.

Knife edge ridge is formed due to rapid resorption of labial and lingual side of the lower anterior ridge. Gingiva overlying it becomes rolled and soft tissue proliferates

leaving hypermobile ridge crest tissue⁸. They are thin, buccolingually, sharp but smooth and like a feather edge. They are painful under pressure and this type of ridge seen only in mandible.

According to Meyer⁸ three types of sharp ridges are :

- 1) Saw tooth ridge
- 2) Razor like ridge and
- 3) Those with discrete spiny projections.

X-rays show a thin ridge with a clearly defined outline, the cancellous bone being covered with a cortical layer.

Immediate dentures are often an ultimate cause of sharp ridges. Local destruction of

the bone by the periodontal disease before tooth extraction, improper surgical procedures of alveolar bone at the time of extraction of teeth, or lack of follow-up and proper correction of changing tissue conditions may be contributing factors. A combination of factors contributes to bone resorption, with the amount of resorption and the relative importance of each factors varying with the patients^{9,10}.

Impression Technique:

A Technique which will distribute loading onto alternative areas over the ridge and relieve the mucosa over the sharp bony ridge producing differential pressure is preferred.

1. A preliminary impression of the edentulous arch using Irreversible hydrocolloid impression material in a metal stock tray is made and a special tray is fabricated on the primary cast.
2. A medium bodied silicone impression is used to make a fully muscle trimmed secondary impression.
3. The impression produces displacement of the mucosa over the sharp bony ridge. If it is used to construct the final denture prosthesis, there is a potential for the denture to cause traumatic pain in this region. The area of the impression over the sharp ridge is cut away using a scalpel blade. The tray is perforated over the sharp ridge.

4. Complete impression is made using light bodied impression material.

Alternative treatments for knife edged ridges⁸:

a) Soft liners may be used

Drawback : Hygiene and maintenance problems associated with these materials.

b) A controlled pressure impression technique would decrease occlusal loading over the affected area and distribute forces more to the primary support areas like buccal shelf.

c) Preprosthetic surgery has been widely advocated for dealing with sharp bony ridges.

Drawback : Surgical trauma to the patient

Loss of potential stabilizing zone

d) Differential pressure impression technique: This technique enables a conservative preservation of ridge height for stability without overloading the crest of the ridge.

Abused Tissues

Complete dentures are foreign objects in the oral cavity that are accepted and tolerated by the tissue only to a certain degree. Wearing well adapted dentures is not harmful to the epithelium and they can stimulate rather than irritate the underlying mucosa. However, ill-fitting complete dentures can alter the character, condition and form of the underlying oral tissues¹¹.

Soft tissue pathologies like papillary hyperplasia of the palate and candidiasis are common in associations with old dentures. Excessive pressure plays a role in the osteoclastic resorption of bone tissue, due to a circulatory disturbance in the periostium or bone marrow.

Before recording impressions for the new dentures, it is essential to improve the health of the denture bearing areas. The existing dentures should be assessed whether they can be used as a reference for the new dentures. The recovery of the underlying tissues can be achieved by the complete removal of the dentures from the mouth for 48 to 72 hours. If the dentures cannot remain out of the mouth

for that period of time, they should be left out of the mouth overnight, and all the excessive pressure areas of the denture should be relieved¹².

Tissue conditioners can be placed in the denture to treat an irritated underlying mucosa. Soft lining materials act to distribute functional stress uniformly¹³.

Denture Induced Tissue Hyperplasia :

It is an overgrowth of intraoral tissue resulting from chronic irritation. It is also called as Epulis Fissuratum. Epulis fissuratum is essentially an inflammatory reactory hyperplasia. The usual reason for Epulis is that the bony ridge to which the denture originally fits changes over time. The etiology of Epulis fissuratum is most commonly attributed to an ill fitting denture which results in excessive pressure on the oral tissues. This in turn increases keratinisation and proliferation of connective tissue because of inflammation resulting in hyperplastic tissue mass^{14,15}.

Management :¹⁶

- | Leave the denture out of the mouth for several days so that the edema will subside, and the remaining lesion will become considerably smaller.
- | If the condition is not long standing and rather limited in extent, simply adjusting the denture flange area in the affected area will bring about a resolution of the lesion.
- | The use of tissue conditioners will also help to subside the lesion.
- | When this does not resolve the lesion surgical excision becomes imperative and this is followed by fabrication of a new set of adequately fitting dentures.

Compromised Situations in Complete Denture Prosthesis

They may be broadly classified as :

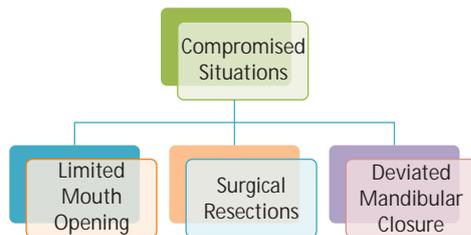
Limited Mouth Opening

Limited mouth opening (microstomia) can be defined as a reduction in the perimeter of the oral cavity or an abnormally small orifice. Usually, mouth opening in healthy individuals is around 30-50mm. An individual with

mouth opening of 20 mm or less is said to have limited mouth opening.

Limited mouth opening manifests as a consequence of certain conditions such as:¹⁷

- Surgical Treatment of oro-facial carcinomas
- Cleft lip
- Trauma and burns
- Plummer-vison's syndrme
- Scleroderma
- Trismus
- Temporomandibular joint dysfunction syndrome
- Rheumatism
- Oral submucous fibrosis
- Any damage to the masticatory muscles



The majority of these patients can be treated with exercise and stretching movements before impressions are made. However, some may not respond to these procedures because of facial scarring and surgical manipulation of the facial muscles. Placement and removal of a loaded impression tray in such patients using the conventional methods may be difficult.

Several techniques have been described for use when either standard impression trays or the denture itself becomes too difficult to place and remove from the mouth.

Preliminary impressions may be made using stock trays that are modified, trimmed and bent using pliers until they can be placed in the mouth with ease¹⁸. Stock trays can also

be sectioned in two parts to make impressions of the right and the left quadrants individually and then reassembled extraorally. However, certain technical difficulties exist in making such impressions and assembling them¹⁹.

In severely restricted mouth opening where use of custom trays is not possible, primary impressions may be made directly using impression compound. Impression compound is kneaded and shaped to the contours of the ridge and loaded on the ridge at bearable temperature¹⁷.

Several modifications of the special tray have been mentioned in the literature. These include:

- 1 Sectional special trays that could be detached and then joined together in the correct original position with the help of acrylic resin blocks which were joined with help of snap fit pins¹⁸.
- 1 Foldable special trays that are joined in the midline using a Steel Door Hinge¹⁷.
- 1 Sectioned Special trays joined with the help of acrylic plate and dowel pins²⁰.
- 1 Sectioned special tray with the lock and key mechanism provided in the handle of the tray.

Surgical Resections

One of the most challenging and demanding maxillofacial endeavors is the construction of functional, complete dentures for the edentulous patient who has undergone a maxillary or a mandibular resection. A prosthesis used to close a palatal defect in dentulous or partially edentulous mouth is called as an obturator. An obturator serves to restore speech, mastication, deglutition and esthetics. Owing to the size of the defect that is created, a conventional denture obturating the defect would be extremely heavy which in turn would greatly affect the retention and stability of the denture. Reduction in weight of the obturator is attained by hallowing the prosthesis. A light weight hollow obturator optimises retention and stability as well as patient comfort²¹. A hollow obturator may be closed or open. Open hollow obturators are readily cleanable but they often collect moisture and require frequent cleaning or placement of a vent to eliminate the

collection of moisture in the hollow section. Removable lids can also be placed in the open hollow portion to prevent this accumulation. Closed obturators have the advantage of eliminating the pooling of moisture while extending superiorly into the defect and reducing air space²².

A closed hollow bulb obturator may be made by using putty during the packing procedure in the defect area which is later removed by drilling a hole in the bulb. Lost Salt technique or a thermocol spacer may also be used to fabricate hollow prosthesis²¹.

Mandibular Deviation

Treatment of mandibular defects includes, defect from surgical resection of mandible, tongue, floor of mouth and associated structures. Disabilities resulting from such resection include impaired speech articulation, difficulty in swallowing, trismus, deviation of mandible during functional movement, poor control of salivary secretions and severe cosmetic disfigurement. Based on the amount of resection or extent of bone loss, mandibular defects can be classified as continuity and discontinuity defects. Mandibular discontinuity can be managed by immediate or delayed surgical reconstruction to re-establish continuity. Loss of mandibular continuity if not re-established alters the symmetry of mandible, leading to altered mandibular movement and deviation of the residual mandible towards the affected side. Different methods used to reduce mandibular deviation are intermaxillary fixation, mandibular guidance appliances, sectional dentures or resection prosthesis. Resection prosthesis may require use of a guide flange or a maxillary occlusal platform incorporated in the prosthesis to guide the mandibular segment into optimal occlusal contact. This prosthesis is made four to six weeks after cancer surgery, after initial healing is complete and the patient is able to open and close the mouth adequately. Mandibular exercise regimen is advocated simultaneously²².

Discussion:

The success of a complete denture relies on the principles of retention, stability and support. The prosthodontist's

skill lies in applying these principles efficiently in critical situations. Severely resorbed maxillary edentulous ridges that are narrow and constricted with increased inter ridge space provide decreased support, retention and stability. Extensive volume of the denture base material in prosthesis due to increased inter-arch space results in a very heavy prosthesis. Retaining such prosthesis requires additional efforts to be made. Various methods have been recommended and selecting the appropriate method is dominated by the existing clinical situation.

Displaceable, flabby or hyperplastic tissues are commonly seen in the anterior region of edentulous maxilla opposing mandibular anterior natural teeth or in the mandibular alveolar ridge when extensive bone resorption has occurred. In the conventional prosthodontic approaches, managing a patient having a flabby maxillary ridge with standard muco-compressive impression techniques is likely to be terminated in an unretentive and unstable complete denture. The use of selective pressure or minimally displacing impression technique should facilitate overcoming some of these limitations.

An abused oral tissue due to ill-fitting dentures is another clinical condition commonly encountered by the prosthodontist. Replacing the ill-fitting denture with a new one will not resolve the problem unless the underlying etiology is eliminated. A comprehensive clinical examination and accurate dental history are essential to identify problems and take necessary corrective action. Additionally, nutritional deficiency is commonly seen in patients seeing complete denture prosthesis. Nutritional Deficiencies can produce a number of oral symptoms such as atrophy, edema, xerostomia, and reduced healing capability. If nutritional deficiencies are suspected, it may be necessary to obtain a medical consultation to identify and correct the specific deficiency.

Apart from compromised ridges, several other compromised oral conditions which are not very ideal for a prosthetic reconstruction are encountered. Temporomandibular disorders, trismus, OSMF, and a number of other causes may lead to restricted mouth

opening. Oral cancers commonly treated by radiotherapy and surgical resection often present with a clinical condition which is difficult to rehabilitate satisfactorily.

Conclusion :

Faulty prostheses can alter the character, condition and form of the underlying oral tissues. The pathological changes must be carefully examined and resolved, prior to the beginning of the new prosthetic rehabilitation. A thorough history, a keen eye in clinical examinations and

sound knowledge about the possible treatment alternatives will help the prosthodontist to provide his patients with satisfactory complete denture prosthesis. The integrated efforts, sound knowledge and practical implication in rehabilitating patients with acquired post surgical defects will help to bring smile and hope for patients with head and neck cancer, as long term survival is now achievable.

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