MOUTH PREPARATIONS

One of the greatest challenges facing the dentist is the provision of the partially edentulous arch with a successful removable partial denture. To ensure this success, the hard and soft tissues of the particular arch being restored and the associated tissues must be in an acceptable biologic state.

A suggested sequence for mouth preparations is as follows:

2. Preparation of the edentulous tissues.
3. Periodontal treatment
4. Teeth preparation:
   1. Establishing guiding plane
   2. Recontouring survey line.
   3. Increasing retention
   4. Occlusal relationship
   5. Restorative procedures
   6. Endodontic treatment
   7. Complete veneer restorations
   8. Rest seat preparations

   As a rule, all preprosthetic surgical treatment (oral surgery, endodontic surgery, orthodontic surgery and periodontic surgery) should be completed as early as possible to allow healing prior to the final impression procedure.
   - Extraction of impacted tooth, remaining roots, malposed tooth, overerupted tooth and tooth with more than grade II mobility
   - Removal of cysts, odontogenic tumors, bony exostoses, prominent tori, hyperplasic tissue.
   - Adjustment of muscle attachment, frena, bony spines and knife-edge ridges.
   - Insertion of osseointegrated devices (dental implants)
   - Augmentation of alveolar bone.

2. Preparation of the edentulous tissues.
   One of the most critical phases in removable partial denture therapy is the preparation of the edentulous tissues to an acceptable biologic state. On many instances, the partially edentulous patient presents tissues that have been traumatized and abused by ill-fitting denture bases, occlusal disharmony, lack of proper oral hygiene measures and most important the improper distribution of stresses caused by faulty selection and location of components.

   With a tooth supported removable partial denture, there is a direct transfer of occlusal forces to the abutment via the rests. The edentulous tissues provide a
passive-supporting role. In this situation, the primary concern is to ensure that the tissues are in their normal healthy anatomic state.

In direct contrast, the distal extension removable partial denture must be dependent not only on the anterior teeth but also on the distal extension tissues. During normal function, the soft tissues are under constant loading. The quality and texture of the residual ridges and the covering mucous membrane must not only anatomic condition but also physiologic (supporting) condition. A thorough investigation of the oral tissues of the partially edentulous patient should be carried out and any abnormalities noted.

1. The New Denture Patient
The new denture patient generally presents no evidence of traumatic abuse caused by ill-fitting dentures or improperly designed partial dentures. However, the presence of any of the following conditions might affect the successful construction, retention or function of the prosthesis.

a. Non pathologic anatomic soft tissue enlargements such as fibrous tuberosities and soft flabby ridges.
b. Unfavorable frena and muscle attachments
c. Abnormalities of the alveolar ridge crests, including sharp bony spicules, knife edge ridge crests and excessive bony undercuts.
d. Bony exostoses and tori.

2. Patient Wearing Dentures
The patient who has previously worn or is wearing a removable prosthesis may present as abused soft tissues caused either by systemic conditions or by mechanical irritation from the prosthesis.

   a. Systemic Effects
   It is not the intent to discuss in detail the systemic conditions, which could directly or indirectly cause a tissue response to abnormal stimulation. It is important to identify any systemic manifestation in the oral cavity and determine whether there is any correlation between the systemic disturbance and the abused tissue. Cavalris lists the following systemic disturbances, which may affect the tissues.

      - Nutritional disturbances to include: iron deficiency anemia, pernicious anemia, vitamin deficiencies and calcium/phosphorus imbalances.
      - Hormonal disturbances such as female hormones, pregnancy disturbances,
      - Hyperparathyroidism, hypothyroidism, acromegaly and diabetes mellitus.
      - Medication effects such as dilantin hyperplasia and mucosal reaction to Premarin.

   b. Mechanical Effects
   Patients wearing ill-fitting or improperly designed removable partial dentures normally present abused tissues on the bearing and/or border areas. The tissues more specifically involved include:

      - Palatal mucosa in the maxillary arch
      - Ridge crest in the mandibular arch
Preparation of mouth for removable partial dentures

- Mucobuccal/mucolingual folds in both arches; and
- Gingival tissue immediately adjacent to the anterior and/or posterior abutment teeth.

The abuse may vary from slight irritation to extensive deformation and is encountered more frequently in free-end extension than in tooth form partial denture situations.

c. Specific Soft Tissue Responses to Ill-fitting Dentures

The continual wearing of an ill-fitting removable partial denture may cause specific soft tissue responses, which must be recognized and treated accordingly prior to the fabrication and insertion of a removable partial denture.

i. Denture Stomatitis

Inflammatory changes sometimes found beneath a removable partial denture have been identified as denture stomatitis or denture sore mouth (DSM) and occurs frequently beneath palatal acrylic bases. Causes have been attributed to:

- Ill-fitting dentures,
- Occlusal disharmony
- Poor oral hygiene
- Constant wearing of the prosthesis and
- Sometimes a superimposed fungal infection

The lesion is generally asymptomatic, however, some patients may complain of a burning or itching sensation related to both the tongue and the palatal mucosa. Angular cheilitis is often associated with denture sore mouth and if the condition is long continued, the skin may become thickened (Brooke-Candidosis).

The treatment would involve removal of the dentures at night and the establishment of a good oral hygiene program. Mechanical trauma should be controlled and minimized as much as possible. If a smear indicates candida albicans infection, Antifungal therapy should be carried out for at least two weeks. A dose of 3 mg one nystatin suppository 100,000 units twice a day for two weeks or coating nystatin cream on the tissue surface of the denture three times a day.

ii. Inflammatory Papillary Hyperplasia

Inflammatory Papillary Hyperplasia or multiple papillomatosis is being observed with increasing frequency in the palatal bearing area of the edentulous and partially edentulous patient. The specific etiology is unknown but Lytle stated that the lesion can be identified with mechanical irritation caused by ill fitting or under-extended denture bases, partial dentures with inadequate tooth support in interceptive occlusal contacts. He feels that the irritation is caused by the underlying tissue becoming trapped between the base/connection and the underlying bone. McCracken considers the design of the horseshoe connector could be a contributing factor to abuse of palatal tissues. Jerbi has suggested that papillomatosis is frequently seen in patients presenting high narrow vaults and that the presence of a negative pressure may be one of the primary etiologic factors. Love and Associates reported that the frequency of this condition is more prevalent in patients who wear their dentures continually. The combination of the trauma superimposed with candida albicans may influence the chronicity of papillomatosis. The lesion presents a broad based configuration in which the
polypoid masses vary in width and depth of 1-2 mm depending upon the extent of its irritation. The degree of success in treating inflammatory papillary hyperplasia will depend upon the ability of the patient to carry out a strict oral physiotherapy program. If a smear demonstrates the presence of candidiasis albicans infection, a therapeutic dose of sucking one nystatin suppository 100,000 twice a day for two weeks.

d. **Treatment Considerations**

To ensure a successful prognosis, the soft tissues must be restored to their optimum biologic status and preserved at that level at all costs. Following the diagnosis and treatment planning, tissue preparation should be accomplished in a logical sequence:

1. Patient education and oral hygiene instruction
2. Removal of the dentures from the oral cavity
3. Oral hygiene measures
4. Use of tissue conditions
5. Modifications to existing prosthesis
6. Provisional prosthesis
7. Interim prosthesis

1. **Patient Education and Oral Hygiene Instruction**

One of the primary requisites is the education and motivation of the patient to accept, understand and carry out a strict oral physiotherapy regimen regularly and conscientiously. The most effective mechanism is based on the patient’s understanding of the etiology, initiation and progression of soft tissue damage caused by the existing prosthesis. The patient must also be aware of the physiologic limits of the partial denture service and the potential dangers that can result from further negligence. Once the patient understands these ramifications, he/she may be instructed in tissue recovery procedures necessary to preserve the tissues in an acceptable condition. At subsequent appointments, oral hygiene can be evaluated carefully and further treatment should be withheld until a satisfactory level has been achieved.

2. **Removal of the Prosthesis**

Lytle demonstrated that if ill-fitting dentures are removed and the soft tissues have not been displaced beyond their normal physiologic limits, the tissues tend to improve in ……..and return to their normal resting form. This capacity of tissues was termed TISSUE RECOVERY. The demonstrated that it was advisable to remove the denture 48 hours prior to the making of new impressions if the tissue had not been abused beyond its normal tissue recovery capability.

3. **Oral Hygiene Measures**

On conjunction with removal of dentures the patient should be advised to:

a. Use intermittent hot and cold rinses periodically throughout the 24 hour period.

b. Stimulate the abused tissue either by finger massage or by chewing bubblegum
c. Brush the abused tissues frequently with a very soft nylon brush in warm water.

4. Tissue Conditioners

If tissues are abused excessively, more than a 72 hour recovery period may be required. Depending on the design and outline form of the corrector/base of the partial denture, a resilient tissue conditioner may be placed inside the denture base/connector. The tissue conditioner consisting of a polymer powder and an aromatic ester-ethyl alcohol mixture provides an intimate contact against the underlying tissue during the recovery period. Some of the more resilient tissue conditioners that can be used effectively are: Hydrocast, Temp, Fill, Coe, Soft, Coe Comfort.

Birman suggested that to ensure the tissue recovery process has been initiated, the denture must be removed at least 24 hours to insertion of a tissue conditioner.

Most tissue conditioners have the property of “flowing” under the forces of mastication for several hours and maintaining their softness for several days. However they do have a short duration effectiveness and should be replaced when necessary. Tissue conditioners become rough, rigid, discolored and usually very foul after 21 days. If the conditioner is left for any length of time, contamination by candida albicans is a common occurrence.

5. Modification to Existing Prosthesis

The existing prosthesis should be carefully evaluated to determine the presence of any mechanical deficiencies causing the abuse of soft tissue.

The following errors should be identified:

a. Correct any gross deflective contacts, particularly heavy balancing contacts.

b. Restore the vertical dimension of occlusion to the desired level (in conjunction with the use tooth-colored triad and a resilient tissue conditioner).

c. Locate and eliminate any denture area causing excessive pressure and deformation.

d. Correct base extensions to provide maximum coverage and stability within the limits of tissue tolerance. If possible, the free end extension area should be registered in a supporting form to minimize masticatory stresses.

e. Adjust component location and function to discourage tissue impingement, resist torquing forces and enhance denture stability.

f. Replace condemned natural teeth within an existing partial denture which can act as a “temporary” while a replacement is fabricated.

6. Interim Prosthesis

In some cases, evaluation of the existing prosthesis reveals that it would be more practical to construct an interim prosthesis during the tissue recovery period. In some cases however, gross negligence of using a “flipper type” tissue borne partial denture has often caused more periodontal and soft tissue damage than already exists. If an interim acrylic base prosthesis is to be used, careful consideration must be given to the design of the prostheses. Sufficient tooth support must be provided to ensure uniform distribution of stress between the remaining natural teeth and the soft tissues. The denture base outline and coverage must enhance tissue preservation not destruction.
3. **Periodontal treatment.**

   There are certain periodontal procedures that should be considered involving soft/hard tissue abnormalities. After oral hygiene measures, scaling and root planning have been carried out periodontal surgery may be recommended for:

   1. No bony defects – excess gingiva  |  gingivectomy
   2. No bony defect – inadequate gingiva  |  microgingival surgery
   3. Bony defect – osseous surgery

   One of the more common and useful procedures is “salvaging the buried crown” increasing the crown length of a major abutment by a simple gingivectomy procedure.

4. **Teeth preparation:**

   The real key to successful mouth preparation lies in an accurate analysis of the diagnostic cast. Unless, the height of contour of the abutment teeth, the determination of desirable and for undesirable undercut areas, the location of tentative rest areas is evaluated, mouth preparations can not be accomplished.

   Tooth modification is one of the simplest procedures and yet one of the most neglected steps in mouth preparation. The main reason for this neglect is that if dentin were exposed, abutments would be more susceptible to caries. Penetration of the dentin can be prevented by careful radiographic interpretation. Susceptibility to caries can be reduced by smoothing the involved tooth surfaces with fine disks, rubber wheels, pumice and fluoride pastes.

   Tooth modification should follow an organized logical sequence:

   1. **Establishing Guiding Planes**

      The initial step in natural tooth surface modification should be the preparation of guiding planes.

      **A. Guiding Planes and the Tooth-Borne Partial Denture**

      a) guiding planes are prepared on the vertical surfaces of abutment and bracing teeth that are parallel to each other and the path of insertion.
      b) greater advantage is realized if these surfaces are parallel to the long axes of the abutment teeth.
      c) to be effective, guiding planes should be established on at least two widely separated teeth in the dental arch.
      d) if possible, guiding planes should include more than one common axial surface.
      e) there should be continual contact between the bracing (proximal or axial plate/arm) of the framework and the guiding plane surface on the teeth from initial contact to the final seating of the prosthesis.
      f) to be effective, the minimal size of the guiding plane should be one-third (⅓) of the axial surface of the abutment.
      g) to preserve the esthetic integrity of the anterior teeth, guiding planes should be prepared in a more proximal-lingual direction.
h) care must be taken to round any sharp line angles incurred during the preparation.

i) preparation of the guiding plane must always precede rest preparations in the abutment tooth in order to determine the correct relation of the rest preparation to the marginal ridge.

j) if an abutment tooth is to be restored by a cast gold crown, guiding planes must be incorporated on the involved cast surfaces and correlate with the selected path of insertion

k) prepared guiding plane surfaces must be highly polished and fluoridated upon completion of preparation.

B. Guiding Planes and the Free End Extension Partial Denture

To minimize normal stresses being directed on the dental and lingual surfaces.

- The prepared guiding plane on the distal surface of abutment tooth must be shortened.

The prepared surface should extend no more than 2-3 mms in occlusal-gingival direction. The proximal plate of the denture should only contact the lower half of the prepared surface.

2. RECONTOURING SURVEY LINES

a) In some cases, the selection of the most acceptable path of insertion will still not eliminate undesirable tooth undercut areas. In most cases, a slight reduction of the high contour survey line will not only minimize the undesirable undercut but also lessen the possibility of abnormal stress by shortening the length of the lever arm.

b) In many cases, the height of contour on the bracing surface may be excessively high, necessitating the placement of the reciprocal arm at a much higher level occlusally than the retentive arm of the clasp. In this instance, the retentive arm would engage the abutment long before the bracing action from the reciprocal arm is initiated. Over a period of time, the unopposed force from the retentive arm would cause a horizontal torquing of the abutment tooth. Reducing the height of contour on the bracing surface would permit the placement of the reciprocal arm. On the same occluso-gingival level as the retentive arm. Once the retentive arm passes over the height of contour into the desirable undercut area, the force generated by the retentive arm would be opposed by the reciprocating action of the reciprocal arm.

c) Where a high survey line exists on the bracing surface of the abutment, near its occlusal surface, it may be necessary to position the reciprocal arm of the clasp on or below the survey line. If the arm is placed below the survey line; that area would have to be blocked out and no stabilizing action would be provided by the reciprocal arm during function.

d) Quite often the existing height of contour is too high interproximally for the proper placement of that clasp arms as they arise from the rest area to emerge on the buccal and lingual surfaces of the abutment. By reducing

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Preparation of mouth for removable partial dentures

the suprabulge areas of the proximo-buccal and proximo-lingual line angles, the components of the clasp can assume their normal position.

3. INCREASING RETENTION

In cases where retention areas are non-existent on abutment teeth, the preparation of slight depressions (dimple) or grooves in desired areas may increase the retentive potential, however, there is always the risk of caries onset in a non-compliant patient or sensitivity in the area occurring. The preparation must be highly polished and not penetrate the involved enamel surface. If the penetration of enamel is anticipated the placement of an over-contoured restoration over which the retentive of the clasp can flex into the desired undercut area. Good results have been achieved using composite lugs to create the proposed retentive areas. The inferior border of the lug must be at least 1.5 to 2 mm from the gingival margin.

4. OCCLUSAL RELATIONSHIPS

One of the most important considerations in removable partial denture therapy is the establishment of a functional and harmonious occlusal relationship between the opposing dentition and between the artificial and natural teeth.

To determine the status of occlusion existing in the partially edentulous patient a careful assessment must be carried.

1. What is the status of the occlusion between the existing natural dentition?
2. Is there a loss of occluding vertical dimension?
3. If there is a loss, how much interocclusal clearance exists?
4. Does any abnormal vertical and horizontal overlap exist?
5. How much interarch space exists?
6. Is there any significant extrusion or rotation of the remaining natural teeth that will interfere with the normal placement of the artificial teeth or prevent coverage of the essential bearing areas by the acrylic denture base?

N.B. The differentiation between extrusion and over-closure must be established prior to any tooth reduction is undertaken.

A careful analysis of the diagnostic casts will indicate to what extent the interarch space may have been lost. The following situations of malposition may require further modification to permit the proper establishment of the functional occlusal plane.

a) an irregular mandibular occlusal plane
b) a posterior molar standing above may be elongated and tilted to interfere with base coverage
c) encroachment of the mandibular occlusal plane by the lingual cusp extension of the maxillary molar

5. RESTORATIVE PROCEDURES

All carious lesions and/or defective restorations must be treated or replaced before considering the fabrication of the removable partial denture. Restoring these teeth to
their correct anatomic and physiologic forms is a necessary adjunct to ensure a successful prognosis and preserve the remaining tissues. Each restoration should be so planned to be consistent in contour with the selected path of insertion of the prosthesis.

In some cases, a badly mutilated tooth may be restored by retained amalgam restorations; however, the decision will be based on the extent of the edentulous areas and the type of partial denture required. If the partially edentulous situation is a free end extension situation, ideally then the major abutment should be a cast gold restoration.

6. ENDODONTICS

Endodontic treatment of a strategic tooth may mean the difference between a patient becoming edentulous or partially edentulous. Endodontically treated teeth that are to be used as abutments should be evaluated such as:

a) location in the arch
b) periodontal support
c) adequacy of and need for retreatment of root canal filling
d) remaining sound coronal tooth structure

The objective in restoring endodontically treated which are to be considered as major abutments, is not only to replace lost tooth structure. The best and really only type of restoration for an abutment which must be endodontically treated is a cast gold crown.

7. COMPLETE VENEER CROWNS

Castings on individual teeth may be necessary for the following reasons.

a) restore badly mutilated abutments
b) reposition a more normal occlusal plane
c) recontour axial surfaces to provide guiding planes and retention

The ideal crown restoration for a removable partial denture is the cast crown which can be carved to satisfy all the requirements for guiding planes, support, bracing, retention and esthetics.

According to Miller, the wax crown pattern should be carved on a full arch cast of the mouth with cast oriented in the surveyor in the desired path of insertion. The crown should be contoured by means of the surveyor spindle (wax carver) to ensure that the guiding planes, reciprocal and retentive areas harmonize with the path of insertion, the occlusal anatomy should be developed so that the restored wax abutment intercuspates and occludes with the teeth in the opposite arch. The occlusal rest must be carved to satisfy all the requirements of an occlusal rest position.

8. PREPARATION OF REST SEAT AREAS

No removable partial denture should be constructed without tooth support by means of rests.

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The basic principle in any RPD design is to incorporate maximum support and bracing with minimum retention. Keeping this principle in mind, it is advisable to utilise as many rests as required to balance the stress loads during function.

**A. OCCLUSAL RESTS**

a) Requirements for Occlusal Rest Preparation

For any type of rest to be effective it must meet certain preparatory requirements that will enhance the biomechanical functions of dentures.

i) The rest must be a definite saucer-shaped depression 1 to 1½ mm in depth extending approximately ⅓ to ½ the buccolingual width.

ii) The occlusal outline should be somewhat triangular in form with its greatest width at the marginal ridge.

iii) The floor of the rest should be at right angles to the long axis of the tooth with the deepest portion toward the centre of the occlusal surface.

iv) The angle formed by the occlusal rest and the vertical minor connector should be less than 90 degrees. Only in this way can the occlusal forces be directed down the long axis of the abutment tooth.

v) The rest must be sufficiently reduced at the marginal ridge to allow bulk of metal for strength as the rest crosses that area.

vi) The rest must be prepared entirely within tooth enamel or within the confines of the restorations, or a combination of both.

vii) The preparation of the rest must always follow the proximal disking of the abutment tooth in order to determine the correct relation of the rest preparation to the marginal ridge. If disking follows the preparation of the rest, the marginal ridge may be too low and too sharp with the centre of the floor of the rest too close to the marginal ridge.

viii) Rest areas must be highly polished and pumiced upon completion of preparation.

ix) To ensure correct rest preparation prior to the making of the final impressions, utility wax may be forced into the rest preparation to check for undercuts and correct outline, or an alginate diagnostic impression adjacent may be made to access all tooth preparations particularly to ensure all rest preps are in the same path of insertion.

b) Multiple Occlusal Rests

One of the greatest problems encountered in any dental laboratory is the faulty preparation of the double occlusal rest. In most instances occlusal interference from clasp arms or fracturing of the clasp arms result from inadequate preparation. The double rest preparation must not only meet the biomechanical requirements for occlusal rest preparation but in addition:

i) Rests must be prepared individually for each tooth - adhering to the basic principles.

ii) There must be sufficient interproximal clearance to bracing and retentive surfaces of the abutment teeth.
iii) The proximobuccal and proximolingual shoulders should be rounded to permit proper adaptation of the clasp arms to the teeth.

**B. ANTERIOR RESTS**

While the preferred site for an occlusal rest is on the occlusal surface of a molar and a bicuspid, an anterior tooth may be the only abutment available for the tooth support of denture. In many cases an auxiliary rest may be necessary to act as an anterior stop or as an indirect retainer. Anterior rests may be prepared on the lingual or incisal areas of anterior teeth. The cuspid is much preferred over the incisor because of its superior root form, crown conformation and the thickness of the enamel at the cingulum area. Generally speaking, the lingual rest provides better support than the incisal rest, as it can better fulfil the biomechanical requirements. With the lingual rest, there is less possibility of orthodontic movement of the abutment tooth as the location of the rest seat directs the forces down the long axis.

i) Cingulum rests:

If a cuspid is sound and the lingual slope is gradual rather than perpendicular, a lingual rest can be prepared just above the cingulum. The proximal marginal ridge is lowered and the deepest portion of the rest is made toward the cingulum rather than the axial wall in order to avoid an enamel undercut. If the cuspid is sound and the occlusion is tight, a circumferential shoulder may be prepared slightly below the cingulum, parallel to the path of insertion. The preparation should be carried as far interproximally as possible (entire mesiodistal width of tooth) as the area does not meet all the requirements of a rest. When no cingulum is present, resin can be bonded to the tooth. Then preparation may be done partly in resin and partly in enamel.

ii) Incisal Rests:

If lingual rests cannot be used then incisal rests must be considered. While the incisal rest may be used on a cuspid abutment in either arch, it is more applicable to the mandibular cuspid. The incisal rest should be located at the mesio- or disto- incisal angle of the abutment farthest from the point or origin of the rest arm. In preparing the rest, the biomechanical requirements of any rest preparation should be met. In addition, the incisal notch must be levelled labially and lingually, and the lingual enamel should be shaped to accommodate the rest arm. In extensive cases where there are only a few remaining natural teeth the multiple tooth support is required, central incisal rests may be prepared extending onto the labial surfaces.

**References:**


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