

## Support for the distal extension denture base

**Support:** resistance to vertical components of masticatory force in a direction toward the basal seat.

**All partial denture have two things in common:**

1. They must be supported by oral structures.
2. They must be retained against reasonable dislodging forces.

**Support can be classified according to Craddock:**

1. Dental support.
2. Mucosal support.
3. Mixed, dental & mucosal / mucosal & dental support.

**Designing support:**

**A. Tooth support:** when abutment available at both ends of the denture base (bounded saddle). It most commonly obtained by occlusal rests.

**B. Mucosa support:** (mucoperiosteum covering residual alveolar bone). It allows varying degree of displacement.

**The amount of displacement (tissue ward movement) will depend on:**

1. The amount of pressure applied.
2. The nature of the mucosa (thickness).
3. Area covered by the denture ( the wider area the less the displacement).
4. Fit of the denture.
5. Type of impression (anatomical, functional, or selective pressure).

**C. Tooth-mucosa support:** (bilateral free end saddle): Posterior tissue support & anterior tooth support.

In class III PD three components are necessary, support provided by rests, the connectors (stabilizing components) & the retainers. An anatomical impression is the only needed to record the anatomic form of the teeth & residual ridge in tooth born RPD. The distal extension removable partial denture does not have the advantage of total tooth support because one or more bases are extensions covering the residual ridge distal to the last abutment, but in this situation , the support comes from both the teeth & the underlying ridge tissues rather than from teeth alone. This is a composite support, & the prosthesis must be fabricated so that the resilient support provided by the edentulous ridge is coordinated with the more stable support offered by the abutment teeth.

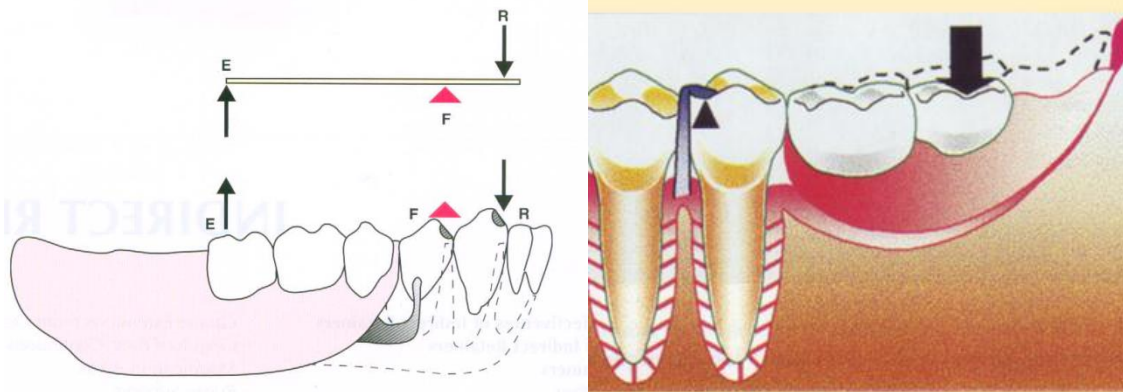
The distal extension removable partial denture must depend on the residual ridge for some support, stability, and retention. Indirect retention, to prevent the denture from lifting away from the residual ridge, should also be incorporated in the design.

**In addition provision must be made for three other factors:**

1. Best support must be obtained from the resilient tissues that cover the edentulous ridges. This is accomplished by the impression technique more than by the PD design. The area covered by the partial denture base is a factor in such support.
2. The method of direct retention must take into account the inevitable tissue ward movement of distal extension base (s) under the stress of mastication and occlusion. Direct retainers must be designed so that the occlusal loading will result in the direct transmission of this load to the long axis of the abutment teeth.
3. The PD with one or more distal extension denture base, must be designed so that movement of the unsupported and not retained end away from the tissues will be prevented by indirect retainer.

**The main problems which might occur in tooth-tissue support are:**

- 1- Mucosa is resilient and displaceable and can lead to unstable prostheses.
- 2- Difficult to record mucosa at resting and at displaced condition simultaneously.
- 3- In distal ERPD under function compresses the mucosa and act as class I lever thus it cause damaging to the abutment teeth, the solution is to record tissue in the functional form so the denture not exert additional stress to the abutment teeth.

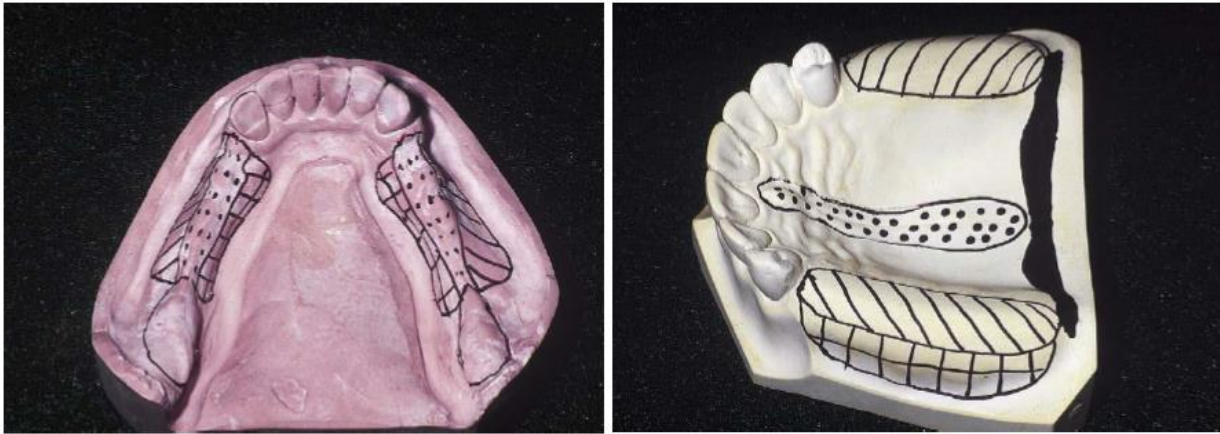


**Factors influencing the support of a distal extension base**

1. Contour and quality of the residual ridge
2. Extent of residual ridge coverage by the denture base
3. Type and accuracy of the impression registration
4. Accuracy of the fit of the denture base
5. Design of the removable partial denture framework
6. Total occlusal load applied

### 1. Quality of the residual ridge for good support:

- The ideal residual ridge to support a denture base would consist of cortical bone that covers relatively dense cancellous bone, with a broad rounded crest with high vertical slopes, and is covered by firm, dense, fibrous connective tissue.
- The buccal shelf region (bounded by the external oblique line and the crest of the alveolar ridge) in the lower ridge as a primary stress-bearing area, because it is covered by relatively firm, dense, fibrous connective tissue supported by cortical bone. While the crest of the bone is mostly cancellous bone not good for support. Unlike in the maxillary ridge the crest is primary stress bearing area.
- Slopes of the ridge can resist horizontal forces.



### 2. Extent of Residual Ridge Coverage by the Denture Base:

The broader the residual ridge coverage, the greater is the distribution of the load, which results in fewer loads per unit area. A denture base should cover as much of the residual ridge as possible and should be extended the maximum amount within the physiologic tolerance of the limiting border structures or tissues lead to better distribution of load & better withstanding of vertical & horizontal forces. The longer the edentulous area covered by the denture base, the greater the potential lever action on the abutment teeth.

- ✓ Flat ridge will provide good support, poor stability.
- ✓ Sharp spiny ridge will provide poor support, poor to fair stability.
- ✓ Displaceable tissue on ridge will provide poor support & poor stability.

The distal end RPD derives its support from the residual ridge with its fibrous connective tissue covering. The length & contour of residual ridge significantly influence the amount of available support & stability.



Comparison of two RPD for the same patient. The denture on the right has severely underextended bases. Its replacement, with properly extended bases, is on the left. Occlusal forces are more readily distributed to denture-bearing areas by the replacement denture.

### 3. Type and Accuracy of the Impression Registration:

The residual ridge may be said to have two forms:

A. The anatomic form: The anatomic form is the surface contour of the ridge when it is not supporting an occlusal load. The anatomic form & the relationship of the remaining teeth in the dental arches, as well as the surrounding soft tissue, must be recorded accurately so that the denture will not exert pressure on those structures.

B. The functional form: is the surface contour of the ridge when it is supporting a functional load. The support form of the soft tissues underlying the distal end base of the PD should be recorded so that firm areas as primary stress-bearing areas and readily displaceable tissues are not overloaded, only in this way can maximum support of the PD base be obtained.

McLean and others recognized the need to record the tissues that support a distal extension removable partial denture base in their functional form, or supporting state, and then relate them to the remainder of the arch by means of a secondary impression. This was called a functional impression because it recorded the ridge relation under simulated function.



Many of the requirements and advantages are associated with the distributed stress denture apply equally well to the functionally or physiologically based denture. Some of these requirements are (1) positive occlusal rests; (2) an all-rigid, nonflexible framework; (3) indirect retainers to add stability; and (4) well-adapted, broad coverage bases.



Comparison of anatomic and functional ridge forms. **A**, Original master cast with the edentulous area recorded in its anatomic form, using elastic impression material. **B**, Same cast after the edentulous area has been repoured to its functional form as recorded by the secondary impression.

#### 4. Accuracy of the Fit of the Denture Base:

- Support of the distal extension base is enhanced by intimacy of contact of the tissue surface of the base and the tissues that cover the residual ridge. The tissue surface of the denture base must optimally represent a true negative of the basal seat regions of the master cast.
- In addition, the denture base must be related to the removable partial denture framework in the same manner as the basal seat tissues were related to the abutment teeth when the impression was made. Every precaution must be taken to ensure this relationship when the altered cast technique of making a master cast is used.

#### 5. Design of the Removable Partial Denture Framework:

Some rotation movement of a distal extension base at the distal abutment is inevitable under functional loading. The greatest movement takes place at the most posterior extent of the denture base. The retromolar pad region of the mandibular residual ridge and the tuberosity region of the maxillary residual ridge therefore are subjected to the greatest movement of the denture base.

- Use of more anterior or mesial rest is suggested as it allow vertical ridge loading, permit greater ridge for support, transfer stress to anterior abutment.
- Incorporation of indirect retainer.
- Incorporation of RPI system in free end saddle which make stress release.



The occlusal rest is placed on the mesioocclusal surface of the lower first premolar; this will move the point of rotation anterior to the conventionally placed distoocclusal rest if contact of the proximal minor connector on the distal guiding plane is designed to release under function. The occlusal rest is connected to the lingual bar by a minor connector, which contacts the small mesiolingual prepared guiding plane.

## 6. Total Occlusal Load Applied:

Patients with distal extension removable partial dentures generally orient the food bolus over natural teeth rather than prosthetic teeth, because of :

1. The more stable nature of the natural dentition.
2. The proprioceptive feedback they provide for chewing.
3. The possible nociceptive feedback from the supporting mucosa.
  - This has an effect on the direction and magnitude of the occlusal load to the removable partial denture, and thus on the load transferred to the abutments.
  - The support from the residual ridge should be optimized and shared appropriately with the remaining natural dentition.
  - The number of artificial teeth, the width of their occlusal surfaces, and their occlusal efficiency influence the total occlusal load applied to the removable partial denture.
  - The reduction of the size of the occlusal table reduces the vertical and horizontal forces that act on the removable partial dentures and lessens the stress on the abutment teeth and supporting tissues.

## Anatomical Form Impression

The anatomic form impression is a one-stage impression method using an elastic impression material that will produce a cast that does not represent a functional relationship between the various supporting structures of the partially edentulous mouth. It will represent only the hard and soft tissues at rest.

With the removable partial denture in position in dental arch, the occlusal rest will fit the rest seat of the abutment teeth, while the denture base will fit the surface of the mucosa at rest.

When a masticatory load is applied to the extension base(s) with a food bolus, the rest(s) will act as a definite stop, which will limit the part of the base near the abutment tooth from transmitting the load to the underlying anatomic structures.

The distal end of the base(s), however, that is able to move more freely, will transmit more of the masticatory load to the underlying extension base tissues and will transmit more torque to the abutment teeth through the rigid removable partial denture framework.

A removable partial denture fabricated from a one-stage impression, which records only the anatomic form of basal seat tissues, places more of the masticatory load on the abutment teeth and that part of the bone that underlies the distal end of the extension base.

### Methods for obtaining functional support from the distal extension base

The objective of any functional impression technique is to provide maximum support for the removable partial denture bases.

- This allows for the maintenance of occlusal contact between natural and artificial teeth.
- Minimal movement of the base, which would create leverage on the abutment teeth.
- Some tissue-ward movement of the distal extension base is unavoidable and dependent on six factors listed previously, it can be minimized by best possible support for denture base.
- No single impression material can record both the anatomic form of the teeth and tissues in the dental arch and, at the same time, the functional form of the residual ridge. Therefore, some secondary or corrected impression method must be used.
- Methods for obtaining functional support for either should satisfy the two requirements for providing adequate support to the distal extension removable partial denture base. These are (1) that it records and relates the supporting soft tissue under some loading, and (2) that it distributes the load over as large an area as possible.

## Selective tissue placement impression method

Soft tissues that cover basal seat areas may be placed, displaced, or recorded in their resting or anatomic form. Placed and displaced tissues differ in the degree of alteration from their resting form and in their physiologic reaction to the amount of displacement. For example, the palatal tissues in the vicinity of the vibrating line can be slightly displaced to develop a posterior palatal seal for the maxillary complete denture and will remain in a healthy state for extended periods. On the other hand, these tissues develop an immediate inflammatory response when they have been overly displaced in developing the posterior palatal seal.

Oral tissues that have been overly displaced or distorted attempt to regain their anatomic form. When they are not permitted to do this by the denture bases, the tissues become inflamed and their physiologic functions become impaired, accompanied by bone resorption. Tissues that are minimally displaced (placed) by impression procedures for definitive border control respond favorably to the additional pressures placed on them by the resultant denture bases if these pressures are intermittent rather than continuous.

The selective tissue placement impression method is based on these clinical observations:

1. The histologic nature of tissues that cover the residual alveolar bone.
2. The nature of the residual ridge bone.
3. and its positional relationship to the direction of stresses that will be placed on it.

It is further believed that by use of specially designed individual trays for impressions, denture bases can be developed that will use those portions of the residual ridge that can withstand additional stress and at the same time relieve the tissues of the residual ridge that cannot withstand functional loading and remain healthy.