

# Improving tissue support- altered cast technique



**ASSIGN  
BUSTER**

**ABSTRACT**

**Aim:** Cast partial denture made using altered cast technique creates an environment in which the teeth and the edentulous tissues support the denture bases as compatible as possible, resulting in a more stable cast partial denture.

**Background:** The tissues of the edentulous ridge in distal extension removable partial denture are liable to be displaced under occlusal pressure. This is a result of the displaceability of the mucosa. The difference between the resiliency of the residual ridge tissues and the teeth causes disparity of support, that causes the denture to rotate about its distal abutment, inducing heavy torsional stresses on the teeth and possible traumatization of alveolar ridge. Studies have proved that better support and stability can be achieved in distal extension cases using functional impression along with altered cast technique.

**Case description:** The following article is a case report of a distal extension cast partial denture using altered cast technique for better tissue adaptability and stress distribution.

**Conclusion:** For recording Kennedy's class I and II edentulous areas, optimum residual ridge coverage with a well fitting denture base is required. This reduces stresses, preserving the remaining supporting structures which can be achieved with the use of altered cast technique.

**Clinical significance:** The altered cast technique allows the residual alveolar ridge to be recorded in functional form and relates to the teeth so that when

the prosthesis is seated, it derives support simultaneously from the teeth and the soft tissues.

Keywords: distal extension, stress distribution, functional impression, altered cast technique.

#### BACKGROUND:

The most important consideration in replacement of missing teeth for a distal extension removable partial denture as per DeVan's statement must be " the perpetual preservation of that which remains, and not the meticulous replacement of that which has been lost." <sup>1-4</sup>.

When occlusal forces are applied to distal extension removable partial dentures, the forces must be distributed equally to the abutments and the tissues of the residual ridge. <sup>2</sup> This cannot be accomplished on a master cast made from a single impression. A dual impression technique is used in which a " corrected cast" can be generated which can record and relate the tissues under uniform loading, distribute the load over as large an area as possible and accurately delineate the peripheral extent of the denture base. <sup>2</sup>

Functional impressions are defined as " The impression which records the form of the residual alveolar ridge under some loading whether by occlusal loading, finger loading, specially designed individual tray or consistency of recording medium." <sup>5</sup> Several methods may be used for registering the alveolar mucosa in its supporting form. The dual impression techniques are categorised as

1). Physiologic impression techniques.

a). McLean-Hindel method,

b). The functional reline method,

c). The fluid wax method.

2). Selective pressure techniques. <sup>2</sup>

According to Leupold <sup>6</sup>, the functional reline method is accomplished after the denture base has been processed onto the framework. The disadvantage being it requires a greater degree of occlusal adjustment after processing of acrylic resin and so it is necessary to modify the new denture before delivering it to the patient. <sup>6</sup> So to overcome this the master cast is altered to accommodate the secondary impression and thus altered /corrected cast is generated. <sup>2, 6</sup>.

Cast partial denture made using the altered cast technique helps create an environment in which the teeth and the edentulous tissues support the base as compatibly as possible resulting in a more stable denture that improves the support for the occlusal relationship of the opposing dentition and the removable partial denture restoration. <sup>2, 3</sup>.

For preservation of the residual ridge, Becker and his colleagues, critically reviewed the evolution of removable partial denture and outlined six principles for its design which include a rigid major connector, multiple positive rest seats, mesial rests, parallel guide planes, the I-bar clasp design

and the altered cast technique.<sup>7</sup> This technique has the potential benefits of reducing the number of postoperative visits, preserving the residual ridges, improving stress distribution, decreasing food impaction and decreasing the torquing of abutment teeth leading to increased patient satisfaction.<sup>8-11.</sup>

The following case report will explain the use of altered cast technique used in the fabrication of a distal extension cast partial denture.

#### CASE DISCRIPTION:

A 60 year old male patient reported to the Department of Prosthodontics Dr. D. Y. Patil Dental College and Hospital, Navi Mumbai with the chief complaint of missing teeth and difficulty in eating.

Extra-oral examination revealed that the patient had an ovoid tapered face, with mild prognathism, competent and thick lips. Patient had a habit of cigarette smoking since 20 years and so was advised to stop the habit.

Intraoral examination revealed that there was only one tooth 23 remaining in the maxillary arch and 31, 32, 33, 41, 42, 43 in the mandibular arch. The teeth were lost due to caries and periodontitis. (fig. 1, 2)

Radiographs were evaluated and the treatment was planned. Tooth supported overdenture for maxillary arch and cast partial denture for mandibular arch was planned. Diagnostic impressions were made in irreversible hydrocolloid (Imprint, DPI). The impressions were poured using dental stone (type III, kalrock) and casts were procured.

For the maxillary arch, the canine was endodontically treated. Pattern resin (DPI) was then used to make a Thimble-shaped coping for the canine which will help in additional retention of the maxillary denture. Primary impression was made using irreversible hydrocolloid (Imprint, DPI) and custom tray was made. The coping was then cemented with zinc phosphate cement (Dentsply). Border moulding was done with low fusing compound (greenstick, DPI) and wash impression was made using polyether impression material (3M ESPE). Master cast was poured in dental stone (type III, kalrock).

For the mandibular arch, Diagnostic cast were surveyed and cast partial framework design was planned. The design included Lingual Plate as the Major Connector, Modified Ladder shaped minor connector. RPI system was planned for the rests and guide planes on 33 and 43. Mouth preparation was done which included the preparations of rest seats on 33 and 43, guide planes on distal of canines. Composite build up on the mandibular anterior teeth was done for better anterior guidance. Impression was made in a custom tray using medium bodied polyether impression material (3M ESPE) and master cast was poured using dental stone (type III, kalrock). Cast partial denture framework was fabricated on the master cast.

The cast partial denture framework was checked on the master cast and in the patient's mouth for the fit. (fig. 3, 4). The cast partial framework was used as a part of the custom tray for recording the functional impression. Spacer wax (DPI) was adapted on the saddle area of the framework and acrylic custom tray was made using Self cure acrylic resin material (DPI). The custom tray was checked in the patient's mouth for correct extension.

Border moulding was done using low fusing impression compound (green stick, DPI). Spacer wax was removed to provide space for the wash impression material. Tray was coated with a layer of adhesives so that the elastomeric impression material adheres to it. Wash impression made using polyether impression material (3M, ESPE).

The master cast was sectioned into 3 pieces with the help of a hand saw and the distal edentulous area was removed. (fig. 5). The wash impression made on the framework was placed on the sectioned master cast making sure that it seats completely in the rest seat areas. (fig 6).

The entire assembly was sealed using utility wax to prevent its dislodgement or movement during pouring of the cast. Beading and boxing was done around the framework and sectioned master cast and the impression was poured using a different coloured dental stone (type IV, kalrock) to distinguish with distal extension areas. The cast thus obtained was the altered cast. (fig. 7). Jaw relation was recorded and teeth arrangement was done. Try in of the maxillary and mandibular trial dentures was done and dentures were fabricated using Heat cure acrylic resin (Leucitone, Dentsply). At the denture insertion stage dentures were checked in the mouth for retention and stability. (fig. 9, 10).

Post insertion instructions were given and follow up at the interval of 1month and 3 months was done.

DISCUSSION:

The fabrication of distal extension partial denture is a difficult task since it involves taking support from both the tissues and the teeth. Both of them have different amount of movements when forces of mastication are applied to them. Thus, the use of special impression techniques becomes necessary. However, in some cases, soft tissue displacement is slight. As a result, the functional and anatomic contours of the ridge may be virtually identical. However, that was not in this case. The decision to use dual impression technique along with altered cast technique was determined in the beginning using a test. Here, first the acrylic denture base was made on the diagnostic cast and placed in the mouth and finger pressure was applied to the base. There was some amount of lift seen in the framework suggesting that there was some soft tissue displacement. So by using the dual impression technique we can get a precise and functionally formed denture border and seal. <sup>2, 3, 7, 8</sup>. The dual impression used is indicated for mandibular distal extension cases because of a limited ridge area, the mobility of the floor of the mouth, to record the stress bearing area and proper peripheral extension. <sup>2</sup>

There are two categories of dual impression techniques mainly the physiologic impression techniques and selective pressure techniques. Physiologic impression techniques record the tissues of the residual ridge in its functional form by placing an occlusal load on the impression tray during impression procedures. The methods are the McLean-Hindels method; the functional reline method; and the fluid wax method. <sup>2</sup>



The need for physiologic impressions was first proposed by McLean and others. He recorded the tissues of the residual ridge in a functional form and the remaining teeth in anatomic form. However the disadvantage of this technique being that the dentists could not produce the same functional displacement generated by occlusal forces because of design of tray being used. <sup>2, 12</sup>

In response to this shortcoming, Hindel developed his impression procedure by modifying the tray as a result of which the finished impression was a reproduction of the anatomic surface of the ridge and the surfaces of the teeth. Disadvantage being that the tissues recorded in this technique continue to be in a functional form all the time. This results in compromised blood flow with adverse soft tissue reaction and resorption of the underlying bone. Also sometimes because of this there is presence of premature contacts of the teeth replaced which will not be acceptable to the patients. <sup>2, 13, 14</sup>

The Functional Reline technique and the Fluid wax method where fabrication of the distal extension denture is done before and the new surface is added to the intaglio of the denture base afterwards. It can be done in cases where the denture becomes loose. However, as in the earlier methods this method too, has some difficulties mainly, the problems caused by failure to maintain the correct relationship between the framework and the abutment teeth during impression making procedure and also failure in achieving accurate occlusal contact following the reline procedure. <sup>1, 2, 3, 15</sup>. To overcome this,

along with this method corrected cast procedure was used yielding a better result. 1, 2, 3, 9, 10, 15

In the mentioned case report we have made use of the altered cast technique along with selective pressure impression procedure. The main advantage of this procedure is that the framework was ready before we make the final impression and alter the master cast. So the adaptation of the framework to the teeth and the soft tissues doesn't change after the final impression. Also the other advantages are,

1. Remarkable stability of the denture base in distal extension removable partial dentures.
2. A positive occlusion which will be maintained for long periods of time.
3. Reduced stress on abutment teeth from unfavorable forces.
4. Reduced numbers of post-insertion adjustments. 2, 7, 10

**CONCLUSION:** Fabrication of a cast partial denture for mandibular distal extension class I cases is a challenge for the prosthodontist. Several functional methods have been proposed for recording the edentulous area and the abutment teeth. An altered cast technique for fabricating cast partial denture was used in the above article. This impression technique helps in registering and co-relating tissues of different resiliency. This improves the stability and support of the denture, resulting in optimal load distribution.

CLINICAL SIGNIFICANCE: An altered cast technique is a way better and faster as compared to other techniques. In this technique the cast partial framework is kept ready before the recording of functional impression. Because of the correct fit of the cast partial framework this technique helps in recording the hard and soft tissues in a better way. Thus, it can be routinely utilized for the recording of distal extension area.

1