

# Management of Mandibular Poor Foundation: Conventional Complete Dentures

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Resorption of residual ridge is a constant process following the extraction of teeth. Resorption may progress at different rates in both jaws and degree of resorption is usually affected by the reason for tooth extraction. Periodontally affected teeth may lead to greater resorption after extraction.

In the mandible, resorption of residual ridge poses many challenges in fabrication of a complete denture. Immediately after extraction of teeth, there is enough residual ridge height to provide a wider denture bearing area, which when captured well with an accurate impression, will provide the denture with sufficient retention, stability and support thus making it acceptable to many patients. As the resorption becomes more severe due to the time lapsed from the extraction date, denture fabrication becomes more complicated; mainly because of reduction in the height of the ridge that does not allow sufficient denture bearing area to provide the desired retention and support.

In cases of severe resorption of the mandible, the goal of the clinician should be to achieve good stability and optimum support from the denture bearing area. Achieving very good retention in such cases may not always be possible. This article aims to take the clinician through all the clinical steps required to manage a poor foundation case in the mandible. The reader is urged to relate the information in the article to mandibular poor foundation cases only as the techniques may change when foundations are strong.

Pre-prosthetic management of mandibular poor foundation cases plays an important role. Gum massage to strengthen the tissues, warm salt water rinsing and discon-



FIG 1



FIG 2



FIG 3

tinuing of ill-fitting denture may be considered. In certain cases use of a tissue conditioner may be necessary.

## PRIMARY IMPRESSION

The goal of the primary impression is to record the entire extension of the proposed final denture so that a custom tray can be

fabricated on the primary cast and final impression made accurately. The success of a complete denture depends on a getting a correct primary impression.

Irreversible hydrocolloids (Alginates) have become a convenient choice for taking primary impression in complete dentures. In skilled hands on a well extended tray alginates may still do the job of recording the denture bearing area in one shot. However these materials have inherent problems in them such as inability to record the depth of the sulcus in poor foundation especially if the tray is not well extended. Due to the irreversible nature of setting process of these materials, it is not possible to modify the impression in any way once the record has been made.

Alternative time tested materials to take primary impressions and the authors preference is to use impression compound. These materials have the ability to support themselves for longer areas beyond the tray compared to alginates and hence they can be used to get a well extended primary impression. Also because they are thermo-plastic in nature, they can be re-heated and modified to get accurate record of entire denture bearing area as needed. This in our opinion outweighs any advantage that alginates offer. The snap impression can be trimmed and reheated and remoulded to get sharp accurate well extended borders in the primary impression.

The third alternative material for primary impressions is the Putty consistency of elastomers. These have the same disadvantage as alginates as they cannot be modified once set and hence the pressure to get all extensions perfect in one shot is always going to be there.

In the case shown in (Figure 1, & 2) a

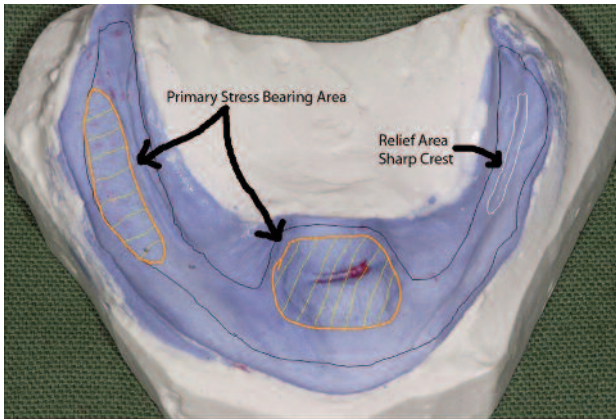


FIG 4



FIG 5

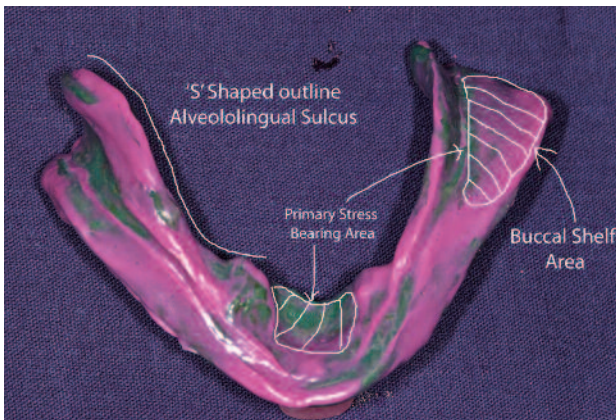


FIG 6

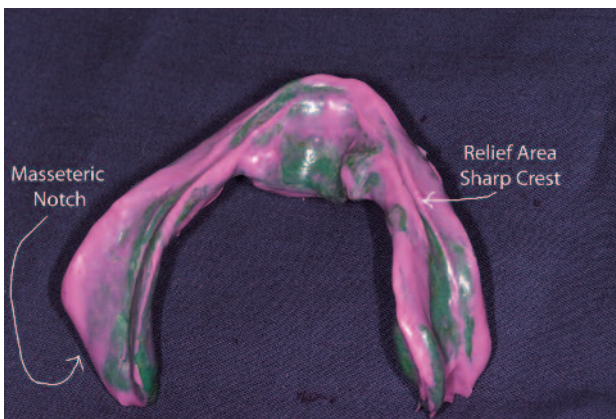


FIG 7

stock tray with impression compound was used to get a well extended impression of the edentulous ridge. A primary cast (Figure 3) was poured and various anatomical landmarks were evaluated before designing a custom tray. In severe resorption cases like these, we generally find the buccal mucosa confluent with the lingual mucosa with severe deficiency of attached keratinized gingiva. This makes the complete denture much more difficult to retain.

### FINAL IMPRESSION

The principles of selective pressure impression technique form the basis of final impressions in complete denture.

On the primary cast, we delineate the primary stress bearing areas and the relief areas (Figure 4). Generally the primary stress bearing area in the mandible would be the crest of the ridge if it is not resorbed severely. As the ridge resorbs, it is no longer capable of bearing stresses which get generated by the denture under mastication. In such cases, it is the buccal shelf area which has to be the primary stress bearing area. Bounded by the crest of the ridge on the medial side, the external oblique ridge on the lateral side, the buccal frenum mesially and the masseteric notch distally (Figure 4); this buccal shelf area is a table of compact bone, oriented perpendicular to the forces of mastication. Moreover the horizontal fibres of the buccinator muscle attach on the buccal shelf thereby making it resistant to resorption and allowing them to form a drape over the flange of the denture which extends in this area. It is because of these reasons that the buccal shelf area plays a crucial role in the success of mandibular denture that is well extended over it.

In certain cases, there might be more than one such compact bone table available for coverage within the complete denture. These areas are commonly found in form of a torus or as an elevation of bone in

the region of genial tubercle (Figure 4). A common error of fabrication in such cases is to avoid these areas and make the denture flange short. This could lead to impingement of bone in the junction of these areas with the rest of the ridge and lead to discomfort on chewing. A more prudent approach is to identify these areas (Figure 4) and cover them with the denture thus utilizing them as additional stress bearing areas.

Any sharp knife edged bony projection as could be seen on the crest of the ridge or the mylohyoid ridge should be relieved in the denture. Once all these areas are identified, a wax spacer can be placed and a custom tray designed in such a way that the primary stress bearing areas contacted by the tray and the relief areas would have less pressure from the tray during making of the impression. This is the basis of the selective pressure technique which is still utilized in contemporary denture fabrication.

In the case shown (Figure 1 & 2), our main goal is to achieve very good stability. Looking at the severity of the resorption of residual ridge and on examination of the OPG, it was decided not to have a spacer during the fabrication of the custom tray. The custom tray itself is made of light cured/self cured tray material and it encompasses the entire denture bearing area including the table of cortical bone in the region of genial tubercle. The extensions of the tray can be seen as marked (Figure 4).

Once the tray is fabricated, it is checked intra-orally to see that there is at least 2 mm space for the material to be used for border molding. Border moulding is carried out to record the length as well as width of denture flanges. The goal is to have the denture flange fill the entire vestibule labially and lingually without getting in the way of muscle function.

There are two basic techniques for border moulding the tissues. One is the sectional border moulding and the other is a one-step bor-

## prosthodontic section

der moulding.

The sectional border moulding technique generally requires the use of low fusing compound which is used to border mould each section of the denture bearing area sequentially. In the one step border moulding, generally materials like polyether are used to record the entire denture bearing area at one go. The advantage of sectional border moulding with low fusing compound is that each section can be refined before going to the next. Any mistake can be corrected by reheating and re-moulding the compound.

In a mandibular ridge with good foundation, the sectional border molding would entail getting the anterior labial sulcus molded first followed by posterior buccal sulcus and then the anterior and posterior alveolo-lingual sulcus. However in cases of poor foundation such as these, it becomes very difficult to re-orient the tray correctly every time for sectional moulding. Thus the recommended technique for all mandibular poor foundation cases is the Green all compound technique which is described as follows.

### GREEN ALL COMPOUND TECHNIQUE

Aimed at achieving excellent stability in mandibular denture in poor foundation cases, this technique requires the custom tray to be adjusted optimally in the patient's mouth. The tray itself is fabricated without any spacer. Low fusing compound is heated in a water bath loaded in the custom tray. Sufficient material is taken to provide adequate bulk to mould the borders. The loaded tray is then tempered in warm water (55°C). Next the borders are shaped with fingers to mimic the borders of the final denture. The tray with low fusing compound loaded is then inserted in position intraorally.

For the anterior labial sulcus, the lip is pulled out and patted over the borders gently. The lip should not be raised upwards as this would lead to shortening of the border and consequently compromise retention. For the posterior labial sulcus or the buccal shelf area, the cheek is pulled outwards and patted in a way as if you are trying to push the compound towards the external oblique ridge. This allows the tray borders to be well extended in the buccal shelf area and eventually helps in retention of the denture because of the draping action of the buccinator. Between the labial and buccal flanges lies the buccal frenum which has to be



FIG 8



FIG 9



FIG 10



FIG 11

moulded by upward, outward, inward, forward and backward movement. The movement of the borders will mimic the movements of the muscles attached in that area.

The alveo-lingual sulcus is next moulded in a specific manner to help the tongue rest on the lingual flange of the denture thus providing better retention and stability. For the anterior alveo-lingual sulcus, the patient

is asked to touch the tongue to the handle of the lower tray and swallow. Caution has to be exercised not to ask patient to protrude the tongue too much as it could lead to shortening of flange in this critical area. The moulding of the posterior alveo-lingual sulcus requires the patient to do the previous two movements again and touch the tongue to the cheek on both sides. The patient is asked to swallow for moulding the entire alveo lingual sulcus. Swallowing activates the mylohyoid and other muscles in the floor of the mouth and records their influence on the lingual border of the tray.

The retro molar pad area, where buccal and lingual borders of the tray meet, needs special attention. To mould, the low fusing compound in this area is heated and shaped with fingers outside the patient's mouth and then pressed in place with pressure distal to the retro-molar pad area. This aids in retention by completing the seal around the denture borders. The retro molar pad should be housed and not compressed in the impression which may lead to the distortion of the soft tissue of the retro molar pad. At the end of this moulding, a gentle S shaped curve (Figure 5 & 6) should be discernable on the lingual flange of the impression in most cases with normal anatomy. The distobuccal area of the border is reheated last and the patient is asked to bite on the finger of the operator (provided upper arch is edentulous too) while the operator applies firm downward pressure on the tray. This contracts the masseter muscle moulds the distobuccal area to produce a gentle notch in some cases called as the masseteric notch (Figure 7).

In the example of case shown in the article, as there is a thick buttress of bone in the anterior lingual sulcus, the border moulding procedure is modified such that the entire buttress of bone gets covered within the confines of final proposed denture. Thus the buttress of bone will act as primary stress bearing area and has the potential to provide excellent stability to the denture in such cases. A common error is to keep such buttresses of bone out of denture area by keeping the flange shorter in the lingual sulcus. Such a design of the lingual flange has potential to cause excruciating pain and discomfort to the patient and instability of the denture as it acts as a fulcrum.

When doing Green all compound technique, it might be difficult for the clinicians to mould all borders perfectly at the same

time. In such cases, it is prudent to get as much as border molding done in the first step and then defining each section by reheating and re-moulding if necessary. Once the border molding is completed, it has to be checked for retention, stability and support. Best way to check for retention after border-molding is complete is to ask the patient to hold the tip of the tongue against the handle of the lower tray and try to pull the tray out. The presence of good suction at this time could be an indication of acceptable retention in final denture. The stability is checked by pressing on the tray in the region of the crest of the posterior ridge alternating on left and right side. Pressing on one side should not cause the tray to lift on the other side. Absence of rocking is an indication of good stability and support which can be best achieved with this all compound technique.

The next step is to selectively scrape the impression in those areas which need to be provided with relief. For example, the knife-edged crest of the ridge, the sharp mylohyoid ridge or any bony spicule needs to be relieved. The final wash impression is taken with light viscosity polyvinyl siloxane (Figure 6 & 7). Then impression is then beaded, boxed and a final cast is poured in improved stone

#### JAW RELATION

The record of maxillo-mandibular relation is carried out in the same way as in conventional denture. If esthetics and phonetics allow, it is advisable to keep the lower occlusal plane closer to the crest of the ridge so as to favor it and minimize the length of the cantilever from the crest to the occlusal plane. This would help in achieving better stability in poor foundation cases. It is recommended to use a self-cured bases to make the jaw relation record. Using base plate wax to make record bases for poor foundation cases may lead to breakage of record base due to inherent weakness of the tray material.

#### SELECTION OF TEETH

Based on posterior tooth form, teeth for denture fabrication may be Anatomic, Semi-Anatomic or Non-Anatomic.

There is a school of thought that utilizes monoplane (non-anatomic teeth) in the posteriors for poor foundation cases. Achieving good esthetics with these types of teeth can be a problem in a demanding

patient. In this case, because of presence of lingual buttress of bone in the anterior region, stability was very good due to which it was decided not to use such monoplane teeth.

Using semi anatomic teeth in such cases will serve both the purpose of esthetics and function. Arrangement should favour the poorer ridge and the occlusal table must be kept parallel to the ridge foundation to enhance the stability and prevent gliding of the denture in an anterior direction

#### TRY-IN

At the try in stage, each denture is tried out by itself. In the upper denture, esthetics is evaluated to determine the accuracy of incisal edge position of anterior teeth. The lip support derived from the trial denture is evaluated. The try-in dentures are then evaluated together. The vertical dimension of occlusion is then verified and accuracy of centric relation is checked. Once the patient's approval is taken, the dentures are then processed. After the processing is done, to minimize the changes in vertical dimension of occlusion, a laboratory remount is carried out. The polished surface of the dentures is shaped to be concave rather than convex. Having concave polished surfaces will allow the perioral muscles of cheek and tongue to drape on the denture thereby aiding in retention.

#### DENTURE INSERTION

The patient is then scheduled for the denture insertion. During insertion each denture is tried out by itself first. A pressure indicating paste may be utilized to identify pressure zones on the intaglio of the denture. Occlusal adjustment is carried out to provide uniform equal intensity contacts on all teeth in maximum intercuspation which should be in harmony with centric relation. Recall is done at 48 hours and there after every 6 weeks in the first 6 months followed by regular recall twice a year. The final pictures are shown (Figure 8, 9, 10 & 11).

#### CONCLUSION

With the advent and popularity of implant dentistry, management of poor foundation cases has become easy. However conventional denture fabrication techniques are still relevant in contemporary dentistry as some patient may not have adequate bone for dental implants or may have medical

conditions that do not allow placement of implants. More over good implant dentistry with tissue supported and implant retained prostheses in atrophied jaws requires correct impression techniques to make a well extended denture. This article revisits the basics of complete denture fabrication in mandibular poor foundation cases. The readers are urged to refer to several good published textbooks on this subject for further understanding of the procedures outlined in this article.

#### Suggested Reading

1. Zarb GA, Bolender CL, Hickey JC, Carlsson GE. *Boucher's Prosthodontic Treatment of Edentulous Patients*. C. V. Mosby Publication. 1990.

## About the AUTHORS



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