

## Management of Compromised Ridges: A Case Report

Smita Sara Manoj · Vidya Chitre · Meena Aras

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**Abstract** Complete denture therapy is an age old form of dental treatment. 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. This article describes the step by step rehabilitation procedure of a patient with atrophic ridges using a hollow maxillary complete denture with cheek plumpers attached to it and the recording of neutral zone to ensure a stable mandibular denture.

**Keywords** Ridge atrophy · Residual ridge resorption · Admix impression · Neutral zone · Hollow maxillary complete denture

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 [1, 2]. The various factors [1, 3–8] influencing ridge resorption are

- 1) Anatomic factors
  - Rate of vertical bone loss in a broad high ridge is slower than that of a small ridge
  - Denser the bone, slower will be the rate of resorption
- 2) Metabolic factors – bone metabolism is dependent on cell metabolism (especially osteoblasts and osteoclasts)
  - PTH imbalance
  - Post menopausal osteoporosis
  - Continuous synthesis of local prostaglandins
  - Hypervitaminosis A and D
  - Hypovitaminosis C
- 3) Mechanical factors
  - a) Functional factors
    - Frequency, direction and strength of forces acting on bone
    - Bruxism
  - b) Prosthetic factors
    - Type and fit of prosthesis
    - Duration of prosthodontic treatment
    - Hours of prosthesis wearing per day
    - Occlusal disharmony
    - Lack of prosthodontic treatment (disuse atrophy)

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S. S. Manoj (✉)  
Department of Prosthodontics, Azeezia College of Dental  
Science and Research Center, Diamond Hillsm, Meeyanoor,  
Kollam, Kerala, India  
e-mail: drsmitamanoj@yahoo.co.in

V. Chitre · M. Aras  
Department of Prosthodontics, Goa Dental College and Hospital,  
Bambolim, Goa

Treatment of atrophied ridges is a clinical challenge faced by dentists world wide. Severely resorbed ridges present difficulty in fabrication of an adequate prosthesis. This article presents a step by step method of rehabilitating a patient with severely resorbed maxillary and mandibular alveolar ridges.

## Case Report

A sixty five year old male patient reported to the Department Of Prosthodontics, Government Dental College, Goa with the chief complaint of replacement of existing dentures. The patient gave a history of loss of teeth over a period of three to five years. The patient was edentulous for the past fifteen years and was wearing complete denture prosthesis since then. The existing dentures were loose and ill-fitting causing discomfort. He was also not happy with the sunken appearance of his cheeks.

## Treatment Plan

Clinical evaluation revealed resorbed maxillary ridge with sunken cheeks, flat (atrophic) mandibular ridge [Figures 1, 2 & 3] and increased interarch space. The existing dentures were unstable and non retentive.

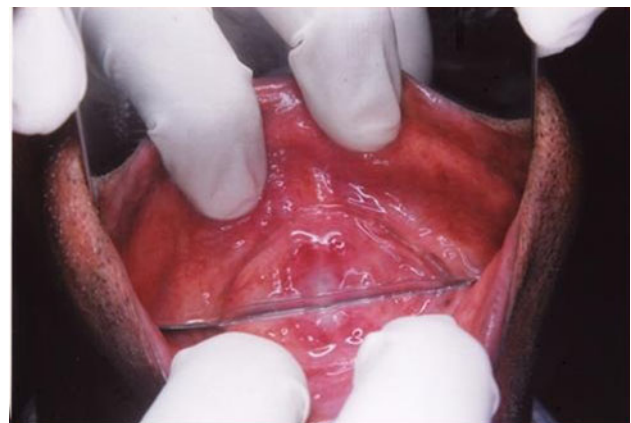
After a thorough evaluation of the patient's history, radiographs and existing clinical conditions, the various treatment options were discussed. The patient did not give any relevant medical history that could have possibly contributed to ridge resorption. Treatment options included pre-prosthetic surgeries followed by conventional complete denture prosthesis, implant supported prosthesis, conventional complete denture prosthesis [1, 6]. However, the patient was not interested in any surgical intervention and opted for a conventional complete denture. Finally, it was decided to rehabilitate the patient with a hollow maxillary



**Fig. 1** Patient without the prosthesis



**Fig. 2** Atrophic maxillary ridge



**Fig. 3** Atrophic mandibular ridge

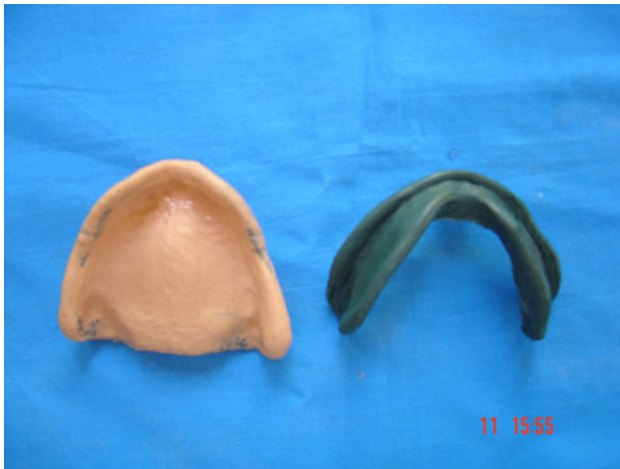
complete denture with attached cheek plumpers and a conventional mandibular denture.

## Clinical Procedure

The primary impressions were made using impression compound. Maxillary custom tray was fabricated using a full spacer design with additional wax relief over the anterior ridge, incisive papilla, mid-palatine raphe and tuberosity areas. Mandibular custom tray was fabricated to provide a space of 4 mm using two wax spacers for the admix impression material.

Maxillary secondary impression was made using zinc oxide eugenol impression paste. The mandibular secondary impression was made using an admix of three parts by weight of impression compound and seven parts by weight of tracing compound [Figure 4].

After the registration of maxillo-mandibular relations, the casts were mounted on an articulator. Zero degree maxillary teeth were arranged to monoplane articulation and a wax try-in was done. The sunken cheeks were



**Fig. 4** Maxillary (zinc oxide eugenol) and mandibular (admix) secondary impressions

plumped by adding and contouring excess wax on the buccal surface of the maxillary record base.

Mandibular neutral zone impression was recorded using the anthropoidal pouch [9] technique (neutral zone technique) [Figure 5]. In this technique, the mandibular wax occlusal rim was removed and retentive wire loops were attached to the acrylic resin record base. Compound was kneaded and adapted to the mandibular denture base. Maxillary record base was placed in the patient's mouth followed by placement of the mandibular record base with softened compound. The patient was asked to carry out different functional movements like sucking, swallowing, smiling, licking the lips, whistling, pronouncing vowels and counting. Excess compound was trimmed away and the material was resoftened and placed back into the mouth asking the patient to repeat the functional movements. Plaster index of the impression was made and the mandibular teeth were arranged in the neutral zone following the index [Figure 6 & 7]. Final try-in procedures were completed and the dentures were processed and finished.

### Laboratory Procedure

The hollow maxillary complete denture was fabricated using the two flask technique described by Fattore et al [10] which was a variation of the technique originally described by Chalian and Barnett [11] for fabrication of hollow bulb portion of obturator prosthesis using autopolymerized acrylic resin shims. The try-in maxillary denture was invested and dewaxed. Baseplate wax was then adapted to the tooth side and cast side of the dental flask [Figure 8]. New flasks whose halves would fit the original flask were selected and placed over the original flask containing teeth



**Fig. 5** Mandibular neutral zone impression



**Fig. 6** Plaster index for the neutral zone impression



**Fig. 7** Mandibular teeth arranged in the neutral zone

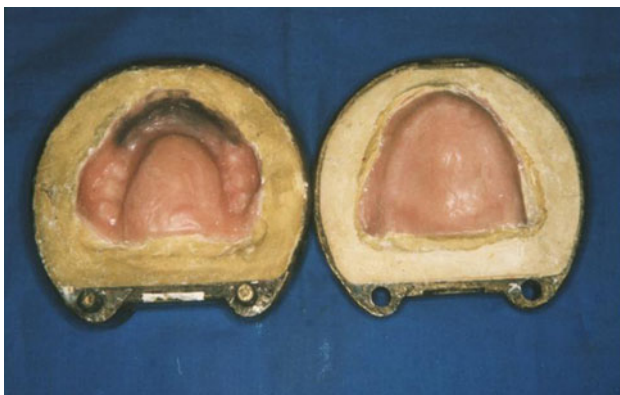




**Fig. 8** Baseplate wax adapted to the tooth and cast side of the flask after investing and dewaxing of the maxillary record base



**Fig. 10** Hollow maxillary complete denture with attached cheek plumpers and conventional mandibular denture



**Fig. 9** Processed acrylic resin shells that will be fused together later by adapting a rope of heat cured acrylic resin around the borders

and cast with wax adapted over them. Dental stone was poured into the alternate halves of the flask and invested.

Following dewaxing, pigmentation was done on the teeth side of the mould cavity so that it could be transferred on to the labial surface of the final denture. The flasks were then packed with high impact heat cure acrylic resin and cured. Both halves of the original flask now contained a processed acrylic resin shell [Figure 9]. The two halves were fitted together to remove any acrylic resin that would interfere with complete flask closure. A rope of heat cure acrylic resin was then adapted around the borders of cured acrylic resin shell on the tooth side of the flask. Following trial closure, the two halves of flask were closed and cured using a long curing cycle. Once processed, the denture base was finished and polished [Figure 10].

The denture borders were evaluated for any fluid seepage into the denture cavity by weighing it before and after placement in water for a day. Once the seal was evaluated, the dentures were inserted in the patient's mouth [Figure 11].



**Fig. 11** Patient's restored smile

The patient was reviewed after a week and minor denture related complaints were corrected. After that the patient never reported back to the department.

## Discussion

Severe ridge atrophy results in increased inter-arch space, unstable and non retentive mandibular dentures with inability to withstand the masticatory forces. The negative

effects of ridge atrophy were managed by modifying the conventional procedures of fabricating a complete denture.

In this case a hollow maxillary complete denture was given in order to decrease the weight of prosthesis. However, a conventional mandibular denture was given as it has been suggested though universally not accepted that gravity and addition of weight to the mandibular complete denture may aid in retention of the prosthesis [12]. Admix impression technique described by McCord and Tyson was used to record the mandibular secondary impression [9, 13]. The philosophy was that a viscous admix of impression compound and tracing compound removes any soft tissue folds and smoothes them over the mandibular bone. This reduces the potential discomfort arising from the atrophic sandwich i.e. the creased mucosa lying between the denture base and mandibular bone.

Neutral zone mandibular impression was recorded in order to determine the space within which the denture could be seated without being subjected to excessive displacing forces from the surrounding musculature and thus aid in denture base stability. Neutral zone is defined as “the potential space between the lips and cheeks on one side and the tongue on the other; that area or position where the forces between the tongue and cheeks or lips are equal” [14–16].

Maxillary neutral zone impression was not recorded as the effect of tongue size and position do not appear to have as profound an impact on the stability of a maxillary denture as compared to the mandibular denture. Besides, the position of the mandibular teeth arranged in the neutral zone was used as a guide to position the maxillary teeth in the neutral zone [17].

Zero-degree teeth were arranged to a monoplane articulation to allow the patient to clench and grind in and around maximum intercuspation during both functional and non-functional activities and also to aid in denture stability as large cuspal forms tend to induce instability via a tripping effect [18, 19].

## Conclusion

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. Though unconventional, a hollow maxillary complete denture can be given to a patient with severe ridge atrophy and increased inter-arch space.

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