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Enhancing Denture Success: A case report on prosthodontic rehabilitation of compromised maxillary and mandibular residual ridge

Susmita Maharjan[1], Bishal Babu Basnet[2], Prakash Kumar Parajuli[3], Pramita Suwal[4]

[1]PG Resident, Department of Prosthodontics, College of Dental Surgery-BPKIHS, Dharan, Nepal
[2]Associate Professor, Department of Prosthodontics, College of Dental Surgery-BPKIHS, Dharan, Nepal
[3]Additional Professor, Department of Prosthodontics, College of Dental Surgery-BPKIHS, Dharan, Nepal
[4]Professor, Department of Prosthodontics, College of Dental Surgery-BPKIHS, Dharan, Nepal

ABSTRACT

Compromised residual ridges in edentulous elderly patients are common clinical finding with flabby tissue and atrophic ridges being the most common. Prosthetic rehabilitation of such ridges using conventional techniques may lead to failure of prosthesis. To achieve favorable prognosis, the rehabilitation begins with specialized impression technique. The window impression technique is used for flabby anterior maxillary ridge which records tissue in mucostatic state. The admix technique and neutral zone concept used for atrophic mandibular ridges allow physiologically optimal teeth arrangement enhancing stability thereby favoring prognosis of denture. With ongoing resorption, there is increase in restorative space between ridges resulting in increase in height and weight of prosthesis. This further overloads the underlying tissues, exacerbating resorption rate of the ridges. Hence, to address this issue of decreased prosthesis weight, hollow dentures can be fabricated. This article describes rehabilitation of compromised ridges using a simplified technique of fabricating hollow maxillary denture using glycerine soap, window impression technique for flabby anterior maxillary ridge and admix technique and neutral zone concept for registration of neutral zone in atrophic mandibular ridge.

Keywords: Admix technique; Atrophic ridge; Flabby ridge; Hollow denture; Neutral zone technique.

INTRODUCTION

Compromised ridges in edentulous elderly patients are common clinical finding. The prosthetic rehabilitation of such ridge poses a significant challenge.[1] With advancing age, long term wearing of ill fitting denture results in bone resorption especially in anterior portion of edentulous maxilla or overlying atrophic knife edge mandibular ridge. The managment of hypermobile tissue can be surgical, prosthodontic or combination. The window impression technique used for flabby maxillary ridge records tissue in mucostatic state.[2]

Neutral zone concept is that for each individual patient, there exists within denture space where function of musculature will not unseat denture and where forces generated by tongue are neutralized by forces generated by lips and cheeks.[3] The admix technique (impression compound and green stick compound in the ratio of 3:7) and neutral zone concept is used for registration of neutral zone for atrophic mandibular ridge. This allows physiologically optimal teeth arrangement enhancing stability thereby favoring prognosis of denture.[4]

With resorption, there is increase in restorative space between ridges resulting in increase in height and weight of prosthesis. This further

Conflict of Interest: None

***Corresponding Author**
Dr. Susmita Maharjan
Post Graduate Resident, Department of Prosthodontics, BPKIHS, Dharan
Phone no. : 9843263036
E-mail: drsusmitamaharjan25@gmail.com

overloads underlying hard and soft tissues exacerbating ridge resorption.[5]

The weight of prosthesis that has been increased due to ongoing residual ridge resorption can be reduced by making hollow prosthesis.[6,7] Various approaches for weight reduction has been achieved using solid three-dimensional spacer.

This article describes rehabilitation of compromised ridges using a simplified technique of fabricating hollow maxillary denture using glycerine soap, window impression technique for flabby anterior maxillary ridge and admix technique and neutral zone concept for registration of atrophic mandibular ridge.

CASE REPORT

A male patient of 71 years reported to Department of Prosthodontics and Crown-Bridge, with chief complaint of loose upper and lower dentures associated with difficulty in chewing food and speaking. On intra-oral examination, patient had flabby tissue over anterior maxillary region and both ridges were resorbed with interocclusal distance at rest was about 35 mm (Fig 1). On extra-oral examination, patient had long lip length. On examination of denture, it was heavy.

Different treatment options were then discussed with the patient, which included pre-prosthetic surgery followed by conventional complete denture or implant supported complete denture or combination of hollow maxillary and conventional complete denture. Due to the affordability and the non-invasive nature of the treatment and with the patient's consent, it was decided to fabricate a hollow maxillary complete denture, utilizing window technique for the flabby tissues, and conventional mandibular complete denture incorporating a combination of admix technique and neutral zone technique.

Maxillary and mandibular primary impression was made with impression compound (Pyrax, India) and cast was poured with Type II Dental Plaster (POP), on which custom trays were fabricated using self cure acrylic resin. The maxillary custom tray included a window in the anterior region (Fig.2). Definitive impression for flabby anterior maxillary ridge was made with window impression using zinc oxide eugenol paste (DPI Impression paste) and light body elastomer (Zhermack elite HD+) and all green impression technique (DPI Pinnacle Tracing Sticks)was used for atrophic mandibular ridge (Fig 3). The admix technique and neutral zone concept using impression compound and green stick compound (3:7) was used for registration of neutral zone followed by teeth arrangement (Fig 4). Try-in of teeth arranged in balanced occlusion was done.

The duplication of waxed up maxillary denture was done with irreversible hydrocolloid impression material (Algitex, Dental Products) and poured with Type III dental stone (Kalstone, Kalabhai Pvt. Ltd) to obtain working cast (Fig 5). A template of 1.5mm thick BIO-ART (Brazil vaccum forming sheet) was adapted over working cast with the help of Erkopress 300 TP which provided external contour of maxillary trial denture. The trial dentures were invested and waxed in the conventional manner. After dewaxing, modelling wax (2mm thick) was adapted over master cast to ensure uniform and adequate thickness of resin all around hollow cavity in the denture which will be subsequently eliminated prior to packing. In order to achieve hollow cavity, a temporary putty spacer (Zeta Plus, Zhermack) was fabricated suiting approximate dimension of hollow cavity. The BIO-ART template was placed over putty spacer and edodontic files with a rubber stopper to ensure uniform space around putty spacer (Fig 6). A glycerine soap (Pears, Unilever Ltd., India) was handcarved to make replica of the putty spacer using Le Cron carver (Hu-Friedy, Chicago, IL)(Fig 7).The replication was ensured

by measuring with a Vernier's calliper. After this, a trial closure was carried out with putty spacer (Fig 8). The putty spacer was retrieved and mold space was assessed for adequate resin around hollow cavity. The hollow spacer was then replaced with soap spacer and final closure of flasks was done. Fabrication of mandibular denture was carried out in conventional manner.

Both the dentures were acrylized in conventional manner. The dentures were retrieved and was inspected for any area of soap exposure. On the denture, distobuccal to second molars, opening were made for removal of soap. Warm water was passed through opening. The hollow cavity was air dried and sealed with auto-polymerizing resin. A water test was performed to evaluate hollow space as evident by the floating denture (Fig 9).The denture were finished, polished and delivered to the patient. The patient was reviewed after 24 hour follow up and minor adjustments were made.

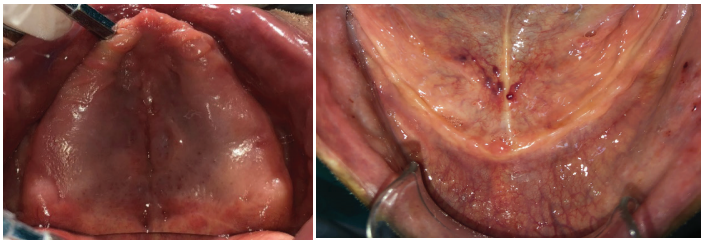

Figure 1: *Preoperative photographs of edentulous maxilla and mandible*

Figure 2: *Custom tray*

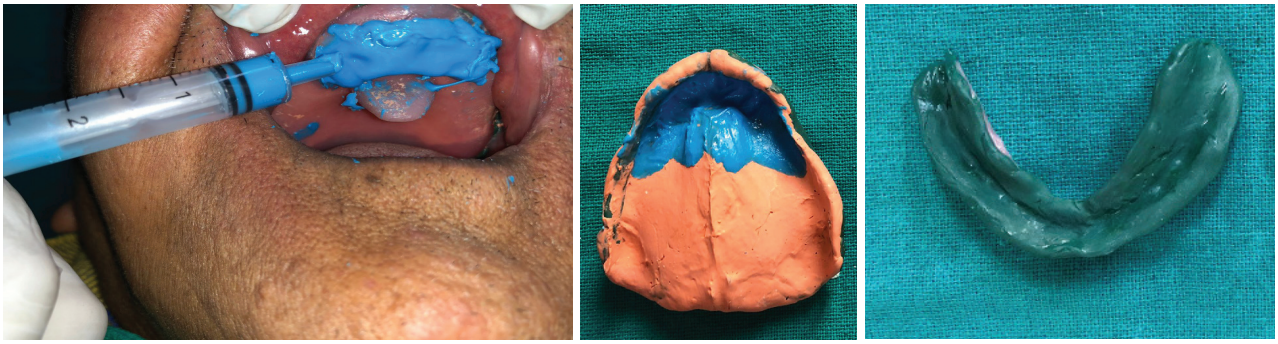

Figure 3: *Window impression technique (Maxilla) and all green impression technique (mandible)*

Figure 4: *Registration of neutral zone and teeth arrangment*

Figure 5: *Working cast*

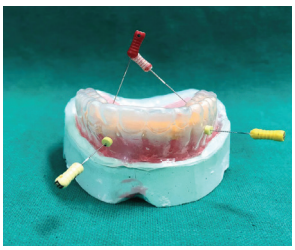

Figure 6: *Achieving hollow cavity with putty spacer*

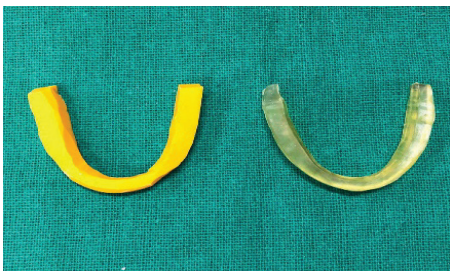

Figure 7: *Soap and putty shim*

Figure 8: *Trial closure*

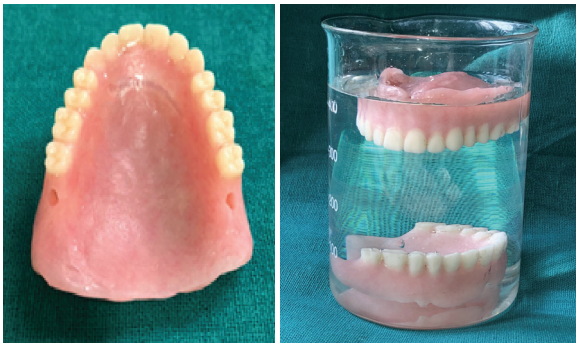

Figure 9: *Processed maxillary denture and water test after closure of holes with previous denture*

Figure 10 *: Before and after insertion of complete denture*

DISCUSSION

The flabby soft tissue causes elastic recoil during function and results in instability and loss of retention and dislodges prosthesis. These hypermobile flabby tissues should be recorded at rest with functional placement of border tissues to enhance retention and stability.[2]

Arranging artificial teeth within neutral zone achieves two important objectives. There is no interference with normal muscle function and the force stabilize and retain prosthesis rather than displacement.[3]

The different approaches to dentures' weight reduction includes the use of dental stone,[6,12] cellophane wrapped asbestos,[9] putty,[8,13] modelling clay,[10,13] thermocol,[14] light body guage,[15] salt,[16] caramel,[17] 3D printed resin spacer.[18,19]

The technique involving soap spacer has easy retrievability, attributing to high content of glycerine and other humectants present in it. It can sustain high curing temperature (boiling point of glycerine - 290^0). It neither interfere with heat cure acrylic resin nor leave any residues inside denture.

However, spacer dimension may not be accurate since it is hand carved using Vernier caliper leading to deficit acrylic in the body of hollow denture.

The primary disadvantage of double flask technique that has been used over years is that the junction between the two previously polymerized portions of the denture occurs at the borders of the denture with an increased risk of seepage of fluid. Furthermore, this junction is a common site for post-insertion adjustment increasing the risk of leakage.

The single flask technique that has been used excludes extra steps (investing, packing and acrylization) which avoids alteration of vertical dimension that may occur due to chances of inaccuracy of fit between flasks that is involved in double flask technique.

The vaccum formed transparent template allows for verification of the thickness of resin around cavity, ensuring an even depth of resin

to prevent seepage and prevent deformation under pressure of flask closure.

The small window in the cameo surface facilitates recovery of the spacer that is not commonly adjusted after denture insertion.

Hollow dentures showed more patient satisfaction and better masticatory performance compared to conventional dentures.[20] The salivary cortisol level was decreased in completely edentulous patients wearing a hollow denture , which showed that the comfort and stresss level were decreasd in patient wearing hollow denture.[21]

CONCLUSION

Prosthetic rehabilitation of patient with compromised ridge in conventional manner may lead to failure of prosthesis. This requires modification in treatment procedures to fulfil the patient's functional and esthetic demands. These specialized impression technique used and simple method of fabrication of hollow denture lead to successful rehabilitation of patients with compromised ridges.

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