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The hollow maxillary complete denture: an innovative, precise, single-flask technique using a biostar template 3D spacer

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Abstract: *The success of removable prostheses is determined by a variety of characteristics, notably retention, stability, support, aesthetics, and masticatory performance. Greater intraoral inter-arch distance contributes to an increased bulk of the prosthesis. Increased intraoral inter-arch distance results in an increase in prosthesis weight.*

This could jeopardize the retention and resistance of the removable prosthesis, both of which are essential for its success. To reduce the bulk of a prosthesis, several procedures, materials, and methods have been documented. This article explains a simple, unique, and single-flask procedure to create a maxillary denture that is lightweight using a biostar template as a 3D spacer

Key Word*: Atrophic mandibular ridge, Residual ridge resorption, Increased inter-ridge distance, Light weight prosthesis, hollow denture, single-flask technique*

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I. Introduction

Residual ridge resorption (RRR) is the severe atrophy of alveolar bone underlying the mucoperiosteum. The resorption of the maxillary residual alveolar ridge is a complex biophysical process influenced by anatomic, prosthodontic, metabolic, and functional aspects.[1] RRR has an effect on the morphology of the alveolar bone, resulting in a reduction in the denture foundation area and an increased inter-alveolar ridge gap. Due to the increased inter-ridge distance, there is a lot more restorative space, thus the resulting complete denture is heavier. This increase in restorative space, together with the patient's long lip length, creates a significant obstacle for the complete denture's success. Furthermore, a smaller denture foundation area increases the heaviness of the prosthesis and has a detrimental impact on the denture's retention due to gravity. [2]

In cases with overly resorbed ridges, obtaining sufficient retention and support is a difficult task in and of itself, which is made even more difficult because of the existence of a wide restorative space. If the standard procedures of denture construction are used in such instances, it may result in a heavy prosthesis, which exacerbates the problem of maxillary prosthesis retention and resistance.[2]

Implants[3], magnets[4], modified impression procedures[5], intramucosal inserts [6], suction discs [7], and lightweight dentures[2,8-10] have all been used previously to help in improving the retention and stability of complete dentures that are heavy. Within its body a hollow cavity is required to make a lightweight prosthesis. To obtain this hollow cavity, a large number of 3D spacers have been utilized. The components used are dental stone,[8,11-13] cellophane-wrapped asbestos,[14] silicone putty,[15,16] gauze roll coated with light-body silicone,[10] modelling clay,[17,18] and thermocol.[18]

Using a biostar template as a spacer to produce a consistent hollow cavity using a single-flask technique, this article provides a simple yet precise way for fabricating a hollow maxillary complete denture.

II. Case Report

A 64-year-old male patient reported to Department of Prosthodontics, KAHER's KLE V.K Institute of Dental Sciences, Karnataka, India with the chief complaint of difficulty in eating and speaking due to teeth loss. The dental history revealed that his teeth were lost due to periodontal involvement and that he had been edentulous for eight years. On clinical examination, both maxillary and mandibular ridges were severely resorbed with increased inter-ridge distance. A thorough dental and medical history was gathered from the patient followed by clinical and radiographic examination. The benefits and drawbacks of various treatment strategies (pre-prosthetic surgery followed by conventional complete denture, implant-supported prosthesis and

conventional complete dentures) were explained to the patient. He opted for a conventional complete denture prosthesis over an implant-supported prosthesis due to the cost and surgical procedure associated with pre-prosthetic surgery and an implant-supported prosthesis.

The steps for standard complete denture construction were followed all the way through to the try-in stage. During the try-in stage, the aesthetics and phonetics of the trial dentures were evaluated, and they required an increase in denture height, which would add to the prosthesis's weight. It was then opted to rehab the patient with hollow dentures in order to reduce the prosthesis' weight.

Technique

- A template of the master cast was made of 1mm thick BIOPLAST (Scheu Dental GmbH, Iserlohn, Germany) transparent film using a BIOSTAR (Scheu Dental GmbH) heat and vacuum press. This will be template 1.
- After try-in, the maxillary denture was reproduced using irreversible hydrocolloid impression medium (Tropicalgin, Zhermack, Badia Polesine, Italy) and poured into Type III dental stone (Kalstone, Kalabhai Pvt., Ltd., Mumbai, India) to create a working cast.
- To acquire the external outlines of the trial denture, a template of 1mm thick BIOPLAST (Scheu Dental GmbH, Iserlohn, Germany) transparent film was made on this working cast using a BIOSTAR (Scheu Dental GmbH) heat and vacuum press. (Template 2) (FIG-1)
- The maxillary trial denture was conventionally invested and de-waxed.
- In order to achieve the hollow cavity, a roll of putty (Zeta Plus, Zhermack) was first fabricated and then adapted on the master cast according to the area that has to be hollowed out (FIG-2)
- The precision and accuracy of the adapted putty was assessed from all aspects by placing between the master cast and the template 2.
- The putty roll was kept over the template 1 make another biostar template (template 3).
- The templates 1 and 3 were separated and the putty roll was removed from between them. These two templates were sealed to each other with cyanoacrylate resin. (FIG 3)
- The accurate fit of the biostar template spacer was verified with the assistance of the template 2 made after try in of the denture. (FIG 4)
- The biostar template spacer was stabilized over the ridge of the flasked maxillary denture base and the denture was packed and acrylised in a conventional manner. (FIG 5)
- The denture is retrieved in the conventional manner following processing.
- The water test is used to ascertain the hollow space which is revealed by the floating denture. (FIG 6)
- The maxillary and mandibular dentures are finished, polished and denture insertion is done.

FIG 1- Fabricated template of Bioplast transparent film on working cast (Template 2)

FIG 2- Roll of putty fabricated and adapted on the master cast (with a template of Bioplast transparent film adapted on it- template 1) according to the area that has to be hollowed out

FIG 3- Sealed templates 1 and 3 to each other after removal of the putty roll from between them**.**

FIG 4- Verifying the accurate fit of the biostar template spacer with the assistance of the template 2 made after try in of the denture.

FIG 5- Biostar template spacer stabilized over the ridge of the flasked and de-waxed maxillary denture base.

FIG 6- Water test used to ascertain the hollow space which is revealed by the floating denture

III. Discussion

Excessive ridge resorption leaves a huge restorative space between the residual ridges.[2] In such cases, prosthetic rehabilitation often leads in an increase in the prosthesis' height and weight, straining the residual ridges and jeopardising the prosthesis' retention and stability, as well as worsening the prognosis by hastening the residual ridges' resorption. [19] This may be due to the continuous pressure exerted on the residual ridge by the heavy denture even at rest.[20] Many cases in which implant surgery and bone augmentation can be done will be ruled out due to systemic sickness, financial difficulties, and refusal to undergo surgery. As a result, in such circumstances, the conventional denture becomes the only therapeutic choice.[21]

Hollow dentures have been explored in the hopes of minimising the overall weight of the prosthesis and thereby enhancing retention and stability.[2,8,9] Various materials have been utilised as spacers to accomplish weight reduction. Worley et al used cellophane-wrapped asbestos[14], O'Sullivan and Gardner et al used silicone putty[2,12], Caculo et al used light-body coated gauze[10], Shetty et al used thermocol [22],Chalian et al used dental stone[23],Gundawar et al used play dough[24] ,Bhushan et al used caramel[25] and Aggarwal et al used salt[26] during laboratory processing to remove the denture base material from the planned hollow chamber of the prosthesis. The most significant disadvantage of these procedures, notwithstanding their efficacy, is the time-consuming retrieval of the three-dimensional spacer due to the arch's curvature, particularly from the anterior region of the prosthesis between the canines.[22] When using a caramel spacer, the operator must exercise extreme caution since hardened caramel is brittle and should be handled carefully and not exposed to water during any point during the process.[25]

The drawback with salt is that it cannot sustain the pressures created during flask closure, resulting in the prosthesis failing to form a hollow chamber. As a result, there can be no considerable difference in prosthesis weight.

Unlike this technique, the double flask technique involves the use of two dental flasks, with one set being used to create a permanent record base and the other being used to pack heat cure acrylic resin over the teeth.[8,9,15] The fit between the base of one flask and the counter of the other flask must be precise, as an incorrect fit might cause vertical dimension changes, and it is time consuming and technically challenging. To connect the

two pieces of the prosthesis that were produced separately, auto- or heat-polymerizing resins are employed. The connection creates a weakness in these procedures, making it prone to fracture and discoloration over time. In addition, the juncture creates a possible leakage point, which could result in fluid seepage into the denture cavity. [10]

To make matters worse, this junction is a typical location for post-insertion modifications increasing the risk of leakage.[25]

The hollow cavity was recently created using a number of 3D printed spacers. Disadvantages of this include cost and availability of 3D scanner, 3D printer and dental SG resin material. The required thickness of dental SG resin limits the volume of space that can be created within the prosthesis.[27]

The technique provided in this article solves this issue by fabricating hollow dentures in a single flask. The extra procedures of investing, packing, and acrylization of a permanent record base are eliminated by using a single flask technique. Unlike other techniques, this one enables for the construction of a single maxillary hollow denture around a 3D biostar template spacer. This 3-D spacer design can be made precise for each case and it remains stable throughout the processing of the denture.

Thus, minimal adjustments are to be made during insertion, there is minimal chance of leakage, and consistent thickness of acrylic resin is present around the cavity. Due to the careful positioning and stabilisation of the spacer, the thickness of the acrylic resin may be controlled and uniform using this procedure. A uniform hollow cavity was achieved using this spacer. The disadvantages of this technique are that its time consuming and maybe more expensive than some other techniques.[2]

References

[1]. Jahangiri L, Devlin H, Ting K, Nishimura I. Current perspectives in residual ridge remodeling and its clinical implications: a review. The Journal of prosthetic dentistry. 1998 Aug 1;80(2):224-37.
[2]. O'Sullivan M, Hansen N, Cronin RJ, Cagna DR. The hollow maxillary complete denture: A modified technique. The Journal of prosthetic dentistry. 2004 Jun 1;91(6):591-4.
[3]. Wyatt CC. The effect of prosthodontic treatment on alveolar bone loss: a review of the literature. The Journal of prosthetic dentistry. 1998 Sep 1;80(3):362-6.
[4]. Riley MA, Walmsley AD, Harris IR. Magnets in prosthetic dentistry. The Journal of Prosthetic Dentistry. 2001 Aug 1;86(2):137-42.
[5]. McCord JF, Tyson KW: A conservative prosthodontic option for the treatment of edentulous patients with atrophic (flat) mandibular ridges. Br Dent J 1997;182:469-472
[6]. Gonc¸alves F, Dias EP, Cestary TM, et al: Clinical and histopathological analysis of intramucosal zirconia inserts used for improving maxillary denture retention. Braz Dent J 2009;20:149-155
[7]. Fenn HRB, Liddlelow KP, Gimson AP: Fitting the finished dentures: aids to retention. In Fenn HRB, Liddlelow KP, Gimson AP (eds): Clinical Dental Prosthetics (ed 1). New Delhi, CSB Publishers and Distributors, 1986, pp. 406-407
[8]. Fattore L, Fine L, Edmonds DC. The hollow denture: An alternative treatment for atrophic maxillae. The Journal of prosthetic dentistry. 1988 Apr 1;59(4):514-6.
[9]. Radke U, Mundhe D: Hollow maxillary complete denture. J Indian Prosthodont Soc 2011;11:246-249
[10]. Caculo SP, Aras MA, Chitre V: Hollow denture: treatment option for atrophic ridges. A clinical report. J Prosthodont 2013;22:217-222
[11]. Browning JD, Kinderknecht J: Fabrication of a hollow obturator with fluid resin. J Prosthet Dent 1984;52:891-895
[12]. Gardner LK, Parr GR, Rahn AO: Simplified technique for the fabrication of a hollow obturator prosthesis using vinyl polysiloxane. J Prosthet Dent 1991;66:60-62
[13]. McAndrew KS, Rothenberger S, Minsley GE: An innovative investment method for the fabrication of a closed hollow obturator prosthesis. J Prosthet Dent 1998;80:129-132
[14]. Worley JL, Kniejski ME: A method for controlling the thicknessof hollow obturator prostheses. J Prosthet Dent 1983;50:227-229
[15]. Holt RA Jr: A hollow complete lower denture. J Prosthet Dent 1981;45:452-454
[16]. Jhanji A, Stevens ST: Fabrication of one-piece hollow obturators. J Prosthet Dent 1991;66:136-138
[17]. Elliott DJ: The hollow bulb obturator: its fabrication using one denture flask. Quintessence Dent Technol 1983;7:13-14
[18]. DaBreo EL: A light-cured interim obturator prosthesis. A clinical report. J Proshet Dent 1990;63:371-373
[19]. Brennom EF. Adding weight may promote retention of lower denture. Dental survey. 1973 Mar 1;49(3):30.
[20]. Nakashima K, Sato T, Hara T, Minagi S. An experimental study on histopathological changes in the tissue covered with denture base without occlusal pressure. Journal of oral rehabilitation. 1994 May;21(3):263-72.
[21]. Jaiswal RS, Kanathila H, Patil AG. A Novel Technique for the Fabrication of Hollow Denture--A Need for Resorbed Ridge. Journal of Evolution of Medical and Dental Sciences. 2021 Jul 26;10(30):2346-50.
[22]. Shetty V, Gali S, Ravindran S. Light weight maxillary complete denture: A case report using a simplified technique with thermocol. Journal of Interdisciplinary Dentistry. 2011 Jan 1;1(1):45.
[23]. Chalian VA, Barnett MO. A new technique for constructing a one-piece hollow obturator after partial maxillectomy. The Journal of Prosthetic Dentistry. 1972 Oct 1;28(4):448-53.
[24]. Gundawar S, Zamad A, Gundawar S. Light weight dentures: An innovative technique. Contemporary clinical dentistry. 2014 Jan;5(1):134.
[25]. Bhushan P, Aras MA, Chitre V, Mysore AR, Mascarenhas K, Kumar S. The hollow maxillary complete denture: a simple, precise, single- flask technique using a caramel spacer. Journal of Prosthodontics. 2019 Jan;28(1):e13-7.
[26]. Aggarwal H, Jurel SK, Singh RD, Chand P, Kumar P. Lost salt technique for severely resorbed alveolar ridges: An innovative approach. Contemporary clinical dentistry. 2012 Jul;3(3):352.
[27]. Shah RJ, Lagdive SB, Machchhar AH, Periyanan K, Cherian S. Technique to Fabricate Hollow Maxillary Complete Denture Using 3D Printed Template. Journal of Prosthodontics. 2020 Apr;29(4):360-3.