ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2021; 7(2): 517-520

www.oraljournal.com
Received: 22-02-2021
Accepted: 24-03-2021

Dr. Najma Shaikh
Senior Resident, Department of Prosthodontics and Crown & Bridge, KBH Dental College and Hospital, Nashik, Maharashtra, India

Dr. Seema Pattanaik
Professor, Department of Prosthodontics and Crown & Bridge, KBH Dental College and Hospital, Nashik, Maharashtra, India

Dr. Bikash Pattanaik
Professor and Head, Department of Prosthodontics and Crown & Bridge, KBH Dental College and Hospital, Nashik, Maharashtra, India

Dr. Anagha Sunder
Senior Resident, Department of Prosthodontics and Crown & Bridge, KBH Dental College and Hospital, Nashik, Maharashtra, India

Corresponding Author:
Dr. Najma Shaikh
Senior Resident, Department of Prosthodontics and Crown & Bridge, KBH Dental College and Hospital, Nashik, Maharashtra, India

Maxillary hollow denture: A literature review

Dr. Najma Shaikh, Dr. Seema Pattanaik, Dr. Bikash Pattanaik and Dr. Anagha Sunder

DOI: https://doi.org/10.22271/oral.2021.v7.i2h.1258

Abstract
Severely resorbed ridges and increased lip length provides challenge to achieve adequate retention, stability and support for the success of complete denture. In such cases Implant supported dentures can be promising alternative to conventional dentures. However, it is not always possible to provide patients with implant treatment as geriatric patients with systemic illness and economic constrains, possess reluctance for a long duration of treatment procedure and unwillingness for any kind of surgical procedure. Hence the best way is to rehabilitate them in conventional way. Light weight hollow dentures can prove to be an effective alternative to conventional denture for achieving optimum results. The aim of this review is to assess the role of maxillary hollow denture in improving the retention and stability in compromised cases based on the data published in the literature.

Keywords: hollow denture, floating denture, maxillary hollow denture, light weight denture

1. Introduction
Dentures are designed to replace missing natural teeth in harmony with the supporting musculature to restore the normal form, function and esthetics. The residual ridge is that portion of the residual bone and its soft tissue covering that remains after the removal of teeth [1]. The resorption of residual ridge is chronic, progressive and irreversible process which is affected by anatomic, prosthetic, metabolic, systemic and functional factors [2]. Extreme resorption of the residual ridge becomes a challenge for the practitioner due to narrower, more constricted residual ridges, and resultant large restorative space between maxillary and mandibular ridges.

Extreme resorption of the residual ridge and presence of large restorative space further complicates the fabrication of complete denture with adequate retention and stability. Restoration of lost vertical dimension results in fabrication of heavy complete denture due to excessive volume of denture base material that may compound to poor denture bearing ability of the tissues and lead to decreased retention of the prosthesis [3]. Although not universally accepted, It has been suggested that the addition of weight to the mandibular denture and effect of gravity may aid in retention of the prosthesis [4, 5, 6]. On the contrary, reducing the weight of the prosthesis has been suggested to be beneficial for the success of maxillary obturator with large maxillofacial defect [7, 8].

To improve the retention and stability of the denture in case of resorbed residual ridges, various methods have been suggested in the past. Chris C.L. Wyatt [9] reviewed the effect of prosthodontic treatment on alveolar bone loss and concluded that although implant-supported fixed prosthesis to replace missing teeth in completely edentulous patients, is a highly successful treatment but the implants are also not immune to bone loss. Riley *et al.* [10] in their study suggested that magnets provide a useful method for attaching dental prosthesis to either retained roots or osseointegrated implants but its use is limited due to the high susceptibility of magnets to corrosion in the presence of saliva which eventually leads to loss of magnetism and failure of the prosthesis. Goncalves *et al.* [11] suggested the use of intramucosal inserts for improving maxillary denture retention, but the procedure may not be acceptable to the patient as it requires surgical intervention. Suction discs and springs can also be used to improve the retention of the prosthesis [12].

A suction disc creates partial vacuum within the perimeter of the disc which holds the upper denture suspended from the hard palate. They cause constant irritation and serve no useful purpose. On the other hand, springs attached to the denture may also prove to be disadvantageous due to their inefficiency and extreme restrictions posed to the lateral movements.

Reducing the weight of the prosthesis has been proved successful by many authors, in improving the retention and stability of the maxillary denture. However, the documentation of different techniques and materials is incoherent. Therefore, the aim of this article is to summarize the existing literature related to Hollow maxillary dentures and to suggest the areas for further investigation.

2. Review of the Literature

Various techniques have been used to reduce the weight of the maxillary denture in the past. Fattore, Fine and Edmonds [13] used a variation of double flask technique to obtain reduction in the weight of the prosthesis. Heat cure denture bases were fabricated, wax occlusion rims were made to record the jaw relation and teeth arrangement was done on the definitive cast. This trial denture was invested in Flask and wax elimination was carried out. Once the flask was cooled, two mm baseplate wax was adapted on teeth side of the denture and the counter flask along with the heat cured baseplate was checked for the proper closure. Another similar flask was taken; its knock-out plate was removed and placed it over the original flask having teeth. Dental stone was poured through the knock-out hole in the alternate half flask and wax elimination was carried out. After complete cooling of the flask, flasks were separated and flash was removed. Both half of the original flask now contain processed acrylic resin shell. A rope of doughy, heat- curing, high impact acrylic resin was adapted around the border of cured acrylic resin in the tooth side of the flask, trial packing was done and flash was removed. Flasks were closed and processed using long curing cycle. Processed denture was finished and polished.

Primary disadvantage of this technique was that the junction between the two previously polymerized portions of the denture occurs at the border of the denture which is long and increases the risk of seepage of fluid into the denture cavity. Furthermore, this junction is a common site for post insertion adjustment, which increases the risk of leakage and it is difficult to gauge the thickness in the cope area.

O'Sullivan *et al.* [14] developed a technique to overcome these disadvantages. They incorporated a transparent, pressure-formed matrix of the trial denture external contours to facilitate the fabrication of silicon putty cavity form which ensures the acceptable dimensions of both, denture base acrylic resin for structural integrity and, denture base cavity for optimal reduction of weight of the prosthesis. The trial denture was duplicated for making a clear template of the stone cast using 0.3mm thermoplastic sheet. Then the trial denture was processed in a standard manner through wax elimination process. By using a second flask, heat cure acrylic resin denture base was fabricated on the definitive cast on which, the clear matrix was placed and checked for the adequate space with the use of an endodontic file. Vinyl polysiloxane putty was mixed and adapted to the shape of the matrix and contoured using a bur. Appropriate reduction was done to provide space for the acrylic resin. Putty was fixed using cyanoacrylate. The original cope was seated on the drag to verify the complete closure of the flask and processing of the denture was done in usual manner. Two openings were made in the denture base distal to most posterior teeth for the removal of silicon putty after which, it was closed using clear acrylic resin. Authors believed that heat polymerizing one portion of the denture against polymerized resin may reduce leakage at the junction of two portions of the denture. Silicone putty was used as a spacer since it is stable, can be carved easily and does not adhere to the acrylic resin. The cyanoacrylate bond between the resin and putty was weak which helped in its easy removal from the cavity.

The technique was useful to estimate the thickness of spacer but removal of putty was found to be difficult especially from the anterior portion of the denture. Moreover, the opening created at the distal end of the denture had to be sufficiently large to retrieve the putty. Shetty *et al.* [15] developed a technique which did not require the removal of spacer material. Thermocol was used as spacer which was light weight and could be left in the denture without compromising the integrity of the denture.

Chaturvedi *et al.* [16] used a dough, made of dental plaster-pumice and sugar syrup as a spacer. This dough is brittle and may break during compression moulding. It may also absorb the monomer and the technique also involved making small openings in the distal end of the denture to remove the spacer which may lead to seepage of the saliva.

Aggerwal *et al.* [17] developed a "Lost salt technique" combined with neutral zone concept for making hollow dentures in case of severely resorbed ridges. Maxillary and Mandibular trial dentures were fabricated by applying neutral zone concept. Mandibular denture was processed in a conventional manner. Maxillary denture was flasked and dewaxed. Half of the heat cure acrylic resin in dough stage was packed over the dewaxed mould and salt crystals were placed over it which was covered by the remaining heat cure material and cured. Cured dentures were retrieved and two holes were made in the thickest palatal portion of the denture. All the residual salt crystals were removed by flushing water with a high pressure syringe through these holes. After this, the holes were closed with autopolymerizing resin. This method had several advantages over the previously described techniques since it was simple to execute, the salt which was utilized as a spacer is heat labile and melts during curing procedure that saves a tedious work of removal of spacer along with the maintenance of integrity of the denture. It is easily available and very cost effective. The lost salt technique has disadvantages that the thickness of the hollow part cannot be kept uniform, salt may react with the heat cure acrylic resin and may lead to porosities in the denture.

Gundawar *et al.* [18] used play dough (modeling clay) and autopolymerizing acrylic resin shell to create adequate and uniform space for the hollow denture. The technique was similar to the technique described by O'Sullivan *et al.* until the fabrication of thermoplastic matrix. The play dough was used in the place of silicon putty. An alginate impression of this cast with the play dough was made and it was used for the fabrication of autopolymerizing acrylic resin shell by sprinkle-on method. Then the play dough was removed from the denture base and the acrylic resin shell was attached to it by the autopolymerizing resin. Over this, heat cure acrylic was placed and processed in a standard manner. Autopolymerizing acrylic resin used in this technique added to the denture strength. Color of the material can be matched with heat cured acrylic resin thus enhancing the esthetics and reducing the chances of any leakage. The technique was predictable and provided even space all around.

Shikha Nandal and Manu Rathi [19] proposed a technique to fabricate a maxillary denture which was made partially hollow in a portion of the ridge which was excessively resorbed, in response to constant impingement of teeth in that area. They fabricated the permanent denture bases over the cast obtained by conventional impression technique. Vinyl polysiloxane was used to create space in the severely resorbed region and then the wax occlusion rims were fabricated to record jaw relation and arrangement of teeth. After try-in, a window was created corresponding to a putty spacer and a lid of wax was fabricated separately to cover the opening after denture fabrication. The denture and the corresponding wax lid were processed in a conventional manner. Vinyl polysiloxane putty material was removed through the window and then the window was covered with a processed lid secured using autopolymerizing acrylic resin. Thus, the weight of the denture was reduced.

Gopinadh Anne *et al.* [20] compared prosthesis weight reduction obtained when Cellulose balls, Polyacrylic fibers and Bean balls are used to create space for the hollow denture. They found that bean balls produce a maximum 31.3% weight reduction as compared to 27.4% and 24.5% weight reduction produced by cellulose balls and Polyacrylic fibers respectively. The highest weight reduction obtained by bean balls is attributed to their property of occupying more volume. As the material used for the creating space is left inside the denture, the name 'hollow denture' was not appropriate. Thus, the term "wispy prosthesis" was used.

Fulari *et al.* [21] used a surgical catheter and orthodontic wire to create space for the hollow denture. Orthodontic wire was inserted into the surgical catheter of desired diameter to maintain its diameter. Orthodontic wire enables the easy retrieval of the catheter after the processing of the denture.

Gelatin was used as a spacer for maxillary hollow denture by Deogade *et al.* [22] as it was very easily available, was easy to recontour and easy to retrieve by using hot water to flush it through the small opening with help of a syringe. The approach uses a clear thermoplastic template of a trial to facilitate insertion of gelatin that acts as a spacer and to maintain the thickness of the resin over the hollow cavity.

Somasundaram Prasadh [23] gave the technique for easy removal of Putty material when used as a spacer for hollow denture. After the dewaxing procedure of the trial denture, two sheets of baseplate wax were adapted over the teeth and a trough-like depression was created as a space for putty material. Lid was closed and the Silicon putty was transferred to the denture base which was covered by a cellophane sheet. Baseplate wax was removed from the flask containing teeth and heat polymerized acrylic resin was mixed and placed over it. Flask was closed and processing was done. After the processing, two halves of the flasks are separated to remove the putty along with the cellophane sheet and the denture was joined using autopolymerizing acrylic resin. Though this technique was effective in easy removal of silicon putty, the risk of seepage through the joint created by joining two halves of the denture remains a challenge.

Anchal Qanungo *et al.* [24] used a hand carved glycerin soap in place of a spacer as it was easily available, very easy to retrieve and does not adhere to the acrylic resin . After the processing of the denture with glycerin soap as a spacer, small openings were created distal to second molar and the denture was immersed in water to allow dissolution of soap. As it is a single flask technique, it eliminated the requirement of two identical flasks and the extra step of fabrication of permanent record base. Hence, it proved simple, economical, time saving and a predictable method.

Bhushan *et al.* [25] used caramel as a spacer which is a brown product originating from various sugars when they are heated. It is shapeable, becomes hard as soon as it cools down, does not adhere or interact with acrylic resin and extremely water soluble, which makes it very easy to retrieve. Because of the extreme solubility in water, it is imperative to avoid any water contamination throughout the procedure, so that shape of the caramel is maintained.

D'Souza and Aras [26] fabricated a hollow denture using vacuum formed thermoplastic sheet and salt. The vacuum-formed thermoplastic material matrix regulates the salt quantity and determines its placement in unpolymerized resin during denture packing stage. It also aids in reinforcement of the hollow denture base.

In condition like Bell's palsy, where flaccidity of the musculature becomes a challenge for the establishment of proper support, esthetics and retention of the denture, hollow maxillary denture along with the modification in occlusal scheme such as monoplane occlusion scheme provides satisfactory results [27].

Hollow dentures provide a good alternative to conventional dentures in cases of Papillon Lefevre syndrome, an autosomal recessive disorder characterized by various dermatological manifestations and periodontitis. Such cases manifest an increased resorption of residual alveolar ridge in young-aged edentulous patient [28].

Patients with Trecher Collin syndrome showing craniofacial deformities along with features of "Robin Sequence" which include severe micrognathia, glossoptosis with or without cleft can be benefitted by the use of hollow dentures [29].

3. Discussion

The prosthetically driven treatment of geriatric patients with severely resorbed ridges always becomes a herculean task for the clinician. Though the choice of rehabilitation in such cases should be tooth-supported overdentures, implant-retained and tissue-supported overdentures with ridge augmentation, due to systemic illness associated with increased age, more prognostically favorable treatment option is to rehabilitate them with conventional complete dentures. To obtain acceptable retention, stability and support, utilizing the maximum denture-bearing area along with modification in complete denture processing and occlusion, may deliver superior results in such patients. The weight of maxillary dentures is often a dislodging factor. Thus, reducing the weight of the maxillary denture has been attempted for years, to enable the clinician to provide the patient with satisfactory results.

Creating a space within the denture is most effectively studied, for obtaining the reduction in weight which lead to the development of hollow cavity inside the denture, hence term hollow denture. Various materials used for the hollowing of denture include vinyl polysiloxane putty, Thermocol, plaster-pumice and sugar syrup, salt crystals, play dough (modeling clay), autopolymerizing acrylic resin shell , cellulose balls, Polyacrylic fibers, Bean balls, surgical catheter and orthodontic wire, Gelatin, glycerin soap , caramel and vacuum formed thermoplastic sheet with salt. Some of the materials like vinyl polysiloxane putty pose a problem during the procedure as the retrieval of such material is difficult. Materials which are easy to remove from the cavity, such as salt, caramel and glycerin soap, proved effective for the fabrication of hollow denture. Further research in the field of materials and techniques is required for the development of

less time-consuming and cost-effective methods to provide patients with hollow dentures.

4. Conclusion

Based on the findings of this review, following conclusions were drawn:

1. Hollow maxillary complete dentures considerably reduce the weight of the prosthesis.
2. Hollow denture can help prevent the transmission of detrimental forces which would otherwise be transmitted from a conventional heavy prosthesis to underlying tissues. Thus, it helps to preserve underlying tissues and bone.
3. Hollow dentures may be a promising and economical alternative for the patients who are reluctant to go for invasive procedures and for those who have serious systemic conditions.

5. References

1. Glossary of prosthodontic terms ninth edition. J Prosthet Dent 2017;117(5s):e1-e105
2. 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;80(2):224-37.
3. Caculo SP, Aras MA, Chitre V. Hollow dentures: treatment option for atrophic ridges. A clinical report. J Prosthodont 2013;22(3):217-22.
4. Ohkubo C, Hosoi T. Effect of weight change of mandibular completedentures on chewing and stability: a pilot study. J Prosthet Dent 1999;82:636-42.
5. Jacobson TE, Krol AJ. A contemporary review of the factors involved in complete denture retention, stability, and support. Part I: retention. J Prosthet Dent 1983;49:5-15
6. Wormley JH, Brunton DA. Weighted mandibular dentures. J Prosthet Dent 1974;32:101-2.
7. El Mahdy AS. Processing a hollow obturator. J Prosthet Dent 1969;22:682-6.
8. Brown KE. Fabrication of a hollow-bulb obturator. J Prosthet Dent 1969;21:97-103.
9. Chris CL. The effect of prosthodontic treatment on alveolar bone loss: a review of the literature. J Prosthet Dent 1998;80:362-366
10. Riley MA, Walmsley AD, Harris IR. Magnets in prosthetic dentistry. J Prosthet Dent 2001;86:137-142
11. 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
12. Dentures: aids to retention. In Fenn HRB, Liddlelow KP, Gimson AP (eds): Clinical Dental Prosthetics (ed 1). New Delhi, CSB Publishers and Distributors 1986, 406-407.
13. Fattore LD, Fine L, Edmonds DC. The hollow denture: an alternative treatment for atrophic maxillae. J Prosthet Dent 1988;59:514-6
14. O'Sullivan M, Hansen N, Cronin RJ, Cagna DR. The hollow maxillary complete denture: a modified technique. J Prosthet Dent 2004;91(6):591-4.
15. Shetty V, Gali S, Avindram SR. Light weight maxillary complete denture: A case report using a simplified technique with thermocol. J Interdiscip Dent 2011;1(1):45-8.
16. Chaturvedi S, Verma AK, Ali M, Vadhwani P. Hollow maxillary denture: A simplified approach. People's J Sci Res 2012;5:47-50.
17. Aggarwal H, Jurel SK, Singh RD, Chand P, Kumar P. Lost salt technique for severely resorbed alveolar ridges: An innovative approach. Contemp Clin Dent 2012;3:352-5.
18. Gundawar S, Zamad A, Gundawar S. Light weight dentures: An innovative technique. Contemp Clin Dent 2014;5:134-7.
19. Dr. Shikha Nandal, Dr. Manu Rathee. Management of severely resorbed maxillary ridge with a modified light-weight hollow complete denture and monoplane teeth: - a case repor.t International Journal of Development Research 2014;4(10):2001-2004, October,
20. Gopinadh Anne *et al.* Wispy Prosthesis: A Novel Method in Denture Weight Reduction Journal of Clinical and Diagnostic Research 2016;10(4): ZC31-ZC34
21. Deepti S Fulari, Sangamesh G Fulari, Mokshada Badadare, Swapnil Chopade. Hollow complete dentures: an innovative technique. International Journal of Contemporary Medical Research 2016;3(9):2744-2745.
22. Deogade SC, Patel A, Mantri SS. An alternative technique for hollowing maxillary complete denture. J Indian Prosthodont Soc 2016;16:412-5.
23. Somasundaram Prasadh. The Hollow Maxillary Complete Denture - An Alternative Technique to remove the Silicone Putty J Dent Oral Health 2016;2(4):038.
24. Anchal Qanungo *et al.*, An Innovative and Simple Technique of Hollow Maxillary Complete Denture Fabrication Journal of Clinical and Diagnostic Research. 2016;10(8):ZD23-ZD25
25. Bhushan *et al.* The Hollow Maxillary Complete Denture: A Simple, Precise, Single-Flask Technique Using a Caramel Spacer Journal of Prosthodontics 2017, 1-5.
26. D'souza KM, Aras MA. A simple approach to hollow maxillary complete denture fabrication: An innovative technique. J Dent Allied Sci 2017;6:84-7.
27. Hussain S, Jayesh R, Nayar S, Aruna U, Abraham AM. Prosthodontic management of a completely Edentulous patient with Bell's Palsy. Indian Journal of multidisciplinary dentistry 2011;2(1).
28. Sreeramulu B *et al.*, Prosthodontic Management in Papillon Lefevre Syndrome Journal of Clinical and Diagnostic Research 2012;6(10):1808-1811.
29. Patel J, Sethuraman R, Mufti K. Case report of a suspected case of Treacher Collin's syndrome. European Journal of Dental Therapy and Research 2014;3(1):199-201.