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A New Era in Maxillary Denture Fabrication: A Case Report on Role of 3D Glycerin Spacers in Creating Hollow Designs

[1]Dr.Reshma Mathew, Post Graduate Student, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam

[2]Dr.George Francis, Professor and HOD, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam

[3]Dr.Paul Kariyatty, Professor, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam

[4]Dr.Arun K Joy, Reader, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam

[5]Dr.Anjali Ashok, Post Graduate Student, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam

[6]Dr.Arjun D Menon, Post Graduate Student, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam

Corresponding Author: Dr.Reshma Mathew, Post Graduate Student, Department of Prosthodontics, St. Gregorios Dental College, Chelad, Kothamangalam

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Abstract

The fabrication of maxillary complete dentures often presents challenges in achieving optimal fit, and comfort. Prosthetic rehabilitation of severely atrophic ridges has always been an ordeal for the clinician due to decreased support, stability and retention. Because of severe resorption the interocclusal space between maxillary and mandibular residual ridges is increased. Rehabilitation in such cases may result in increased height and weight of the prosthesis which in turn overloads the underlying hard and soft tissues exacerbating ridge resorption so, in order to break this vicious cycle, the weight of the prosthesis needs to be reduced which can be achieved by making hollow prosthesis.

This case report approach utilizing a three-dimensional (3D) glycerin spacer to create a hollow maxillary complete denture, enhancing both functionality and patient satisfaction. This cavity form ensures the appropriate dimensions of both the denture base acrylic

resin for structural integrity and the denture base cavity for optimal weight reduction.

Keywords: Prosthetic function, atrophic ridges, 3D glycerin spacer.

Introduction

In the realm of prosthodontics, the quest for enhancing patient comfort and optimizing denture functionality continues to drive innovative approaches. Conventional maxillary dentures, while effective, often pose challenges related to weight, fit, and patient comfort. In response to these challenges, recent advancements in dental technology have introduced new methods aimed at improving the overall prosthetic experience.

One such innovation is the development of hollow maxillary dentures, which are designed to reduce the weight of the prosthesis while maintaining structural integrity and functional performance.

In this context, the introduction of a 3D glycerin spacer represents a significant advancement. The glycerin spacer, with its customizable and adaptable nature, allows for the precise creation of hollow cavities within the denture, potentially enhancing patient comfort and prosthetic function.

This case study explores the application of this innovative method, detailing the process of fabricating a hollow maxillary denture using a 3D glycerin spacer.

Case Report

A 82-year-old male patient reported to department of prosthodontics OP, St. Gregorios dental college, Kothamangalam, with the chief complaint of loose upper and lower artificial teeth. Intra-oral examination revealed completely edentulous maxillary and mandibular arches. Various treatment options including conventional complete denture, pre-prosthetic surgery, implant retained prosthesis, and modified complete denture were advised to the patient. The patient opted for the modified complete denture.

Clinical steps

1. Diagnostic impressions of the maxillary and mandibular arches were made using irreversible hydrocolloid. Primary casts were obtained and special trays were fabricated (fig 1)
2. Tray extensions were checked and trimmed. Border molding of maxillary and mandibular arches were made with green stick impression compound and final impressions were made with light body impression material (Fig.2) .Master casts were obtained.
3. Temporary denture base and the wax occlusal rims were fabricated covering the edentulous area. The jaw relation was recorded and articulation was done. The teeth arrangement was done in a class I molar relation followed by a satisfactory try-in (fig 3).

During try-in, esthetic and phonetic analysis of the trial dentures demanded an increase in the height of the dentures that in turn would increase the weight of the prosthesis. To counteract this added weight, it was decided to use hollow dentures for the final prosthesis.

Figure 1:

Figure 2:

Figure 3:

Figure 4:

Laboratory steps

1. V-shaped notches were made at three sites on the land area of the maxillary cast and the waxed maxillary denture was sealed to the master cast (Fig.4).
2. The maxillary trial denture was duplicated with putty impression material and poured in Type III dental stone to obtain a working cast (Fig.5).
3. A template of 1mm thick BIOPLAST transparent film was then fabricated on this working cast with the help of a BIOSTAR heat and vacuum press to obtain the trial denture external contours(Fig.6)
4. The maxillary trial denture was invested and de-waxed in the conventional manner(Fig.7)
5. Adjust the existing temporary record base to fit the master cast so that the thickness of the resin around the planned hollow space in the finished denture is consistent and sufficient (Fig.8).
6. For the purpose of achieving the hollow cavity, first a temporary spacer was fabricated using modelling wax, adjusted for suitability and used for all the steps of denture fabrication up till the trial closure (Fig.9).

Figure 5:

Figure 6:

Figure 7:

Figure 8:

Figure 9:

Figure 10:

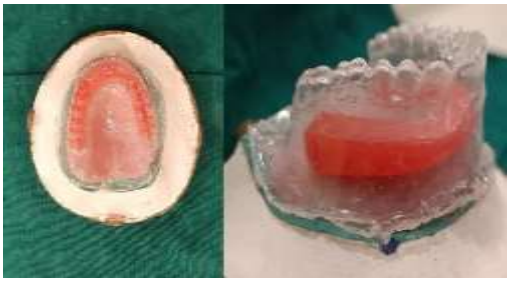
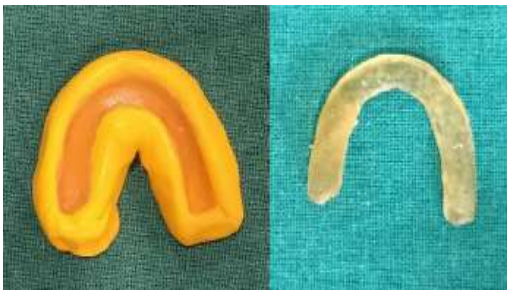


Figure 11:

Figure 12:



7. The temporary wax spacer was placed and adjusted between the master cast (with 2mm record base adapted to it) and biostar template, to achieve 2mm space above the spacer for acrylic to flow (Fig.10).
8. The temporary wax spacer was duplicated using putty impression material, to obtain an accurate mould of the spacer (Fig.11)
9. A glycerin soap was melted and poured onto the prepared mould to get the exact replica of the wax spacer for use during the final closure and acrylization (Fig.12)

Figure 13:

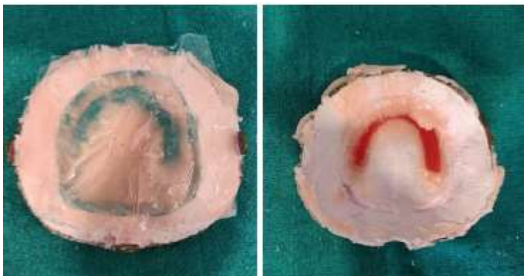


Figure 14:

10. The precision of the 3D spacer from all aspects was assessed by placing between the master cast (with 2mm record base adapted to it) and the biostar template.
11. Afterward, a test closure was performed with the temporary wax spacer. The flasks were then opened, and the temporary wax spacer was removed. The mold was visually inspected to ensure the resin thickness was even around the hollow cavity. The hollow area previously occupied by the temporary wax spacer was replaced with the soap spacer, and the flasks were closed. The denture was then processed using the conventional method (Fig.13)

Figure 15:

Figure 16:

12. The denture was retrieved in the usual manner following processing. Using a micromotor handpiece, openings were cut into the denture base distal to the second molar. The denture was then placed in a bowl of water to dissolve the soap. Additionally, a thin cleaning brush was inserted and moved in and out of the openings to help remove the soap mechanically. A water spray was used to thoroughly rinse away any remaining soap. The hollow cavity was allowed to air dry, and the openings were sealed with autopolymerizing acrylic resin (Fig.14).
13. The mandibular denture was also processed using the conventional method of acrylization. maxillary/mandibular dentures were then trimmed, polished, and delivered to the patient.
14. A water test was performed to evaluate the hollow space as evident by the floating denture(Fig.15). Finished and polished maxillary denture was found to have decreased weight when compared to the conventional complete dentures. The difference in weight was about 5 grams.
15. The patient was trained about insertion and removal of the prosthesis followed by hygiene maintenance instructions. The patient was reviewed after a week, and minor adjustments were made. The 1- month, and 3-month follow-up was found to be satisfactory in terms of function, esthetics, and maintenance of the prosthesis (Fig.15).

Discussion

The incorporation of glycerin spacers in maxillary denture fabrication represents a progressive shift towards more refined and patient-centric prosthetic solutions. This technique aligns with the growing emphasis on enhancing denture comfort and functionality through innovative approaches. Glycerin spacers provide a precise method for creating hollow designs in dentures, addressing common challenges associated with traditional techniques. Compared to conventional methods such as wax patterns or putty spacers, glycerin spacers offer superior accuracy in forming hollow cavities, leading to a lighter and more comfortable prosthesis. This is consistent with findings from previous studies that emphasize the benefits of innovative spacer materials in improving denture outcomes.[1][2].

The technique described here uses a glycerine soap spacer as it can be retrieved easily due to high content of glycerin and the high boiling point enables it to sustain the curing temperature. The added advantages of glycerin are that it does not leave any residue in the hollow cavity and does not interfere with the polymerization process [3].

Historically, hollow maxillary dentures have been fabricated using various techniques, each with its own set of advantages and limitations. For instance, the use of the lost salt technique and thermocol has been well-documented for managing compromised ridges and reducing denture weight [4][5].

However, these methods often involve complex processes or materials that may not always provide consistent results. Glycerin spacers, on the other hand, offer a more controlled and reproducible approach.

Additionally, while initial clinical outcomes are promising, further research is needed to evaluate the long-term performance and patient satisfaction

associated with glycerin spacers. Future studies should focus on optimizing the material properties and fabrication techniques to ensure the sustained effectiveness of this approach and address any potential issues that may arise over time [6].

Conclusion

Glycerin spacers offer a promising alternative to traditional hollow denture techniques. By improving precision and patient comfort, this technique contributes to the ongoing evolution of prosthetic dentistry. Continued research and refinement will be essential to maximize the benefits of glycerin spacers and to address any challenges associated with their use.

Overall, glycerin spacers mark a promising development in denture fabrication, paving the way for more advanced and patient-centered solutions in prosthodontics.

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