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Fabrication of a Maxillofacial Prosthesis with a Novel Suspension Technique for a Patient with Exenteration: A Case Report

Alireza Khaghani[1], Taher Babaee[1,*], Shahla Mohajeri[2], and Naeimeh Rouhani[3]

[1]Ph.D, Rehabilitation Research Center, Department of Orthotics and Prosthetics, School of Rehabilitation Sciences, Iran University of Medical Sciences, Tehran, Iran
[2]MSc, Department of Orthotics and Prosthetics, University of Social Welfare and Rehabilitation, Tehran, Iran
[3]MSc, Rehabilitation Research Center, Department of Orthotics and Prosthetics, School of Rehabilitation Sciences, Iran University of Medical Sciences, Tehran, Iran

*** *Corresponding author:*** Taher Babaee, Rehabilitation Research Center, Department of Orthotics and Prosthetics, School of Rehabilitation Sciences, Iran University of Medical Sciences, Tehran, Iran. Tel: +982122220947, Email: babaee.t@iums.ac.ir

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Abstract

Background: Fabrication of a prosthesis for people who lose an eye and parts of their cheekbones and nasal tissues is a challenge. The prosthesis suspension is a significant problem due to the open nasal cavity and the vast lesion area on the face.

Case Presentation: The present case report describes the application of a new suspension technique for a maxillofacial prosthesis on a person with an exenterated left eye. Moreover, parts of the patient's maxillary and frontal sinuses had been as well removed due to infection. The conventional methods for suspending the prosthesis (i.e., anatomical, mechanical, chemical, and surgical methods) could not be used due to the fact that the patient's sinus and nasal cavities were exposed. Therefore, a new prosthetic suspension technique was used to solve this problem.

Conclusion: In this clinical report, an optimal and effective method was adopted to make a prosthesis that can be used in similar cases of eye loss and extensive loss of the face. This new method does not need the application of adhesives and minimizes the donning and doffing time of the prosthesis.

Keywords: Eye, Maxillofacial prosthesis, Orbit exenteration, Suspension

1. Background

Partial or complete eye loss causes impaired sight and has a significant impact on one's emotional and psychosocial wellbeing (1). An orbit exenteration, which might involve removing parts of the jaw and face, is a major surgery in the head and neck area (2). Fabrication of the maxillofacial prosthesis is an essential part of rehabilitation for those who undergo such surgeries. This study aimed to improve the quality of life and the sense of self-confidence and self-consciousness in these patients and help them return to the community (3, 4).

Various materials including silicone elastomers, acrylic resins, copolymers, and polyurethane elastomers are used to fabricate the craniofacial prostheses (5-7). A major challenge in the fabrication of a maxillofacial prosthesis is the application of an optimal suspension technique for maintaining the prosthesis on the patient's face (8).

This clinical report describes the method we used to fabricate a maxillofacial prosthesis for a person who had an exenterated left eye and parts of his maxillary and frontal sinuses had been removed due to infection.

2. Case Presentation

A 70-year-old man referred to our cosmetic prosthetics center in Tehran, Iran. The patient had a massive infection in his left eye that spread into the frontal and maxillary sinuses. Therefore, the patient had undergone a radical excision procedure for orbital exenteration as well as a conservative excision to remove the superomedial region of the frontal sinus and inferomedial part of the maxillary sinus (Figure 1). Therefore, the frontal and maxillary sinuses and the nasal cavity were exposed as a result. The patient suffered from severe depression after this experience, which had made him reluctant to communicate and socialize with others.

In the process of prosthesis fabrication, we first covered the damaged area with Vaseline gas and took a negative impression from his entire face (Figure 2). The hardened negative impression was filled with liquid dental stone (Welmix, GC Fujirock, Leuven, Belgium) and left to dry out to provide a working positive cast.

An ocular prosthesis was fitted on this working positive cast to ensure that it is positioned correctly (Figure 3). The skin of the missing parts of the face was also mirrored with the opposite side (9). We made a silicone prosthesis and attached it to the patient's face with a special adhesive (Figure 4). However, there was a problem with an adhesive suspension due to the vastness of the damaged area and the nasal cavity's connection to the back of the prosthesis. Accordingly, with each deep exhalation, the air flew to the back of the prosthesis and caused it to detach from the patient's face. We also tried using glasses to help with the suspension, but it failed.

Therefore, we decided to design a prosthesis that

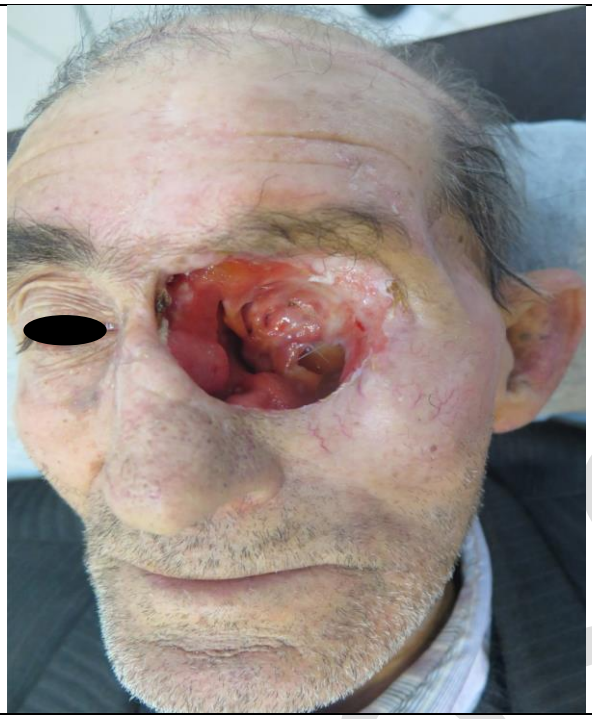

Figure 1. The patient with a massive infection in the left eye and frontal and maxillary sinuses. A radical excision procedure was planned to exenterate the eye and remove the superomedial part of the frontal sinus and inferomedial part of the maxillary sinus.

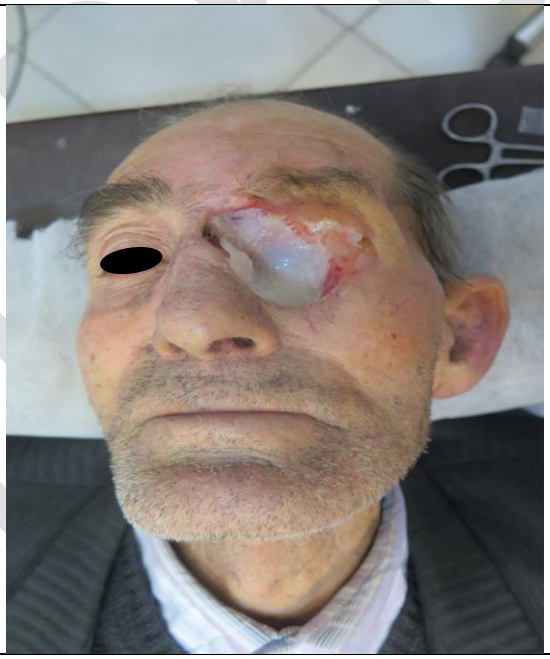

Figure 2. Covering of the damaged area with Vaseline gas for taking a negative impression cast.

had internal and external components with an adequate suspension (Figure 5). The internal part, which was in contact with the mucosal tissue, was made of heat-cured acrylic resin. The ocular prosthesis was placed on the external part which was made of flexible silicone. The internal rigid socket was connected to the external part using an anchor mechanism.

In the fabrication of the prosthesis, we covered the sinuses and nasal cavity with Vaseline gas and then re-molded the lesion site. After a suitable negative template of the patient's face was obtained, we made a positive cast and modified it. In this new positive working cast, a bony lock was created using the anatomic undercuts to increase prosthesis suspension and provide rotational stability. Subsequently, a 1.5 mm thick shell of heat-cured acrylic resin was made based on the anatomy of the

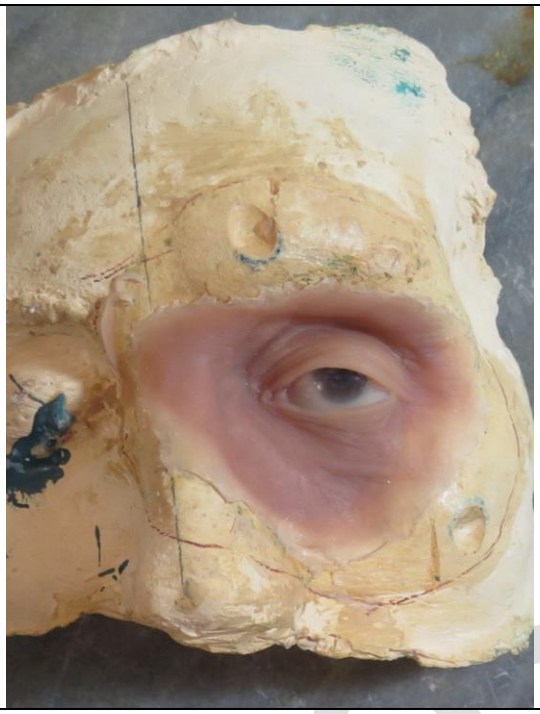

Figure 3. The ocular prosthesis fitted on the working positive cast by the paste.

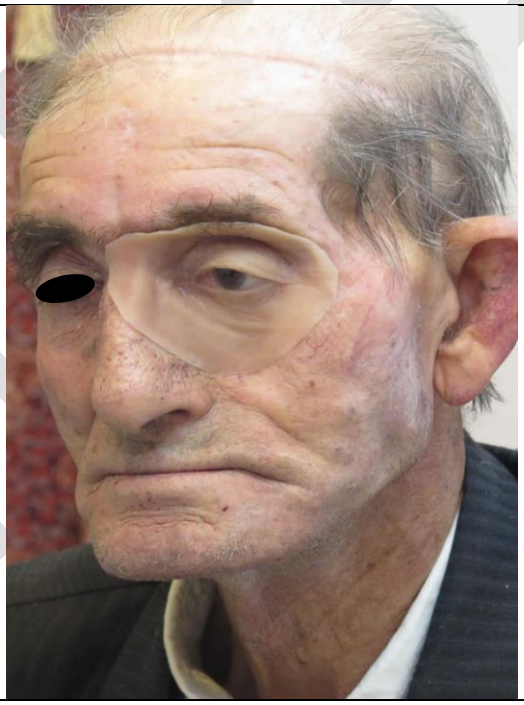

Figure 4. Connection of the silicone prosthesis to the patient's face using adhesive.

entire cavity floor.

After the shell was polished, it was tested on the face cavity floor of the patient, ensuring airway closure, fitting, convenience, and proper suspension. Afterward, we vertically attached an acrylic rod (8 mm in diameter) to the shell bottom (Figure 6). This rod had a handle for the shell to be placed on the patient's face, and it acted as an interface for attaching the external silicone to the internal parts of the prosthesis (due to its elastic properties, silicone was placed firmly around the acrylic rod like a pen cap) and facilitated the process of donning and doffing for the patient.

We attached the external silicone component of the prosthesis after attaching the rod to the shell and inserting it into the patient's face cavity. The external

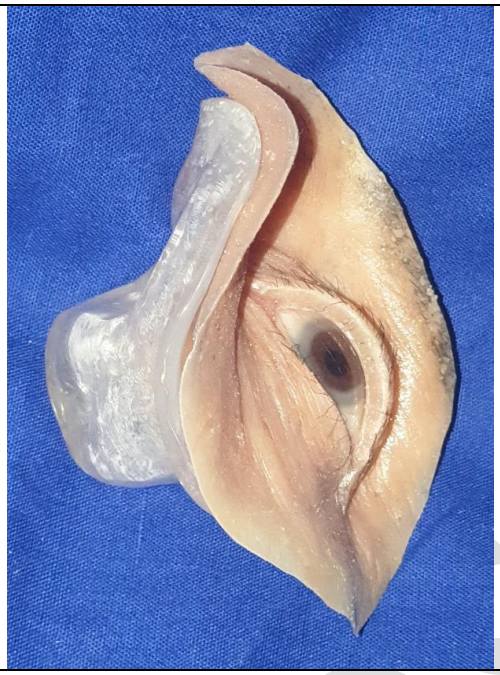

Figure 5. The internal and external components of the prosthesis.

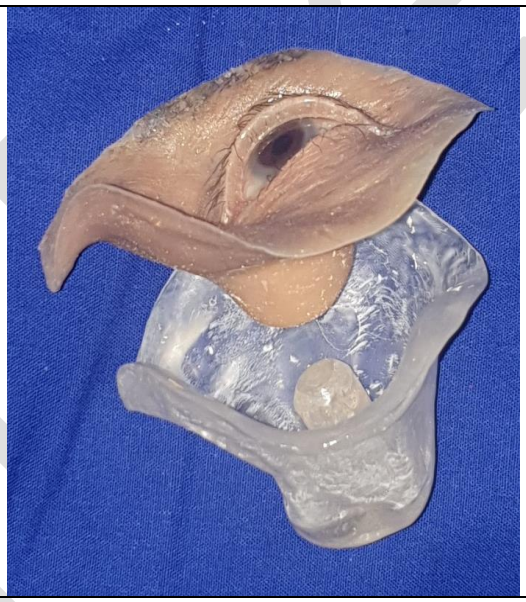

Figure 6. Acrylic rod of the internal component of the prosthesis.

appearance of the attained prosthesis was finalized and fashioned to match the skin tone of the surrounding tissues. The patient eventually applied the prosthesis successfully (Figure 7). This case study was supported by the Research Committee of Iran University of Medical Sciences under approval number 1398.295. The written informed consent was obtained from the patient at the beginning of the study and the images were published by his consent.

3. Discussion

Fabrication of a prosthesis for patients who have lost an eye and parts of their cheekbones and nasal tissues is a challenge. The prosthesis aims to cover the open cavity after the surgery and improve the patient's appearance, psychosocial status, and quality of life (3). The advantages of anatomic suspensions used for placing the prosthesis in this case included proper placement, elimination of the patient's respiratory problem, and easy use (donning and doffing). The patient could do various activities after putting on the prosthesis (i.e. bending, stretching, eating, talking, and smiling) without the risk of falling or loosening.

A problem with silicone materials that are in contact with mucous tissue is the creation of an environment for germs and fungi growth (10) and the

Figure 7. The final prosthesis.

Table 1. --------

Authors	Conception and design of the study	Acquisition of data	Analysis and interpretation of collected data	Drafting of the manuscript and/or critical revision	Final approval of the manuscript
Alireza Khaghani	*	*	*	*	*
Taher Babaee	*		*	*	*
Shahla Mohajeri	*	*	*	*	*
Naeimeh Rouhani	*		*	*	*

risk of infection. In our case, we used acrylic resin to build an interior conformer to minimize the probability of growth of these microorganisms. In addition, due to the vastness of the affected area, the patient needed to put on his prosthesis with a special maneuver (rotating the internal acrylic conformer over the lesion area). Therefore, placing a rod on the acrylic conformer facilitated this maneuver. The other benefit included the easy connection of the prosthesis' internal acrylic part to the external silicone part, which eliminated the need for adhesives to connect the internal and external parts of the prosthesis.

4. Conclusion

In this clinical report, an optimal and effective method was adopted to make a prosthesis that can be used in similar cases of eye loss and extensive loss of the face. The need for adhesives is eliminated in this new method and the donning and doffing time of the prosthesis is minimized.

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Footnotes

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Conflicts of Interest: The authors declare that they have no conflict of interest regarding the publication of this study.

Ethical Approval: The ethics committee of Iran University of Medical Sciences approved the study protocol (IR.IUMS.REC.1398.295)

Informed Consent: The written informed consent was obtained from the patient at the beginning of the study.

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