Case Report
International Journal of Medical and Dental Sciences, *Vol 8(1), DOI: 10.18311/ijmds/2019/23008, January 2019* *ISSN (Print) : 2454-8952*
ISSN (Online) : 2320-1118

Rehabilitation of Exenterated Right Eye: A Prosthetic Challenge

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Abstract

Background: Facial defects can be acquired or congenital, but irrespective of etiology, any maxillofacial structure if damaged or missing will result in an unaesthetic and unappealing personality of individual. Orbital defects are very evident and effect the appearance and social front of the individual. Many modalities are available to rehabilitate the defect of an orbit but prosthetic rehabilitation with silicone prosthesis is a simple and effective approach. Retention is generally achieved by engaging available undercuts or using mechanical accessories or skin adhesives etc. This case report describes successful rehabilitation of right orbital defect using a non-surgical approach with room temperature vulcanized silicone and skin adhesives. **Case Report:** A 45 yr old male reported with, chief complaint of missing right orbit and unaesthetic appearance secondary to gunshot wound. Patient was not ready for any more surgical procedures or additional accessories and available retentive undercuts were minimal. Hence, conventional silicone prosthesis was made using stock eye shell and room temperature vulcanized silicone retained with skin adhesives. The approach was simple to a complex problem and gave reliable result in very limited time. **Conclusion:** With extensive orbital defect, rehabilitation is difficult and complex as retention is compromised and it is difficult to match the shade of the prosthesis.This case represents a simple and predictable approach to a case of exenterated right orbit with conventional roomtemperature vulcanized silicone and silicone skin adhesives.

Keywords: Maxillofacial Prosthesis, Orbital Prosthesis, Orbital Exenteration, Orbital Defect, Silicone Elastomers

1. Introduction

One of the most complex structures in the maxillofacial region is eye. Eye or the orbit contains many vital contents like periorbital fat, optic nerve muscles, conjunctiva and the eye ball or globe with in a bony eye socket. Etiology of orbital defects can be congenital or acquired. Acquired orbital defects are commonly because of tumor or trauma.[1] According to removal of orbital content, surgical procedure can be classified into 3 categories: Enucleation, evisceration, and exenteration. Enucleation is removal of globe leaving the rest of the orbital contents like orbital fat, conjunctiva and bony socket. Evisceration is removal of eye content leaving outer layer of eyeball intact. Exenteration is removal of all the contents of orbital cavity including optic nerve, lacrimal gland, muscles. In some cases, part of orbital cavity may also be removed and similarly, depending on the surgical need eyelid can be retained or removed.[2,3] The most complex situation to rehabilitate from a prosthodontic purview is exenteration, as it compromises replacement of complete orbital content and sometimes periorbital structures as well. There are various approaches to rehabilitate exenteration defect of orbit like surgical, implant retained prosthesis and others, but most conservative and predictable is conventional silicone prosthesis.[4] The only limitation

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with a conventional silicone prosthesis encountered is the mode of retention. Literature reports many ways to retain conventional silicone orbital prosthesis, like soft tissue undercuts or mechanical methods using accessories like spectacles, but they all possess some or the other complication. The case discussed here followed a conservative approach of fabricating conventional silicone prosthesis for rehabilitation of an extensive orbital defect.[4,5] This was accomplished using stock eye shell, room temperature vulcanized silicone and silicone adhesive for retention.

2. Case Report

A 45 yr old male serving in the armed forces came with a chief complaint of missing right eye and was referred from Department of Reconstructive Surgery to our clinic for prosthetic rehabilitation. On asking history of presenting illness, patient reported that around 2yrs back he sustained a gunshot injury to his right side of face. He suffered multiple facial and cranial bone fractures and reconstruction surgery was done. During these surgeries, exenteration of right eye was done with skin flap leading to obliteration of the orbital volume. Supra orbital rim and part of frontal bone were also lost, so a titanium plate was placed for reconstruction of the same. Past medical and dental histories were noncontributory. On examination of current status of orbital defect, it was found that there was complete obliteration of orbital cavity with scars from injury and surgery. It was assessed that there was minimum soft tissue retention available [Figure 1].

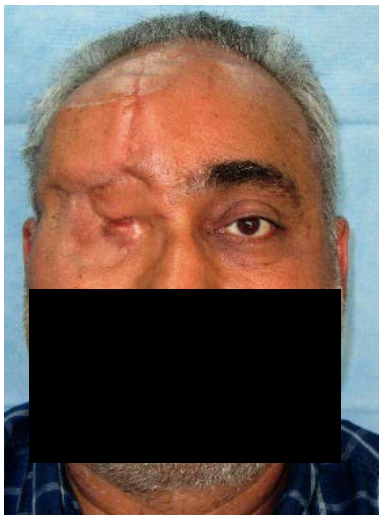

Figure 1: Preoperative condition

3. Treatment Plan

Various treatment options available for rehabilitating this defect included conventional silicone prosthesis with different mode of retention like implants, mechanical methods or skin adhesives. The treatment options were discussed with the patient and patient denied for any more surgical procedures. He was also reluctant to wear additional mechanical devices like spectacle for retention of prosthesis. Hence, it was decided to give him silicone adhesive retained prosthesis.

4. Impression Procedure

As the defect was extensive, it was necessary to record complete facial moulage so as to replicate and compare contralateral anatomy. As there were no reference landmarks on the defective site, reference lines were marked. For this contralateral eye was kept in conversational gaze and line 'A' was marked in the midline of face. Line 'B', 'C', 'D' and 'E' were further marked with 'B' passing through medial canthus of eye, 'C' through pupil of left eye, 'D' through lateral canthus of eye and 'E' passing horizontally through the pupil of left eye. Distance between 'A' and 'B', 'C' and 'D' were measured and line 'b', 'c', and 'd, were marked on defective site as per the measurement. Line 'E' was extended to maintain the horizontal orientation [Figure 2].

Figure 2: Reference lines marked, beading done and suction tips modified for maintaining airway.

Once the orientation lines were marked, then the impression compound (The Hindustan Dental products, Hyderabad, India) was used to make a bead around the face. Saliva ejectors tips (Patterson dental, US) were modified to provide air way for breathing of patient while undertaking the procedure of impression. Then using irreversible hydrocolloid (Zelgen alginate, Densply) facial impression was made an impression material was mixed in thin consistency so as to achieve adequate flow. All the critical areas were painted for better reproduction of details. Cotton pellets were added to the setting impression material, which will provide anchorage with the reinforcing material. Once the impression material was set then it was reinforced with Type 2 Dental stone (Neelkanthdentico plaster of paris, India). Once the plaster was set, the complete impression was teased out and poured with Type 3 Dental stone (Neelkanth's dental plaster, India). The reference lines were transferred on to the cast which helped to orient the stock eye and the complete prosthesis.

Once the facial moulage was available, the area to be rehabilitated was marked and a closely matching stock eye was selected matching the iris of the patient. This stock shell was placed on the model centered as per the 'c' reference line [Figure 3]. The stock eye was secured with moulding wax (DPI Modelling Wax, India) and complete wax up was done extending to the area demarcated for the prosthesis. When the wax up was finished, it was tried on to the patient. Esthetics was given prime importance and approval of patient was achieved [Figure 4]. Once the wax pattern was finalized, an index on the stock eye was made which will prevent movement of stock eye during dewaxing. Then the wax pattern was invested and dewaxed. The two part mould thus achieved had the stock eye secured at the correct position. [Figure 5].

Figure 3: Model with reference lines and centered stock eye shell

Figure 4: Wax up tried on the patient to check for aesthetic outcome

Figure 5: Two part mould with fixed eye shell after dewax

5. Color Matching

One of the most difficult part of this rehabilitation was color matching as it will determine the fate of prosthesis. For this case, a room temperature vulcanized silicone (ElkemRTV-4410(A-RTV-10) Factor-II, USA) was used. Various intrinsic colors (Fi-Sk: Functional Intrinsic Skin Colors - Silicone Coloring System, Factor-II, USA) were used to match the base shade of skin of the patient. Once that was done more colors and flockings (H- Flocking - Individual Colors, Factor-II, USA) were added to small quantities of base shade to replicate specific parts of the orbit. The specific shades were painted to specific parts of mould and the volume was filled with base shade. The mould was closed and allowed to cure for 24 hrs. After 24 hrs the polymerized silicone prosthesis was carefully retrieved and processed [Figure 6]. The prosthesis was tried on the patient and showed excellent esthetics, with correct position of the stock eye shell but the retention was compromised. Hence, to give prosthesis life like appearance and characterization eyebrow hairs were weaved in and eye lashes were attached. [Figure 7].

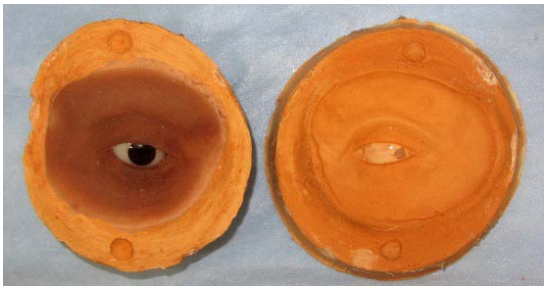

Figure 6: Processed silicone prosthesis with correct shade matching

Figure 7: Additional characterization with extrinsic stains and hairs

Extrinsic stains were added to determine shade matching. During final delivery of the silicone prosthesis to the patient, the Daro Adhesive Regular (B-200-RDaro Adhesive Regular factor II, USA) was applied to the tissue surface and then the prosthesis was secured on to the patient. [Figure 8]. This mode of retention was active for 4-5 hrs as reported by the patient. On the day of the delivery and in subsequent visits patient appeared very satisfied and reported that the prosthesis has made him feel more confident and has near normalized his life.

6. Discussion

Any facial defect is a challenge for both the patient and the operator. A patient has to undergo, first the trauma of the injury and then the associated compromised look, the function and social limitation. So for the operator also it's a tough rehabilitation to carry out due to the expectation of the patient.[6] The complexity of orbital defects further complicates the rehabilitation procedure. Exenteration of orbit is the most difficult to rehabilitate and prosthetic approach is a simple and reliable modality for treating such cases.[4] One of the challenge faced in fabrication of orbital prosthesis, is orientation of stock eye. There are many methods explained by various authors.[7–10] Method followed in this case was a modification of Jooste CH method, in which orientation lines were marked on contralateral normal eye and same distance was used to mark lines on affected eye.[8] Next important decision to make in prosthetic rehabilitation of orbital defect was

Figure 8: Prosthesis retained with skin adhesives

impression material and the extent of impression. An accurate facial impression including the defective and normal side is a must. A full facial moulage gives a better preview to the placement of wax pattern. Full facial model will give insight to placement and coordination of final prosthesis in a better way.[11] But it is difficult to achieve a full facial moulage and requires patient cooperation. There are many materials to choose from for impression of orbital defect but irreversible hydrocolloid has been the material of choice because of ease of handling and good detail reproduction.[11, 12]

Other important decision is the choice of material for fabrication of prosthesis. There is a plethora of material for rehabilitation of maxillofacial defects which include porcelain, PMMA, RTV silicone elastomer, poly urethane elastomer, HTV silicone and many more.[10, 13-15] Silicones have been proved to be a good choice because of its properties like good tear strength, excellent esthetics, life like appearance and their ability to be intrinsically stained to produce specific shades. The challenge faced, is to make a close shade match and it's a hit and trial method which requires practice and artistic skills. Finally, to decide the mode of retention is another hurdle in the rehabilitation of orbital defect. Various authors have used different modes of retention of orbital prosthesis, like magnets, soft tissue undercuts, spectacles, resin bonded attachments and implants.[15,16] In present case silicone skin adhesive was used to provide with primary retention, as soft tissue undercuts were not available for engaging and patient did not agreed for implant surgery. Silicone adhesives are generally composed of silicone elastomers i.e., poly (dimethyl siloxane) (PDMS) which provide excellent adhesion and cause minimum damage to both the prosthesis or skin.[17]

7. Conclusion

This article showcased a simple approach to rehabilitate a complicated clinical condition. It is not necessary to rehabilitate an orbital defect with implants or to add accessories like spectacle. In this case patient did not want surgery, so implants were ruled out and limited soft tissue undercuts were unreliable to provide adequate retention, hence a simple solution which involved using silicone adhesive was used. Answer to a problem may not always necessarily be complicated. Use of silicone adhesives and careful basic steps in fabrication can be just as effective as any other modality.

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How to cite this article: Chauhan D., Thakur A., Viswambaran M., Yadav R.K., Khattak A., Gopi A. and Sharma D. Rehabilitation of Exenterated Right Eye: A Prosthetic Challenge. J. Med. Dent. Sci. 2019; 8(1): 1709-1714.