Expansion of a Contracted Eye Socket by Ocular Prosthesis: An Alternative Prosthetic Approach to Correct the Post Enucleation Socket Syndrome

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Abstract

Eye socket contracture include inability to retain a prosthesis. It is considered when the fornices are excessively small. Most common causes includes: radiation treatment of tumor, extrusion of orbital ball implant, severe injury like burn and not using any prosthesis for the prolonged periods. Several surgical procedures are introduced to manage the contracted sockets. But, surgical methods are not often chosen as a definitive option. This clinical report describes the rehabilitation of a post-enucleation socket syndrome with a modified ocular prosthesis. The patient was completely satisfied and experienced no complications. Modifications of the ocular prostheses were performed by several sized conformer and gradual expansion of the eye socket. Contracted socket with a post-enucleation socket syndrome can be corrected with the modifications to the prosthesis. This rehabilitation procedure provides satisfactory results.

Key words: Contracted Eye Socket, Conformer, Ocular Prosthesis, Prosthetic Management

Introduction

The reconstruction of an anophthalmic socket to retain an artificial eye, requires a cavity with sufficient size and shape [1]. The term anophthalmic socket sometimes refers to the condition as a post-enucleation socketsyndrome. Ananophthalmic socket due to enucleation of eye leads to contracture and the shrinkage of eye socket. Enucleation is often indicated for serious injuries to the eyes. After enucleation, the loss of volume and rotation of intra orbital contents may results in superior sulcus deepening, enophthalmos, ptosis, ectropion and lower lid laxity, which are known as post-enucleation socket syndrome. The post-enucleation socket syndrome often leads to contracture of eye socket, if the socket is not supported by prosthesis. Contracted eye socket is characterized by a low-lying upper eyelid margin, which narrows the palpebral opening of the eye. In such cases, superior sulcus deformity produces deep surface contours in the upper eyelid above the tarsus and may arise from atrophy of the orbital fat, degeneration of the extraocular muscles, or displacement of the orbital implant. These conditions are often described as ptosis [2].

To solve these problems, reconstruction surgery of the eye socket is often required. Several studies have reported the successful use of a free skin graft in an anophthalmic socket reconstruction [3,4]. Surgical procedure to correct ptosis includes resection of Müller's muscle and shortening of the levator palpebrae [5]. Sometimes surgery cannot be done due to several reasons, such as lack of patient's interest, limited oculoplastic surgery facility, and technique sensitive surgery etc. An ocular prosthesis can be introduced in the eye socket in such conditions with some special considerations and measurements.

This clinical report describes the rehabilitation of a post-enucleation socket syndrome with an ocular prosthesis by different sizes of conformer and gradual expansion of the contracted eye socket opening and volume to retain a prosthesis.

Outline of the Case

A 60-year-old Malay female was referred to the maxillofacial prosthetic service, School of Dental Sciences, Universiti Sains Malaysia for the rehabilitation of an ocular defect. The patient's chief complaint was a defect associated with left eye. Past medical history revealed that the eye was lost due to retinoblastoma 25 years back. Enucleation was done, and no intraorbital implant was placed. There was no history of using ocular prosthesis. As a results the eye socket become severely contracted. Examination of the eye socket showed the presence of superior sulcus deepening, narrow opening of eye with upper eyelid ptosis, superior and inferior eyelid laxity, normal lacrimal secretion, inadequate superior fornix depth and shallow inferior fornix depth *(Figure 1A-1B)*. The treatment plan were involved, fabrication of an ocular prosthesis with the modifications to correct the opening of both eyelids with correction of ptosis, expansion of remaining eye socket and the superior sulcus deformities.

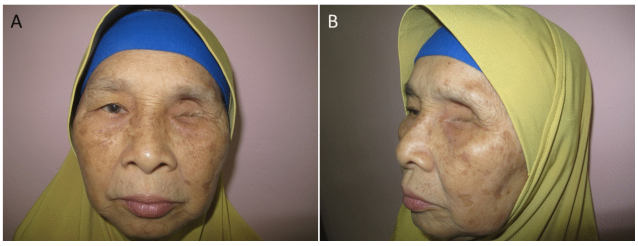

Figure 1. Appearance of patient with right ocular defect in frontal view (A) and lateral view (B).

Custom special ocular tray made by utility wax and an ocular impression of the eye was made with polyvinyl siloxane impression material (EXAMIX – light body, GC America) *(Figure 2A-2B)* at the first visit. A mold was made with Type III dental stone (Lafarge Prestia, Meriel, France), and a conformer was fabricated with clear, heat-polymerized polymethyl methacrylate (PMMA) resin (Vertex-Dental,

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Zeist, Netherlands), according to the manufacturer's instructions *(Figure 3A-3B)*. The conformer was tried in the the second visit *(Figure 4A-4B)*. The patient was asked to exercise of defect eye with conformer by opening and closing of both eye lids. In the third visit, baseplate wax (Carvex TT 100 soft, Carvex, Holland BV, Haarlem, Holland) was added on the center, mesial and lateral surface of the conformer to lift up the margin and opening of the eye. Finally, the baseplate wax was replaced with PMMA *(Figure 5A-5B)*. The final conformer was delivered to the patient and instructed to wear it for 3 weeks *(Figure 6A-6B)* to allow tissue adaptation. Following the use of expanded conformer an ocular prosthesis was fabricated from PMMA *(Figure 7A-7B)* and delivered to the patient with care instructions. The patient was given exercise protocols to increase the tonicity of the eyelid muscles and to increase the opening of the eye. The exercise protocol includes: opening, closing, right and left lateral movement of the eyelid with the different size of conformer. Patient advised to massage on upper eyelid by her palmer surface of tip of index finger while having the conformer. As well patient advised to pull the upper eyelid over the conformer using two fingers. Patient was recalled for the follow-up review at an one-month interval.

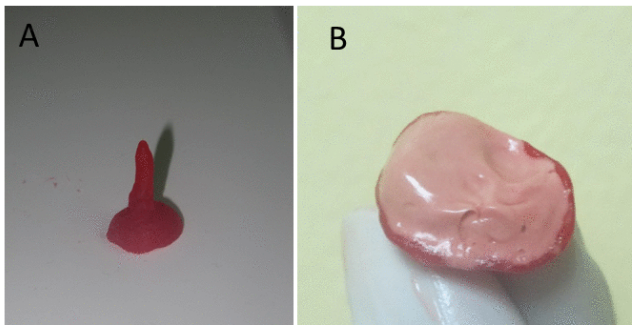

Figure 2. A. Custom special ocular tray made by utility wax, B. Impression of ocular defect made with polyvinyl siloxane impression material.

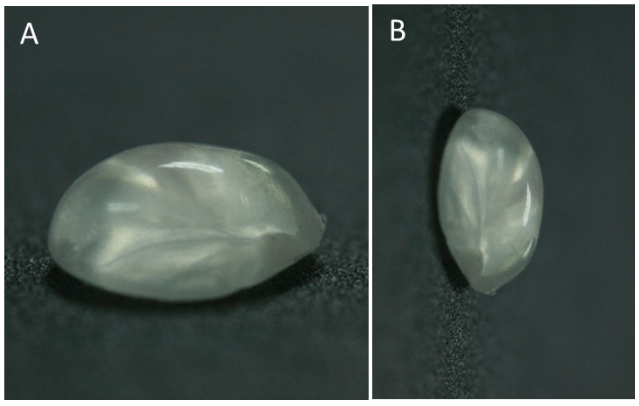

Figure 3. Conformer made by Clear heat polymerizing polymethyl methacrylate (PMMA), frontal view (A) and lateral view (B).

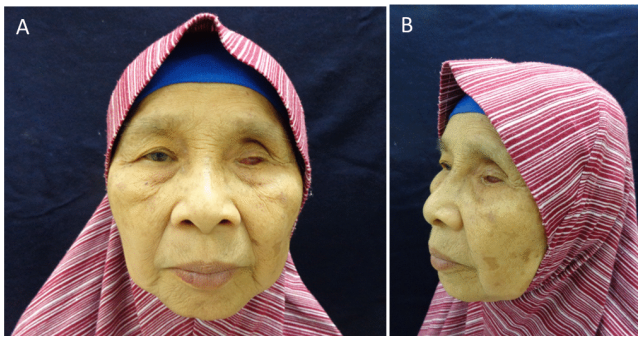

Figure 4. 2nd visit try in conformer in frontal view (A) and lateral view (B).

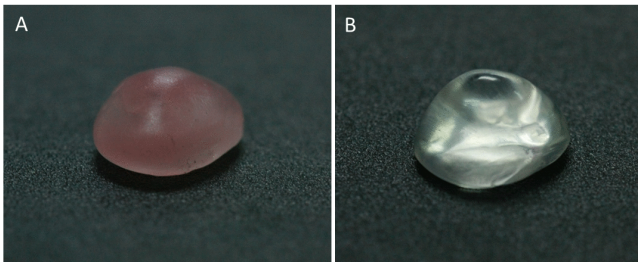

Figure 5. Adjustment done on the conformer; reducing the anterio-superior aspect, addition of Baseplate wax on the centre, mesial and lateral surface of the conformer (A) and the final conformer (B).

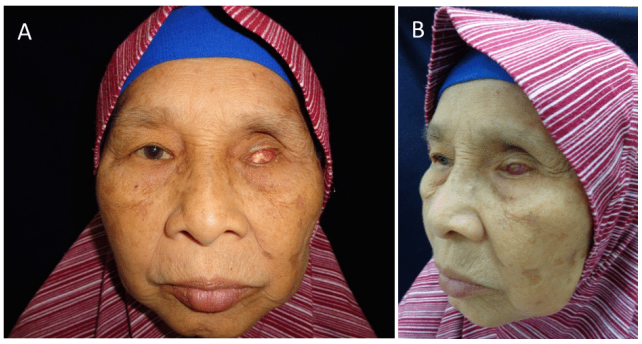

Figure 6. 3rd visit try in modified conformer in frontal view (A) and lateral view (B).

In a follow-up visit, modification was made on the ocular prosthesis according to Allen's technique [6] for further expansion of the eye socket *(Figure 8A-8B)*. The size and shape of prosthesis was increased on the anterior-superior aspect to reposition the superior tarsal plate, correct the ptosis and increase eye opening. Baseplate wax was also added on the antero-superior corneal area to support and lift up the upper eyelid.The anterior-inferior surface of the conformer was reduced to lift down the lower eyelid *(Figure 9A-9B)*.

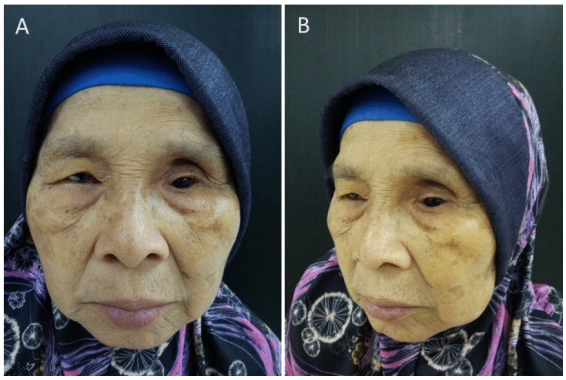

Figure 7. Try in first ocular prosthesis in frontal view (A) and lateral view (B).

Figure 8. Modification done on the ocular prosthesis; Baseplate wax was added on the anterior-superior aspect to reposition the superior tarsal plate which leads to increase of eye opening.

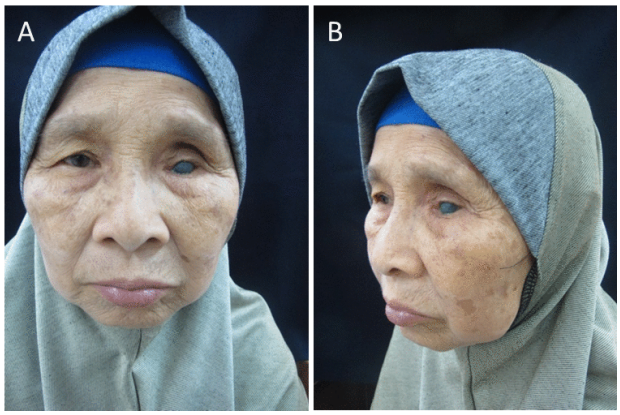

Figure 9. Try in modified first ocular prosthesis in frontal view (A) and lateral view (B).

Finally, a second new ocular prosthesis was fabricated using the mold of wax relined of the first ocular prosthesis *(Figure 10A,10B,11A,11B).*

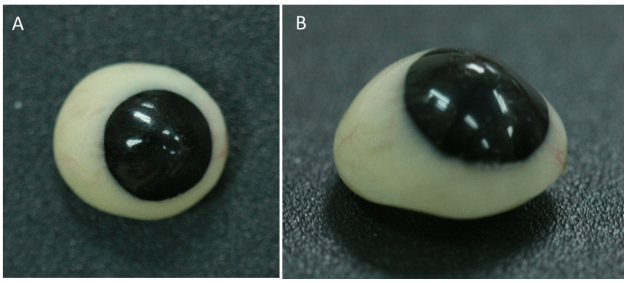

Figure 10. Final ocular prosthesis, frontal view (A) and lateral view (B).

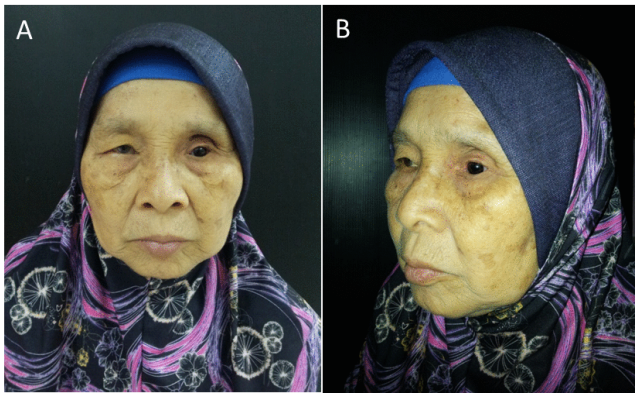

Figure 11. Final definitive ocular prosthesis in frontal view (A) and lateral view (B).

Discussion

The method for obtaining an optimum level of eye opening and increased socket volume by an ocular prosthesis has been described. The functional impression wax relining technique on conformer has used to modify the conformer to get the proper size of definitive ocular prosthesis. Because the nucleus will fill the anophthalmic socket comfortably to result in a normal appearance and most often near normal movement. The goal of rehabilitation for this case, to achieve a considerable amount of eye opening and increase socket volume. Furthermore, fabrication of definitive ocular prosthesis provides a normal cosmetic appearance [7].

Conformer plays an imperative role in expanding the eye socket and volume. A plan should be made for the appropriate socket expansion to be done by conformer. Since the cases are acquired defect, the aesthetic will be compromised. Step by step expansion should be done following subsequent recall visit. Importance are given to the certain perimeters, such as maximum eye opening, correction of superior sulcus deepening, upper eyelid support and stability of the prosthesis in the eye socket [8].

Present case is unique, in first visit; patient could not manage to open the upper and lower eyelid on the defect side. Step by step different sizes of expanded conformer in several recall visits, patient eye opening and socket volume has been improved. The final expanded size of the prosthesis with maximum opening and greater aesthetic was decided as the definite size of final prosthesis. Expansion of the socket was

done by reshaping the conformer into a more vertically elongated design. Volume was also added posteriorly and superiorly to push the lid tissue into the superior sulcus. However, some of similar method was also applied in different cases [2, 6, 9,10].

Conclusion

Contracted socket with post-enucleation socket syndrome can be corrected with modifications to the prosthesis. Proper prosthetic treatment plan is needed for gradual expansion of a contracted socket. Functional relining wax technique provides a well-adapted prosthesis with improved expanded eye socket and appearance.

References

1. Converse JM (Editor). Reconstructive plastic surgery (2nd edn). The orbit. W.B. Saunders, Philadelphia. 1997.

2. Amornvit P, Rokaya D, Shrestha B, Theerathavaj S. Prosthetic rehabilitation of an ocular defect with post-enucleation socket syndrome: A case report. *The Saudi Dental Journal*. 2014; **26**: 29–32

3. Antia NH, Arora S. Malignant contracture of the eye socket. *Plastic and Reconstructive Surgery*. 1984; 74: 292-294.

4. Taneda H, Sakai S. Effective use of a ready-made ocular prosthesis for contracted anophthalmic socket reconstruction surgery. *Anaplastology*. 2013; **2**: 107-108. doi: 10.4172/2161-1173.1000107

5. Finsterer J. Ptosis: causes, presentation, and management. *Aesthetic Plastic Surgery*. 2003; **27**: 193–204.

6. Allen L. Reduction of upper eyelid ptosis with the prosthesis,with special attention to a recently devised, more effective method. *Symp Spec*. 1976; 3–25.

7. Beumer J, Marunick MT, Esposito SJ. Maxillofacial Rehabilitation. Prosthodontic and Surgical Management of Cancer-Related, Acquired and Congenital Defects of Head and Neck. Quintessence Publishing Co. 2011.

8. Chin K, Margolin CB, Finger PT. Early ocular prosthesis insertion improves quality of life after enucleation. *Optometry*. 2006; **77**: 71–75.

9. Workman C. Prosthetic ocular motility-an ocularist's analysis. *Journal of the American Society of Ocularist*. 1991; 9–13.

10. Jamayet N, Eusuf Zai SZ, Alam MK (2014) Silicon Orbital Prosthesis: A Case Report. *International Medical Journal*. 2014; **21**: 304-306.