Case Report

Naso-orbital fistula and socket reconstruction with radial artery forearm flap following orbital mucormycosis

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ABSTRACT

Invasive mucormycosis is an uncommon cause of orbital exenteration. Reconstruction of an exenterated orbit is a surgical challenge. The loss of eyelids, adnexal structures, and even surrounding skin causes significant facial disfigurement. The goal for reconstruction demands a symmetrical orbital cavity with good prosthetic rehabilitation. Multiple reconstructive options in the form of skin grafts, local flaps, and free flaps are available. However, none of them provide ideal reconstruction. Our patient not only had extensive soft-tissue loss and unstable lining but also a large naso-orbital fistula. Reconstruction for this complex defect was done using an adipofascial radial artery flap which not only closed the fistula but also provided soft-tissue bulk and good skin match. Radial artery forearm flap provides a simple, stable, and good reconstructive option postorbital exenteration.

Key words: Exenteration, mucormycosis, orbital reconstruction, radial artery forearm flap

Introduction

Anophthalmic orbits following exenteration due to invasive fungal infections and invasive carcinoma cause significant psychosocial disability to the patient making an adequate and esthetically acceptable reconstructive procedure, a mandatory option. Such conditions often lead to partial or total orbital loss causing significant disfigurement of the face. The anophthalmic socket has been associated with many complications such as infection leading to continuous discharge or bleeding, exposure or extrusion of the orbital implant, and contracted socket. Meyer and Zaoli's classified[1] four types of orbital exenteration depending on the extent of destruction involved in the surgery:

- Type I: Palpebral skin and conjunctiva are spared
- Type II: Only the palpebral skin is spared, and the eyeball and its appendages are removed with the conjunctiva
- Type III: Both eyelids are removed with orbital contents
- Type IV: The eyeball, eyelids, and appendages of the eye are removed with the involved bone structures.

Reconstruction of an exenterated eye has always been a challenge for surgeons. Once the prosthesis is placed in an inadequately reconstructed orbit, it can get misplaced, extruded, or desired results are not obtained. Moreover, the loss of the lid structures, periorbita, appendages, and sometimes the surrounding skin makes placement of an intraocular prosthesis impossible. In such cases, obliteration of the orbital cavity with a robust flap and the use of external ocular prosthesis is the desired goal.

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Case Report

A 35-year-old male presented 6-month postexenteration for invasive fungal infection. There was complete loss of the orbital contents and medial orbital wall along with the upper and lower eyelids with a naso-orbital fistula leading to escape of inspired and expired air through the orbital defect. The exposed orbital cavity had unstable lining with history of recurrent bleed from the orbital surface. The patient also gave history of recurrent upper respiratory tract infections [Figure 1]. On evaluation, loss of both eyelids with orbital contents and lining with a large communication with the nasal cavity was observed. The patient was investigated in the form of routine blood investigations along with three-dimensional computed tomography scan of the face [Figure 2]. The aim of the reconstruction was to release the socket contracture, give stable lining to the orbital wall, close the naso-orbital fistula, and provide supple matching soft tissue cover for anophthalmic orbit amenable for external prosthetic reconstruction.

Since the patient had a naso-orbital fistula, this condition was a challenge for the anesthesiologist as induction was not possible with routine bag and mask ventilation due to the escape of inhalational agents through the fistula. Thus, obliteration of orbital route was first accomplished with dry pad packing, and it was only then the patient could be put effectively on inhalational agents [Figure 3]. Socket contracture was released, unstable lining was excised, and the orbital defect was measured. The dimensions of the defect were 5.2 cm in its depth, medial to lateral wall measured 6.4 cm, and distance between supraorbital ridge and infraorbital rim measured 3.5 cm [Figure 4]. Radial artery forearm free flap (RAFF) was chosen as the preferred method of reconstruction. The flap was planned and outlined on the left forearm after performing Allen's test [Figure 5]. The central skin paddle was used to create the matching eye patch which would be subsequently used for eyelid reconstruction by an external prosthesis and the peripheral adipofascial component used for filling of the orbital defect. Under tourniquet control, a curvilinear incision starting from the inner boundary (central skin paddle) of the flap was given along its axis to reach the antecubital fossa. The skin incision for the flap was limited to the dimensions of the central skin paddle. The skin was elevated off the peripheral component of the flap till its outer dimensions where it was deepened to incise the deep fascia. The flap was then carefully raised keeping in view of the adequate pedicle length. A tunnel of adequate size was created superficial to the facial muscles for the pedicle to be anastomosed with facial artery and vein in the neck. Adipofascial component was placed into the defect, and the central paddle was sutured with the skin margins. The donor site was closed with a split skin grafting cover.

The patient has been followed for 6 months with complete fistula correction and well-settled flap [Figure 6]. Further reconstructive procedures such as eyelid reconstruction and placement of orbital prosthesis are yet to be performed. The donor site has healed well with no loss of function.

Figure 1: Postexenteration large orbito naso cutaneous fistula

Discussion

The patient apart from having a cosmetic deformity had persistent naso-orbital fistula leading to difficulty in respiration and repeated upper respiratory tract infections. A successfully rehabilitated anophthalmic socket must hold and support a prosthetic device that mimics the contralateral globe or else should have a stable cover to accommodate an external prosthesis.

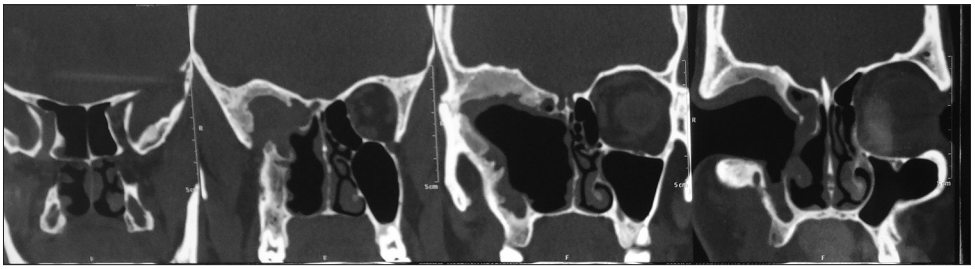

Figure 2: Computed tomography scan showing the defect

Figure 3: Difficult intubation after temporary patching of the fistula

Figure 4: Final defect after excision of unstable lining

Figure 5: Adipofascial flap raised on the forearm with central cutaneous paddle

Figure 6: Long-term postoperative result

The goal is symmetry. Static symmetry of the palpebral apertures, canthal angles, and superior sulcus is basic objectives. Movement of the socket implant and prosthesis with upper eyelid excursion is definitely desirable but impossible to attain in our case. Variety of flaps that had been used in the past had one or the other drawback, and history suggests that there is no ideal free flap which can be used to reconstruct the anophthalmic eye. Temporalis fascia has been commonly used for reconstruction of the anophthalmic socket but was avoided in our case because of its inability to provide bulk of tissue as requires in this patient, and it leads to temporal hollowness and scar alopecia making the donor site esthetically unacceptable to the patient.[2] Gracilis free flap not only does contour well into the defect but also has limitations of its pedicle length, an unreliable skin paddle if the required dimensions are quite small, and the use of graft with the muscle make it less cosmetically pleasing to the patient. Latissimus dorsi or rectus muscle free flaps can be used but are quite bulky and more often required when defects require more complex reconstructions. Dorsalis pedis flap provides thin and supple soft tissue cover as RAFF, but it lacks good adipofascial component in thin patients and can lead to significant donor site morbidity if the flap is harvested according to the required dimensions without skin sparing. Anterolateral thigh flap provides tissue cover for defects ranging from small to large with minimum morbidity but was avoided here because of dense coarse hair on the donor site and the comparatively bulky thighs in this patient which could have lead to further stages of debulking procedures before implant placement. Advantages of radial forearm flap lie in its thin, pliable, relatively hairless skin, efficient soft tissue, and flexible pedicle length which offer a suitable contour restoration to the anophthalmic orbit. Compared to lateral arm flap, forearm flaps are relatively thinner, softer, and easier to fold.[3] The pedicle was anastomosed with the facial artery and vein as it gave us an advantage that in case of flap failure, we can easily use regional temporalis fascial flap based on superficial temporal artery as an option. The patient had desired successful functional and clinical outcome for the treatment of severe anophthalmic orbit as well as satisfactory naso-orbital fistula obliteration with no

recurrence 6 months postoperatively, using microvascular radial forearm free flaps. Postoperatively, we have adequate soft tissue for contoured eyelid reconstruction as well as for sufficiently deep conjunctival fornices which are necessary to keep the prosthesis in place. The patient refused any further surgery for placement of intraocular prosthesis and settled for an external prosthesis in form of spectacles.

Conclusion

Among these spectrums of options for reconstruction, we chose adipofascial RAFF because the patients main concern was firstly to have an appropriate skin cover over the socket to match the face and secondly obliteration of the oro-naso-cutaneous fistula. This required a flap which could not only fill the orbital cavity defect with adipofascial tissue but also provide stable skin cover along with minimal donor site morbidity.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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