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Case Report

Dermis fat graft for pediatric exenteration-challenging but rewarding

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Abstract

Orbital exenteration is a destructive and disfiguring surgery and involves removal of the entire orbital contents, soft tissue and often lids as well. We report a case of an eight month old female, with malignant orbital teratoma who underwent lid sparing exenteration for the destructive, locally advanced disease. Three month post surgery she developed recurrence with intracranial extension as well as socket infection with pus discharge. Repeat surgery involved a multispeciality approach for removal of the tumor which was abutting the cavernous sinus posteriorly and ethmoid sinus medially, apart from filling the entire bony orbit. The focus of infection was found to be the retained lacrimal sac. The unhealthy lid skin also had to be sacrificed. The challenges in repeat exenteration of an 8 month old, and the utility of autologous dermis fat graft as a reconstructive option are discussed.

Keywords: Exenteration socket reconstruction, Pediatric socket, Dermis fat graft, Biological dressing

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Introduction

Orbital exenteration involves removal of the entire orbital contents, soft tissue and often lids as well. Common indications include, orbital fungal infection, advanced ocular surface squamous neoplasia, sebaceous gland carcinoma of eyelid with orbital involvement, orbital extension of intraocular malignancies such as retinoblastoma, melanoma. Exenteration may be done in combination with sinus surgeries for tumor resection in case of sino-orbital masses.

The defect after resection can either be left to granulate or covered with soft tissue and skin. The choice of flap or graft depends on tissue availability and case based requirement. Common techniques include using available split thickness eyelid skin, split thickness thigh skin, anterolateral thigh flap, temporalis muscle flap, and glabellar flap.

Post exenteration complications which warrant revision surgery could be disease-related to residual or recurrence of disease, or defect-related like infection, fistula, failure to heal.

Case report

We report a case of an eight month old female infant, who was diagnosed to have a right sided orbital teratoma .She underwent orbital exenteration with temporalis muscle flap and split eyelid skin graft . Three month post surgery she developed socket infection and pus discharging from wound. Imaging confirmed residual disease. The anterior and posterior ethmoids, superiorly skull base and dura and inferiorly maxilla were involved. Posteriorly, the disease was abutting the lateral wall of the cavernous sinus (Fig. 1).

A decision was made to repeat exenteration after medical control of the infection. Intra operatively infected lacrimal sac

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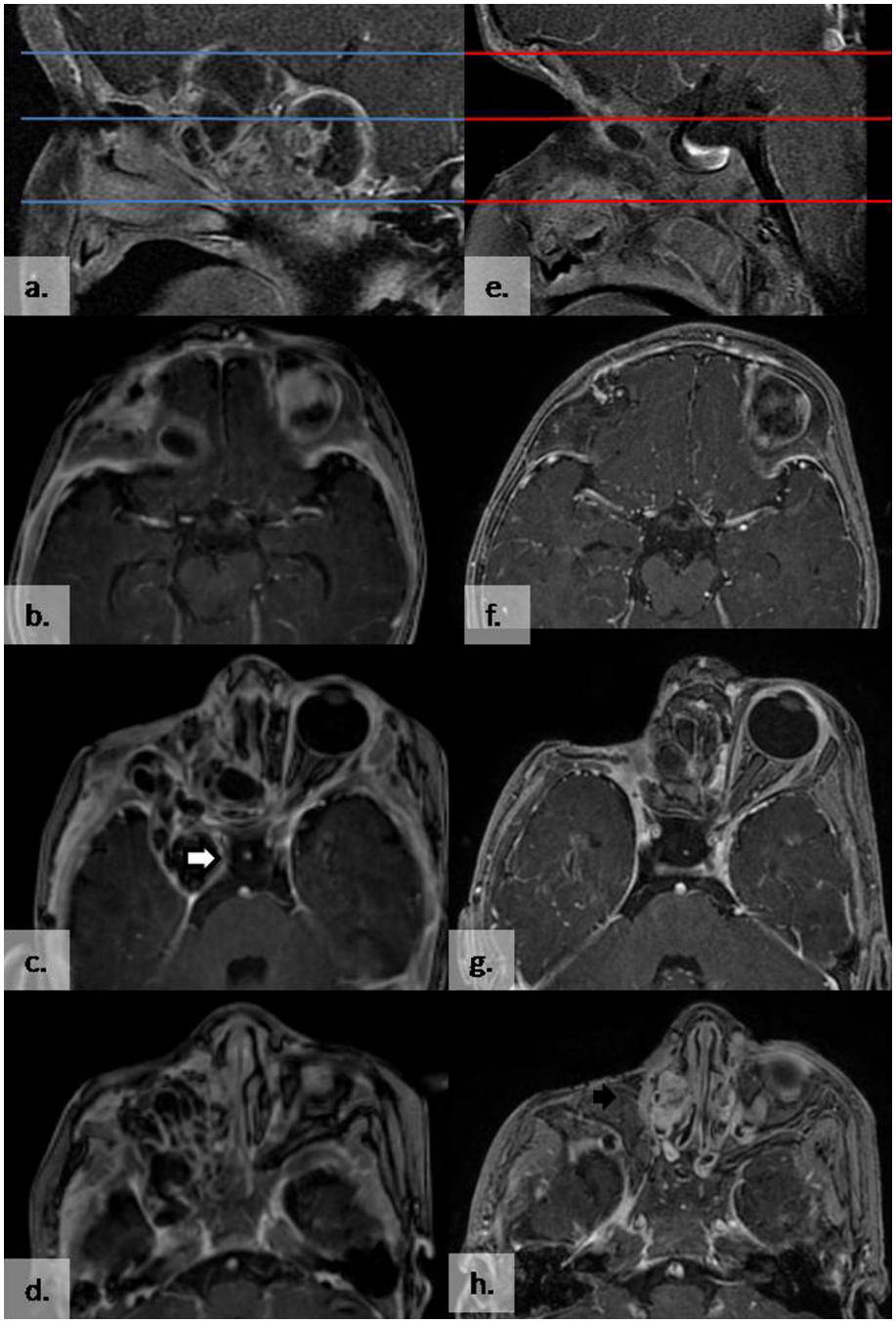

Fig. 1. Magnetic Resonance Imaging Sagittal and axial cuts depicting extent of disease at presentation (a–d) and after resection (e-h) at orbital roof, mid orbital and orbital floor level (a and e). White arrow: Disease involving cavernous sinus. Black arrow: Fat graft filling the orbital defect.

was identified and resected. The lid skin was infected and unhealthy and had to be resected (Fig. 2a). No remnants of temporalis muscle were identified. The tumor was completely removed after careful microdissection at the orbital apex and roof. There was minimal cerebrospinal fluid leak at apex. Unhealthy eyelid skin was excised. The defect after excision comprised of bone laterally, dura and cavernous sinus structures posteromedially and cavity of the ethmoids medially.

This defect could not be left to granulate since the cavernous sinus was in close proximity and there was minimal CSF leak. The need was a vascular soft tissue cover with skin lining. Temporalis muscle had been previously used. An anterolateral thigh flap would have been the next option. However the permissible blood loss rendered this option unsuitable. Considering the cavernous sinus proximity and CSF leak, fat graft was an ideal option to plug the leak and offer cushioning.

A decision to do gluteal harvested dermis fat graft was made. A 25 mm by 25 mm site was marked on the gluteal region in upper outer quadrant. The marked area was infiltrated intra dermally with saline to create a plane between dermis and epidermis. The epidermis was de-epithelized using 15 number blade. Epidermis and underlying fat was harvested. Some fat was harvested and cryopreserved for

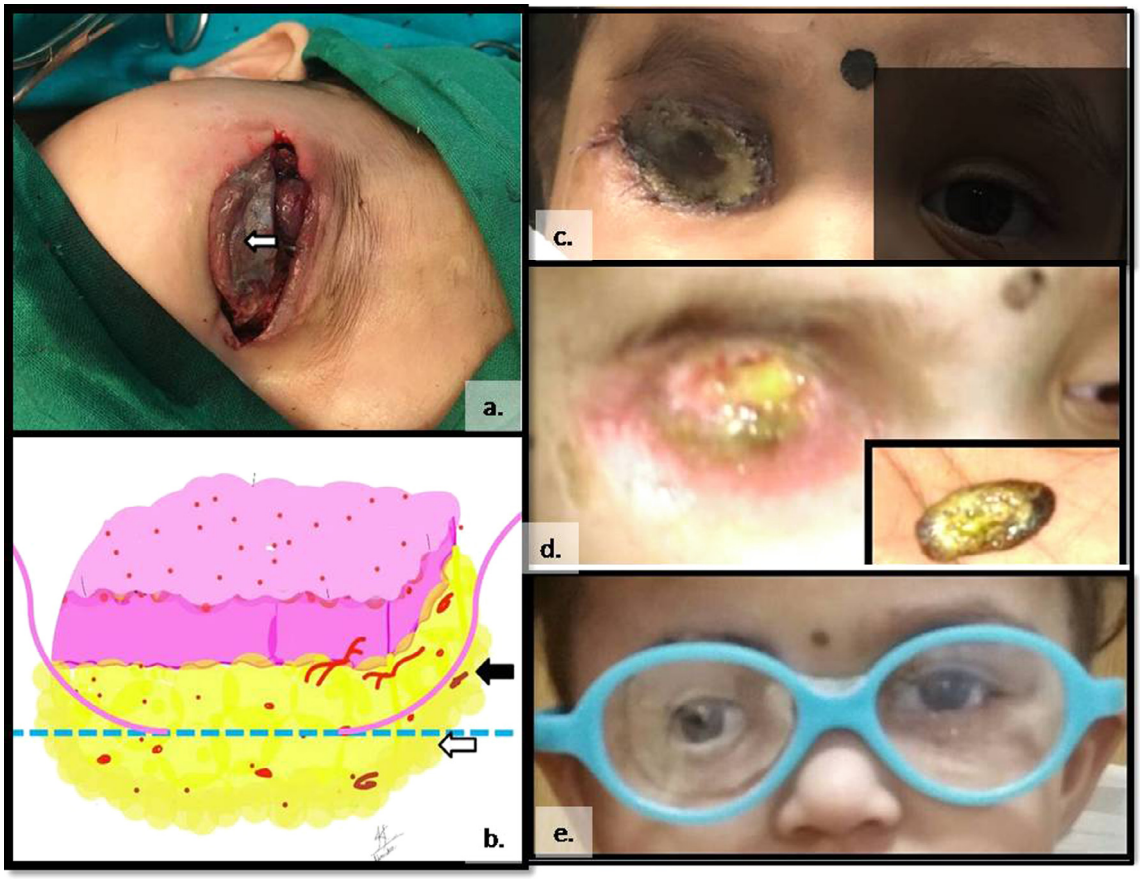

Fig. 2. a. Intra operative-Unhealthy lid skin excised with the tumor. b. Dual mechanism of dermis fat graft. Black arrow- Superficial layer as temporary biological dressing .White arrow- Fat graft incorporated to fill defect. c. One month post reconstruction, no evidence of graft infection or uptake. d. Two months post surgery-autodebridement of the superficial devitalized graft component (Inset). e. Socket rehabilitated with spectacle mounted exenteration prosthesis.

subsequent use. The harvested graft was placed on to the socket defect and the dermis was sutured to the surrounding skin with 6–0 vicryl interrupted sutures.

One month post surgery, the graft remained in place, with no signs of infection or necrosis (Fig. 2c). The patient was followed up regularly. Two months post surgery, the child pulled off the graft remnants from the socket, leaving a 5 mm by 10 mm central oval wound gape (Fig. 2d). Part of the dermis fat graft (deeper fat layer) had incorporated into the recipient defect, while the superficial dead dermis had been auto debrided by the child. The socket defect was managed by placental extract dressing along with collagen dressing. Patient was maintained on close follow-up and 3 weeks post dressing, the wound was completely healed. The patient was successfully fitted with a spectacle mounted silicone orbital prosthesis (Fig. 2e) eight months after the surgery.

Post-operative imaging revealed no residual disease (Fig. 1).

Discussion

The extent of exenteration determines the reconstruction requirement. Hence a customized stepwise approach is recommended for reconstruction (Table 1). Meyer and Zaoli classified exenteration defects into four categories where Type I involved sparing of conjunctiva and eyelid skin and Type IV involved removal of skin, complete ocular structures as well as bone.[1] Post exenteration socket poses multiple challenges. The socket cavity can be lined by skin or can be obliterated by skin with soft tissue graft. In Type 1 and 2 defect, lid skin can be utilized to close the defect. Depending on the extent of the disease, periocular lid skin may be utilized or a full thickness or split thickness graft harvested from thigh. When the exenteration extends up to bone or intracranial contents, then a simple skin lining may not suffice and may cause necrosis or infection. Such a socket can also be left bare to granulate. This would involve regular dressings and prolongs the post-operative healing time. Anterolateral thigh flaps ensure obliteration of socket with less chances of avascular necrosis or infection.[2]

There are multiple approaches recommended to avoid post exenteration complications.[3] The soft tissue flaps have their own vascular supply and generally include the skin as well.

This case the disease recurrence mandated bony orbit resection which extended up to the cavernous sinus. Hence a simple skin lining was inadequate.

Most of the conventional reconstruction techniques could not be employed in the current case. A microvascular flap, would involve bleeding and prolonged surgical time would cross the safety limit of permissible blood loss for his infant. The first exenteration was a Type II defect, wherein temporalis muscle covered by lid skin was utilized. In the current

Table 1. Customized reconstruction plan as per extension defect.

Sr No	Defect grading[1]	Extent of defect	Soft tissue graft options	Skin lining options
1	Type I	Eyelid skin and conjunctiva spared.	None needed Orbital apex soft tissue/muscle stump (if spared) Temporalis muscle flap	Eyelid skin Conjunctiva Median forehead flap Split thickness skin graft (Thigh)
2	Type II	Eyelid skin spared. Rest ocular structures including conjunctiva removed	None needed Temporalis muscle flap Anterolateral thigh flap	Eyelid skin Median forehead flap Split thickness skin graft (Thigh)
3	Type III	Eyelid skin and all orbital structures removed	Anterolateral thigh flap Temporalis muscle flap	None needed (Left to granulate) Split thickness skin graft (Thigh)
4	Type IV	All orbital structures including involved bone removed	Anterolateral thigh flap Temporalis muscle flap Latissimus dorsi flap Pectoralis muscle flap	None needed Split thickness skin graft (Thigh) Full thickness skin graft Dermis fat graft

scenario lid skin was excised. The defect could not be left to granulate since the infant had tendency to rub the wound and repeated dressings would be difficult.

Dermis fat grafts are considered to be one of the best options for post enucleation contracted sockets.[4] This comprises of an autologous harvested dermis with subcutaneous fat from gluteal, or periumblical region. The fat provides soft tissue whereas the dermis provides the surface lining for the defect. This is a 'live graft'. It is a free graft and vascularizes with the help of recipient soft tissue and can grow as the patient grows. Hence, it is a preferred modality in pediatric socket reconstruction. In the current case dermis fat graft was chosen due to the ease and speed of harvesting which would reduce the anesthesia time and blood loss. The graft would fulfill the need for a soft tissue lining with superficial skin protection. Dermis fat grafts with vascular flaps have been employed for exenteration socket reconstruction in the past.[5] There were concerns about adequacy of vascularity since most of the fat was directly on bone and intracranial structures rather than a vascularized pedicle. Post-operative on day 70, the superficial nonvascularized component of the graft auto debrided. The dermis fat graft in this served a dual purpose (Fig. 2b). The superficial half, though did not vascularize, provided a temporary biological dressing giving tectonic support to the fat and underlying neurological structures. It protected the defect from infections and any further trauma or insult. The deeper component comprising of fat vascularized and provided the soft tissue cushioning. Epithelium from the recipient skin edges grew centripetally to re-epithelize the defect and achieve a healed socket. Effectively the deeper manually harvested free fat was incorporated in the defect and the superficial epithelium with fat underwent necrosis. Debatably, this could have been achieved by simply plugging the defect with autologous fat and doing a superficial dressing. However, this would be cumbersome in an infant and the risk of infection would not be completely eliminated. Biological dressings are generally used for temporary wound closure and provide excellent protection from infection and fluid loss.[6] Amniotic membrane, allogenic skin, collagen are some examples. Biological dressings are often used to close skin wounds in burns and diabetic ulcers and pave the way for a more definitive reconstruction or skin closure.

This case is unique since it highlights the challenges faced in reconstructing an infantile exenterated socket, where conventional options were unavailable. Also, the versatility of the dermis fat graft not only as a soft tissue and surface lining graft, but also as a temporary biological dressing is highlighted. Being autologous it is safe, inexpensive, and easily available.

In oncology and traumatology, often the surgeon is faced with bizarre defects. The use of dermis fat graft as a dual entity, that is temporary biological dressing and soft tissue supporter can be considered in such unique scenarios.

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