CASE REPORT

Orbital exenteration: surgery, treatment outcome and rehabilitation

Tiffany L.M. Yeung, MBChB, MRCSEd (Ophth); S.T. Mak, FRCSEd (Ophth); Kenneth K.W. Li, FRCSEd, FRCOphth
Department of Ophthalmology, United Christian Hospital, Hong Kong SAR, China.

Correspondence and reprint requests:
Dr. S.T. Mak, Department of Ophthalmology, United Christian Hospital, 130 Hip Woo Street, Kwun Tong, Kowloon, Hong Kong SAR, China.
Email: dr.makst@gmail.com

Abstract

We report on three patients who underwent orbital exenteration from June 2011 to June 2016 at United Christian Hospital, Hong Kong. We aimed to illustrate the surgical techniques of orbital exenteration, the treatment and the rehabilitation. Healing by primary granulation and epithelialization has the advantage of avoiding tumor or disease recurrence being masked. Ocular prosthesis was provided to achieve good cosmetic outcome. In conclusion, orbital exenteration is a major surgery indicated in non-salvagable ocular disease. In good hands, surgery can provide good anatomic and cosmetic outcome.

Key words: Orbit evisceration; Reconstructive surgical procedures; Treatment outcome; Wound healing/physiology

Introduction

Orbital exenteration, first described by George Bartisch in 1583,[1] is defined as surgical removal of the globe and the affected orbital contents, including orbital fat, conjunctival sac, with or without the eyelids.[2] It is the most radical type of eye amputation, reserved as a curative treatment for potentially life-threatening locally invasive malignancies, or to aid in palliation of blind painful eye or severe deformity, or less often as a treatment for non-malignant disease.[3] We present a case series of 3 patients who underwent orbital exenteration at United Christian Hospital, Hong Kong from June 2011 to June 2016. Surgical techniques, the treatment outcome and the rehabilitation are illustrated.

Case reports

Case 1 (sebaceous cell carcinoma, illustrating surgical techniques)

An 84-year-old female with a history of severe tricuspid regurgitation and bilateral total knee replacement presented with recurrent left upper lid chalazion in April 2010 (**Figure 1a**). Multiple incision and curettage was performed but the lesion recurred. Excisional biopsy was performed in April 2013 and the pathologic diagnosis was poorly differentiated carcinoma. Computed tomography (CT) imaging of the orbit showed a contrast enhanced lesion at the left upper outer eyelid, compatible with the biopsy-proven carcinoma. The patient refused any further surgical intervention in view of her advanced age and comorbidities. Radiotherapy was therefore arranged in July and August 2013 but the lesion did not regress. Another excisional biopsy in December 2014 confirmed a pathologic diagnosis of sebaceous cell carcinoma. The patient was informed of the aggressive nature of the disease but still refused surgical treatment. She consented to undergo only left upper lid mass debulking and cryotherapy under local anesthesia that was performed in September 2015. After a long course of counseling and regular follow-up at the oculoplastic outpatient clinic, she finally agreed to undergo orbital exenteration. Contrast CT of the brain, orbit, thorax, abdomen and pelvis confirmed no distant metastasis. Orbital exenteration was performed in June 2016 (**Figure 1b**).

Surgery was performed under general anesthesia and the surgical steps of exenteration are detailed in **Figure 2**.

Case 2 (apocrine carcinoma, illustrating healing process by granulation)

A 67-year-old man with a history of hypertension presented in August 2012 with right lower lid induration for 1 year

Figure 1. Case 1: (a) left upper eyelid cancer with invasion into surrounding periocular tissue; and (b) an orbital socket with granulation 2 months after the operation.

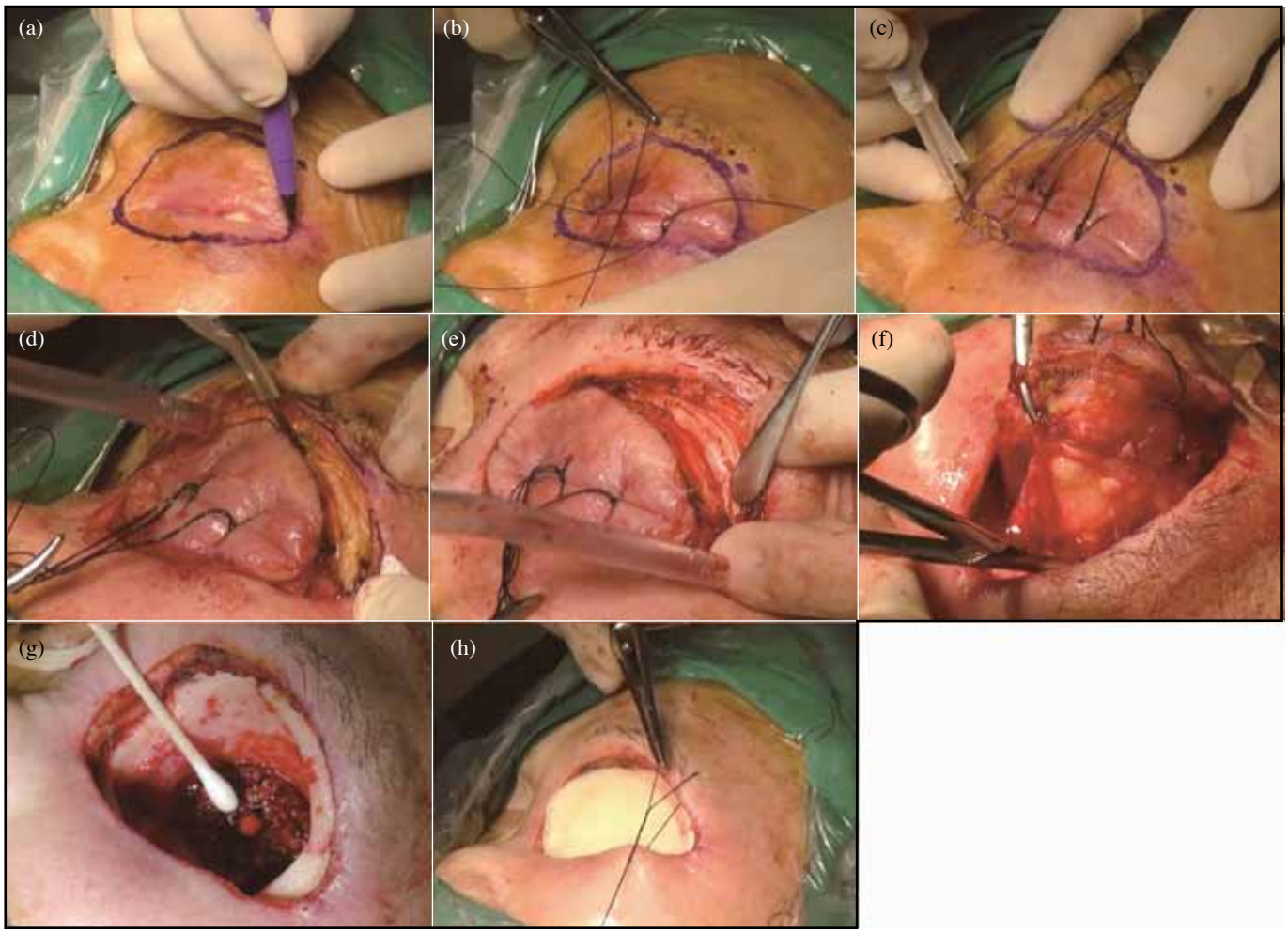

Figure 2. Case 1: the surgical steps of exenteration. (a) The orbital rim is marked by skin marker. (b) Eyelids are closed with traction sutures inserted. (c) Skin incision is made along the marked area using cutting diathermy. (d) Dissection is made through the periorbital to expose the orbital rim. (e) The periosteum is incised for 360 degrees and the reflected periosterum is elevated from orbital wall. (f) Orbital tissues are divided at the apex. (g) Completion of exenteration with hemostasis achieved. (h) The socket is dressed with paraffin gauze and skin aperture closed with suture.

(**Figure 3a**). CT revealed a lobulated mass at the medial and inferior parts of the right orbit, abutting on the globe and infiltrating the right lower lid and lacrimal sac. Incisional biopsy of the mass in October 2012 yielded a pathologic diagnosis of adenocarcinoma with lymphatic permeation. Positron emission tomography confirmed no distant metastasis. Right orbital exenteration was performed in December 2012. The exenterated tissue was sent for histologic analysis and confirmed the diagnosis of apocrine carcinoma. Adjuvant radiotherapy was completed in March 2013. In April 2014, upon routine regular monitoring, a submandibular lymph node was noted. Ultrasound-guided fine-needle aspiration confirmed metastatic adenocarcinoma. Right modified radical neck dissection with superficial parotidectomy was performed in May 2014 and adjuvant radiotherapy was completed in September 2014.

A series of clinical pictures after orbital exenteration is shown (**Figures 3b** to **3f**). The granulation process required approximately 4 months to complete and is compatible with data from the literature.[3]

Case 3 (nasopharyngeal carcinoma, illustrating rehabilitation possibilities)

A 49-year-old man with a history of endoscopic dacryocystorhinostomy (EDCR) performed for nasolacrimal duct obstruction in 2005, presented with vertical diplopia in 2010. He was found to have right hypertropia on examination, initially suspicious of right fourth cranial nerve palsy. CT orbit found a right inner canthus mass with bone erosion. The nasal mucosa and previous EDCR site was biopsied and pathology was undifferentiated carcinoma at nasolacrimal sac. Orbital exenteration with open

Figure 3. Case 2: (a) A right lower lid mass near the medial canthus before operation. Postoperative clinical photographs showing (b) mild oozing on day 3, (c) necrotic slough at the base of socket at 2 weeks, (d) thick yellowish slough at base of wound at 2.5 months, (e) dried slough with granulation tissue at the base of the wound at 4 months and (f) scarring and completion of the granulation process at 15 months.

maxillectomy was carried out in July 2011. The anterior and posterior margins were involved and adjuvant radiotherapy was completed in November 2011.

He was referred to a maxillofacial prosthodontist for rehabilitation with artificial prosthesis, and he started using the orbital prosthesis 1 year after exenteration. He was first given a silicone intrinsic pack, which is a type of adhesive retained prosthesis (**Figure 4a**). With time, wear and tear of the prosthesis caused frequent dislodgment. Hence the prosthodontist created a self-retaining implant based on the idea of osseointegrated implants. The external eye piece was secured onto the self-retaining device with magnets (**Figure 4b**).

Discussion

Exenteration can be classified as total, subtotal or extended; subtotal exenteration spares either or both the eyelids and the conjunctiva, and the extended type removes also the diseased bone or soft tissue. Although subtotal exenteration offers a better cosmetic outcome, faster healing and less chance of sino-orbital fistula formation, it should not be chosen at the expense of a complete surgical cure.

The most common indication for orbital exenteration is orbital invasion by periocular cutaneous malignant tumors, of which 90% are basal cell carcinoma.[4-9] Orbital invasion can present with mass effect such as globe displacement or ptosis, or signs of tissue infiltration including restricted ocular motility, immobile eyelids or fixation of the tumor to bone.[8] When these signs are present, orbital exenteration is deemed necessary, be it for curative or palliative intent. The surgical specimen should be sent for checking of margin involvement, although a clear margin does not necessarily indicate a complete cure.[10,11]

Reconstruction methods may be local, regional or locoregional. All our 3 cases healed by secondary intention, in other words spontaneous granulation. The advantage is that local recurrence of malignancy can be picked up early, and patients can commence radiotherapy. The disadvantages include frequent need for wound dressing and socket care, a longer course to complete healing and a potentially higher

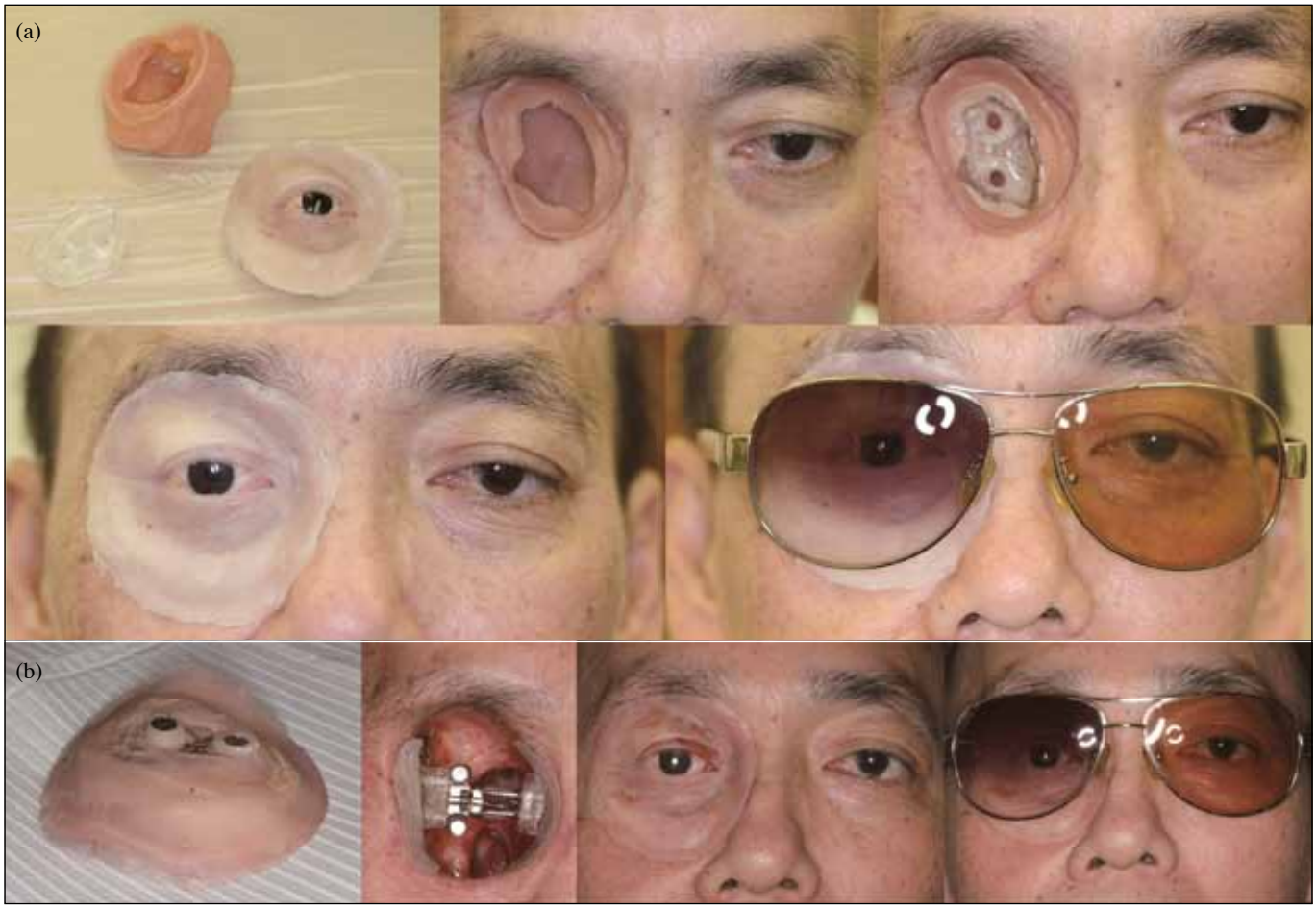

Figure 4. Case 3: Clinical photographs showing (a) the silicone intrinsic pack comprising 3 components: a silicone elastomer as the base, a connector and the external prosthesis. The 3 pieces merge to form the final silicone prosthesis after being inserted into the patient's socket in turn; and (b) the self-retaining device with a magnetic counterpart to secure the external eye piece.

Table. Summary of the 3 cases.

Case No.	Age (years) at operation	Gender	Presenting symptom	Histopathologic diagnosis	Hospital stay (days)	Time of disease till procedure (months)	Other treatment	No. of procedures related to current lesion
1	84	F	Recurrent LUL chalazion	Sebaceous cell carcinoma	17	39	Radiotherapy	7
2	67	M	RLL indurated mass for 1 year	Apocrine carcinoma	6	2	Radiotherapy	2
3	49	M	Vertical diplopia	Nasopharyngeal carcinoma	11	8	Radiotherapy	3

Abbreviations: LUL = left upper eyelid; RLL = right lower eyelid.

risk of developing sino-orbital fistulas.

Patients can choose between a spectacles-retained, adhesive-retained or implant-retained prosthesis. Spectacles-retained prosthesis, as its name suggests, is an oculofacial prosthesis that can be mounted on the spectacles frame. The advantages of using this type of prosthesis are that it is economical, user-friendly, and easily placed or removed by the patient.[12] The prosthesis, however, can be quite heavy and bulky, and patients need to wear glasses if they wish to use the prosthesis; in other words they cannot remove their spectacles in public.[3,12] Patients may then lose confidence with this type of prosthesis and may consider using an eye patch instead.[4]

An adhesive-retained prosthesis is attached to the patient's sockets by adhesives in the form of tapes, creams or sprays.[12] The advantage is that patients do not have to wear glasses while using the prosthesis, but it may not be appropriate for those who are allergic to the adhesives or who have sensitive skin. It is also not desirable for unhealed sockets or wounds that heal with exudates. Misalignment is also another drawback.[13,14] It may not be possible for patients who have bilateral exenteration, as it requires manual dexterity and vision for correct orientation of the prosthesis and daily application and removal of the prosthesis.[12]

An implant-retained prosthesis means the prosthesis is attached by magnets or clips to the titanium osseointegrated implant in the socket.[3] The advantages are that it is economical with a longer shelf life, less affected by sweat or UV light,[15,16] and does not require the use of spectacles or adhesives yet can still provide satisfactory retention.[12] The disadvantages include increased expense and the need for 2-stage surgery; it is also not appropriate for patients who have received postoperative radiotherapy. The risk of soft tissue infection is higher and brings a higher failure rate.[12,17] Patients also need to have a certain degree of manual dexterity to position the prosthesis correctly, although this can be learnt with time.[12] Another drawback is corrosion or loss of magnetism.[18]

Our patient in case 3 started using his implant-retained prosthesis 1 year after orbital exenteration and is enjoying a satisfactory cosmetic outcome.

Conclusion

Orbital exenteration was performed for malignancy in all our 3 cases with their summary shown in the **Table**. As it is both psychologically and anatomically disfiguring, it is considered the last resort when conservative excision is unlikely to achieve complete clearance.[3] Good surgical techniques as well as collaborative treatment with an oncologist are necessary to prevent metastasis. Rehabilitation with an orbital prosthesis provides a superior aesthetic effect.

Declaration

All authors have disclosed no conflicts of interest.

References

1. *Rahman I, Cook AE, Leatherbarrow B. Orbital exenteration: a 13 year Manchester experience. Br J Ophthalmol. 2005;89:1335-40.*
2. *Tyers AG. Orbital exenteration for invasive skin tumours. Eye (Lond). 2006;20:1165-70.*
3. *Sagili S, Malhotra R. Orbital exenteration: indications, techniques and complications. Expert Rev Ophthalmol. 2016;11:201-13.*
4. *Goldberg RA, Kim JW, Shorr N. Orbital exenteration: results of an individualized approach. Ophthal Plast Reconstr Surg. 2003;19:229-36.*
5. *Ben Simon GJ, Schwarcz RM, Douglas R, Fiaschetti D, McCann JD, Goldberg RA. Orbital exenteration: one size does not fit all. Am J Ophthalmol. 2005;139:11-7.*
6. *Kato JM, Fonseca FL, Matayoshi S. Survival following orbital exenteration at a tertiary brazilian hospital [in English, Portuguese]. Rev Col Bras Cir. 2016;43:42-7.*
7. *Howard GR, Nerad JA, Carter KD, Whitaker DC. Clinical characteristics associated with orbital invasion of cutaneous basal cell and squamous cell tumors of the eyelid. Am J Ophthalmol. 1992;113:123-33.*
8. *Madge SN, Khine AA, Thaller VT, et al. Globe-sparing surgery*

for medial canthal Basal cell carcinoma with anterior orbital invasion. Ophthalmology. 2010;117:2222-8.

9. *Donaldson MJ, Sullivan TJ, Whitehead KJ, Williamson RM. Squamous cell carcinoma of the eyelids. Br J Ophthalmol. 2002;86:1161-5.*
10. *Bartley GB, Garrity JA, Waller RR, Henderson JW, Ilstrup DM. Orbital exenteration at the Mayo Clinic. 1967-1986. Ophthalmology. 1989;96:468-73.*
11. *Rahman I, Maino A, Cook AE, Leatherbarrow B. Mortality following exenteration for malignant tumours of the orbit. Br J Ophthalmol. 2005;89:1445-8.*
12. *Pruthi G, Jain V, Rajendiran S, Jha R. Prosthetic rehabilitation after orbital exenteration: a case series. Indian J Ophthalmol. 2014;62:629-32.*
13. *Parel SM. Diminishing dependence on adhesives for retention of facial prosthesis. J Prosthet Dent. 1980;43:552-60.*
14. *Kiat-amnuay S, Gettleman L, Khan Z, Goldsmith LJ. Effect of adhesive retention on maxillofacial prostheses. Part I: skin dressings and solvent removers. J Prosthet Dent. 2000;84:335-40.*
15. *Toljanic JA, Eckert SE, Roumanas E, et al. Osseointegrated craniofacial implants in the rehabilitation of orbital defects: an update of a retrospective experience in the United States. J Prosthet Dent. 2005;94:177-82.*
16. *Roumanas ED, Freymiller EG, Chang TL, Aghaloo T, Beumer J 3rd. Implant-retained prostheses for facial defects: an up to 14-year follow-up report on the survival rates of implants at UCLA. Int J Prosthodont. 2002;15:325-32.*
17. *Arcuri MR, LaVelle WE, Fyler E, Jons R. Prosthetic complications of extraoral implants. J Prosthet Dent. 1993;69:289-92.*
18. *Veerareddy C, Nair KC, Reddy GR. Simplified technique for orbital prosthesis fabrication: a clinical report. J Prosthodont. 2012;21:561-8.*