Considerations in Orbital Exenteration

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Abstract

Orbital exenteration (OE) is a radical operation associated with significant psychosocial disability and functional impairment. Indications for OE include primary tumors of the eye, oral cavity, paranasal sinuses, skin, and brain. Careful consideration regarding the likelihood of local control and cure is needed before proceeding with this operation. Multidisciplinary work-up should be performed before proceeding with surgery. The method of reconstruction after OE should be tailored to the defect and the post-operative needs of the patient. Appropriate follow-up and rehabilitation should be arranged for the patient.

Keywords

- orbital exenteration
- orbital invasion
- globe resection

Orbital exenteration (OE) was first described by Georg Bartsch in 1583.¹ One must distinguish between enucleation, which involves globe resection only, and exenteration, in which the entire orbit including the globe, the eyelids, the retrobulbar soft tissues, and periosteum are potentially removed.¹ Indications for OE include primary or recurrent tumors involving the orbital apex, invasion through periorbital, involvement of retrobulbar fat, extension into the extraocular muscles, and invasion of the conjunctiva or sclera. Additionally, OE can be palliative in situations where there are severe local symptoms or a diminished quality of life.² Others have advocated for OE in cases of orbital invasion of paranasal malignancy, eyelid skin malignancy with conjunctival involvement, recurrent malignancy in close proximity to the orbital contents requiring adequate resection margins, massive involvement of the orbit by malignant disease, and uncontrollable pain resulting from incurable orbital tumors.³

Orbital exenteration is a radical operation associated with significant psychosocial disability and functional impairment. Careful consideration regarding the likelihood of local

control and cure is needed before proceeding with this operation. Therefore, OE is usually reserved for the treatment of locally advanced sinonasal malignancy and aggressive orbital tumors with associated poor prognosis.⁴ Invasive diseases may require extended procedures, including maxillectomy and craniofacial resection. This results in communication of the orbit with the cranial cavity, nasal cavity, and paranasal sinuses which can necessitate reconstruction.^{2,4} It has been shown that a large number of patients undergoing OE have had previous treatments such as local excision, cryosurgery, curettage and electrodesiccation, Mohs' excision, enucleation, and radiotherapy.^{5,6} The combination of inappropriate observation, neglect of the lesion by the patient, and tumor aggressiveness results in orbital tumors presenting at an advanced stage.^{5,6}

The main issues that need to be considered when performing an OE include addressing the dead space; isolating the orbit from the sinonasal space and brain; reconstruction of the orbital rim; the need for cancer surveillance; the impact of radiation therapy; and the possibility of prosthetic implantation.⁷ Extensive management of the orbit requires

multidisciplinary collaboration of head and neck surgeons, neurosurgeons, ophthalmologists, plastic surgeons, radiologists, and medical oncologists.⁸ In one study, indications for OE included primary tumors of the eye (35.71%), tumors of oral cavity or maxillary sinus (35.71%), skin (23.81%), and brain (4.77%).¹ According to another source, the paranasal sinuses and/or nasal cavity are the sites of origin of the majority of tumors requiring exenteration.⁹

Mucormycosis is well known as an opportunistic fungal infection that may require OE. The indication for exenteration rests on the clinical judgment of the multidisciplinary surgical treatment team.^{10,11}

Diagnostic Work-Up

All patients being considered for OE should be examined preoperatively by the head and neck surgeon or an ophthalmologist. A neurosurgical evaluation should be performed in cases of skull-base involvement. All patients for whom reconstruction is planned should be evaluated by a reconstructive plastic surgeon.⁸ Radiologic evaluation includes both a high-resolution contrast-enhanced computed tomographic (CT) scan and magnetic resonance imaging (MRI) enhanced with gadolinium. While the CT scan provides optimal imaging of bony structures, the MRI delineates orbital and intracranial involvement. Patients with malignant tumors are evaluated for metastatic disease with positron emission tomographic CT (PET-CT), which offers accurate staging. This can guide treatment and prevent unnecessary procedures in patients with distant metastases.^{8,12} In patients with known metastatic disease, the survival benefit should be heavily weighed against the morbidity of OE.¹³

Operative Techniques

The procedure typically begins by applying either skin sutures or a large Allis clamp to the lid margins for traction of the orbital contents. A circumferential skin incision overlying the bony rim of the orbit is outlined. Cold knife incision is first carried through the skin followed by monopolar cautery down to the periosteum. Careful attention is made to preserve the supraorbital nerve to preserve sensation to the forehead. The periorbita separates easily temporally,

above, and medially except for the firm attachment of the medial and lateral canthal ligaments and the trochlea, which is best severed with a No. 15 blade scalpel. The thinness of the orbital roof should be realized so that one does not inadvertently penetrate the anterior cranial cavity. Great care must be taken in elevating the periorbita to prevent opening into the nasal cavity due to the thinness of the nasal orbital wall over the ethmoid air cells. The lacrimal sac is then removed and the anterior and posterior ethmoidal arteries are ligated and transected. In separating the periorbita along the rim or the orbital wall, the neoplasm may be encountered. The periorbita can be freed as far back as the apical stump and along the superior and inferior fissures. These can be clamped and cauterized with monopolar cautery. The apical stump can be cut with curved neurectomy scissors applied from the nasal side. The stump invariably needs additional clamping and cauterization to avoid bleeding. The ocular muscles, optic nerve, and ophthalmic vessels at the orbital apex are then transected. Involved bone is removed with a rongeur and bone wax can be used to control bleeding. At this point, the orbit is packed and one can proceed with their reconstructive technique of choice.^{14,15}

Orbital exenteration may be subtotal, total, or extended. The traditional OE procedure includes the removal of the globe, eyelids, conjunctiva, and entire orbital contents including the periorbita. "Superexenteration" or "extended exenteration" may include the bony orbital walls, adjacent paranasal sinus tissues, and/or intracranial tissue. Subtotal exenteration involves removal of the globe, conjunctiva, and extraocular muscles, without a subperiosteal dissection.¹⁶ Subtotal exenteration with preservation of orbital tissue volume, eyelids, or conjunctiva may facilitate the use of orbital and ocular prosthesis, resulting in faster healing, fewer complications, less dressing changes as well as improve esthetic and functional results. There is no conclusive evidence that the rate of local tumor recurrence or the risk of systemic metastasis is higher with subtotal exenteration procedures. However, the ability to detect local orbital recurrence by physical examination may be compromised by either the preservation of orbital tissues or by performing reconstruction.¹⁷ An eyelid-sparing exenteration technique has also been described, with a reduction in healing time and improved cosmetic results.¹⁸ If approximately 50% of the patient's conjunctival surface can be saved, a mucous

Table 1 Orbital exenteration classification by stage and type

Stage	Type	Surgical technique
Subtotal exenteration	I	Eyelids and palpebral and bulbar conjunctiva sparing
	II	Eyelids and palpebral conjunctiva sparing
	III	Eyelid skin and deeper muscle layer sparing
Total exenteration	IV	Eyelid resection
Radical exenteration	V	Resection of orbital cavity bones
	VI	Extension of adjacent structures

Source: Adapted from Frezzotti et al.¹⁹

Note: Categorization of orbital exenteration based upon surgical technique.

membrane-free graft, either buccal mucosa, hard palate mucosa, or nasal turbinate mucosa, can be used to reconstruct the fornix.¹⁷

Orbital exenteration is primarily performed under general anesthesia; however, the use of intravenous sedation with local anesthetic has been reported for older patients with comorbidities. These patients were primarily reconstructed with split-thickness skin grafts.^{5,6}

Frezzotti et al categorized exenteration into six different types. Subtotal exenteration includes three different types: type I—eyelids and palpebral and bulbar conjunctiva sparing; type II—eyelids and palpebral conjunctiva sparing; and type III—eyelid skin and deeper muscle layer sparing. Total exenteration is classified as type IV involving eyelid resection. Radical exenteration includes two different types: type V involves resection of orbit cavity bones and type VI involves extension to adjacent structures (►Table 1).¹⁹

Conclusion

Orbital exenteration is a radical operation associated with significant psychosocial disability and functional impairment. The method of reconstruction after OE should be tailored to the defect and the postoperative needs of the patient. Appropriate postoperative follow-up and rehabilitation should be arranged for the patient.

Financial Disclosure

None.

Conflicts of Interest

The authors have no conflicts of interest to disclose.

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