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Management of the Blind Eye and Options for Cosmesis

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Introduction

As ophthalmologists, our ultimate goal in the treatment of patients with eye conditions is the preservation of vision and the eye. However, there are conditions necessitating the removal of an eye for pain control; control of infection source; treatment of malignancy; severe trauma; perforated corneal ulcer; or cosmesis.[1] Over the years, there has been a shift in both surgical techniques and choice of implants, all with the goal to improve cosmesis outcome and decrease implant exposure and extrusion. However, there remains a wide range of approaches due to the variety of patient and disease factors. We present here an overview for how to think through the different aspects of eye removal and the subsequent cosmetic rehabilitation.

Enucleation vs Evisceration

The use of enucleation, removal of the entire eye including the scleral shell, or evisceration, removal of the ocular content and cornea, continues to be a topic of significant debate. A survey in North America and Asia found that fellowship-trained oculoplastic surgeons show a higher incidence of performing evisceration than enucleation.[2,3] However, some have advocated against evisceration in any patients with a blind, painful eye with no obvious cause to avoid inadvertent evisceration and seeding of occult malignancy.[4,5] Conversely, this risk can be mitigated with b-scan ultrasound in any patient without a clearly documented underlying cause for blindness to rule out possible malignancies prior to evisceration.

Persistent socket pain after eye removal has also been used as an argument for enucleation over evisceration. Despite earlier arguments for possible preservation of the sensory ciliary nerve although it continued to conduct pain following evisceration, later studies did not find a difference in chronic socket pain in patients undergoing evisceration compared to enucleation.[6,7] In a 2018 meta-analysis, the cause for persistent pain for more than a month following eye removal was attributed to phantom pain in 73% of cases.[8] More importantly, in 20% of cases there is an attributable underlying cause that may be correctable, such as prosthesis fit; dry socket; trochleitis; compression of the infraorbital nerve; implant infection or exposure; or neuromas. It is important for the clinician to explore these possibilities in patients with chronic pain following eye removal.

Sympathetic Ophthalmia

The risk of sympathetic ophthalmia (SO) has been an argument for enucleation rather than evisceration following severe open globe injury, even though the risk of SO is likely similar for any mechanism where there is uveal trauma or incarceration. In the only prospective study to date out of the United Kingdom, the risk of SO from all causes was found to be only 0.03/100,000.[9] Vitreoretinal surgery, especially with repeated surgery, may be as important a risk factor for the development of SO as trauma. The risk of SO was cited to be as high as 1 in 8,000 vitrectomies, where enucleation of the inciting eye did not lead to better visual outcome of the fellow eye.[9,10]

In eyes severely damaged by trauma with no visual potential, historically, early enucleation within 14 days was advocated in order to prevent SO. However, a meta-analysis of SO cases published over a 30-year period found that more of these eyes had enucleation (5.7%) after eye trauma rather than evisceration (3.2%).[11] Moreover, prophylactic removal of an eye to decrease the risk of SO, even in severe trauma, is not warranted.[12] Attempts should be made for primary repair of the globe whenever possible.

Endophthalmitis vs Panophthalmitis

In cases of endophthalmitis or panophthalmitis requiring eye removal, arguments have been made for enucleation rather than evisceration for the prevention of implant exposure or extrusion due to the remaining sclera as a source of residual infection. In cases of endophthalmitis without panophthalmitis, one can also argue that by not opening the globe, there is better containment of the infectious source with enucleation. However, in recent years there has been increased use of evisceration following treatment with broad-spectrum antibiotics, with a comparable implant extrusion rate of approximately 13%.[13] The risk for extrusion was related to the type of infection, specifically pseudomonas, but the pendulum favouring the use of porous vs non-porous implants continues to shift with time without one showing a clear increased risk of exposure or extrusion.[14,15]

Socket Movement

The removal of an eye, even when for chronic pain, can be psychologically overwhelming for patients. One fear for the patient is the potential for disfigurement and the lack of acceptance in society. In addition to prosthesis fit and movement, which are addressed below, socket movement contributes to the overall reality of the prosthesis. Note that the discussion of socket movement and prosthesis movement is separate as they are independent factors. Attempts at using surgical techniques to improve socket movement have included the use of porous implants especially with pegging. However, the long-term issue with foreign body reaction around the peg and subsequent exposure of the implant around the peg has led to pegging falling out of favour with most surgeons.[16,17] The surgical technique and choice of implant can impact the long-term complication rate. The combination of suturing the extraocular muscles to the fornices and use of a porous implant has been shown in a randomized trial to ensure optimal socket movement.[18] Even with the use of a non-porous implant, bringing the extraocular muscle to the fornix confers better movement to the socket than imbrication of the muscle above the implant, which is also believed to contribute to implant migration.

Prosthesis Fit

A well-fitted prosthesis can not only provide wear comfort for the patient; it is also important for cosmesis, an important aspect of overall patient quality of life following the removal of an eye. Without polishing and maintenance, a prosthesis can develop scratches and chips over time that can lead to socket conjunctival inflammation, increase discharge and cause patient discomfort. Aside from the inherent quality of the prosthesis, socket and lid factors also impact the wear of a prosthesis.

A healthy mucosal lining that is not keratinized is required for movement of the prosthesis and comfort

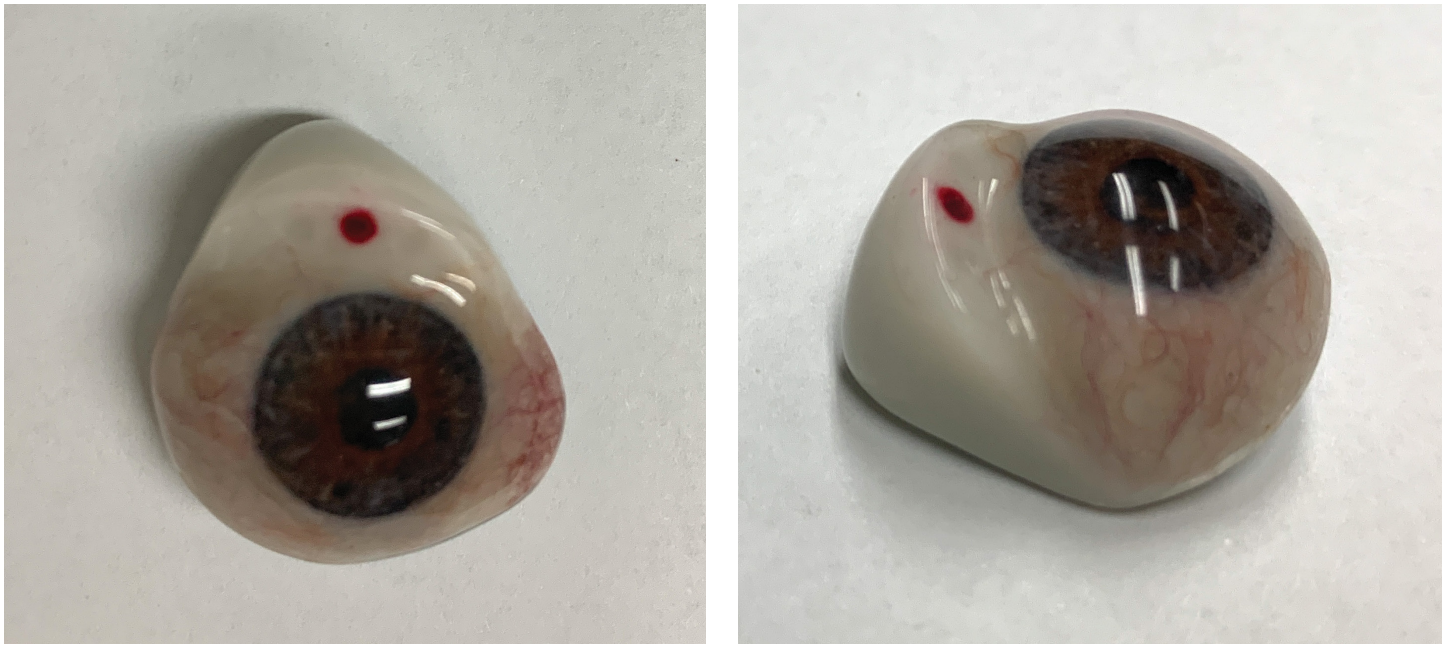

Figure 1. A) Front profile of an ocular prosthesis with an addition superiorly to help correct for ptosis. B) Side profile of prothesis showing thickness attempting to correct for deficiency in superior sulcus; courtesy of Marie Allen, BCO, BADO.

in wear. This may be challenging when the patient has had numerous prior ocular surgeries, prior radiation therapy or chemical injury. Buccal mucosal grafting and/or dermis fat graft may be needed at times to try to reconstruct a mucosalized socket lining. In cases of severe avascular socket where survival of mucosalized tissue is challenging, there may be a temptation to resort to skin graft for closure. Although this provides a lining for the socket, patients invariably complain of discomfort during prosthesis wear and complete lack of movement of the prosthesis. Anecdotal evidence has shown utility in pre- and/or post-operative hyperbaric oxygen therapy to facilitate retention of dermis fat graft in these difficult cases.

The socket volume also has an interplay with fornix depth, which is important for prosthesis retention. Socket volume plays a greater role in cases of shortened fornix secondary to insufficient orbital volume and deficiency in the “bulbar” conjunctiva rather than the palpebral conjunctiva. Augmentation of socket volume allows for the fornix to be reformed. True palpebral conjunctival deficiency is less common and is typically seen with chemical injury or trauma. Lid reconstruction with buccal mucosal or hard palate graft may be required in these cases to achieve sufficient fornix depth.

In addition to its role in fornix depth, socket volume plays a critical role in long-term prosthesis wear. When the volume of the socket is insufficient, the prosthesis needed is larger and thicker, making movement of the prosthesis more difficult; it also causes secondary stretch on the lids over time due to weight. Patients should be counselled that even in a well-sized prosthesis, increased stretch of the lids can occur over time, necessitating lid adjustment with ectropion repair or lid shortening of, most commonly, the lower lids and possibly even the upper lids.

Ptosis post-eye removal can be as high as 40% and may also be impacted by insufficient socket volume.[19] To correct mild ptosis, i.e., ≤ 1 mm, an addition can be made to the superior portion of the prosthesis (**Figure 1**). However, for larger ptosis, the use of this method will only aggravate the condition over time as the result of mechanical stress on the levator muscle. Some patients also find these additions to be painful to wear; additionally, they may decrease movement of the prosthesis. Ptosis repair with levator advancement with removal of these additions prior to surgery is advisable.

Lastly, prosthesis movement does require some additional room within the socket, especially with horizontal movement where closer distance already exists between the edge of the prosthesis and the orbital rim. An overzealous fill of the socket space when molding a prosthesis may result in a prosthesis that’s too large to allow for full movement. Simply decreasing the size of the prosthesis alone can improvement movement in these cases.

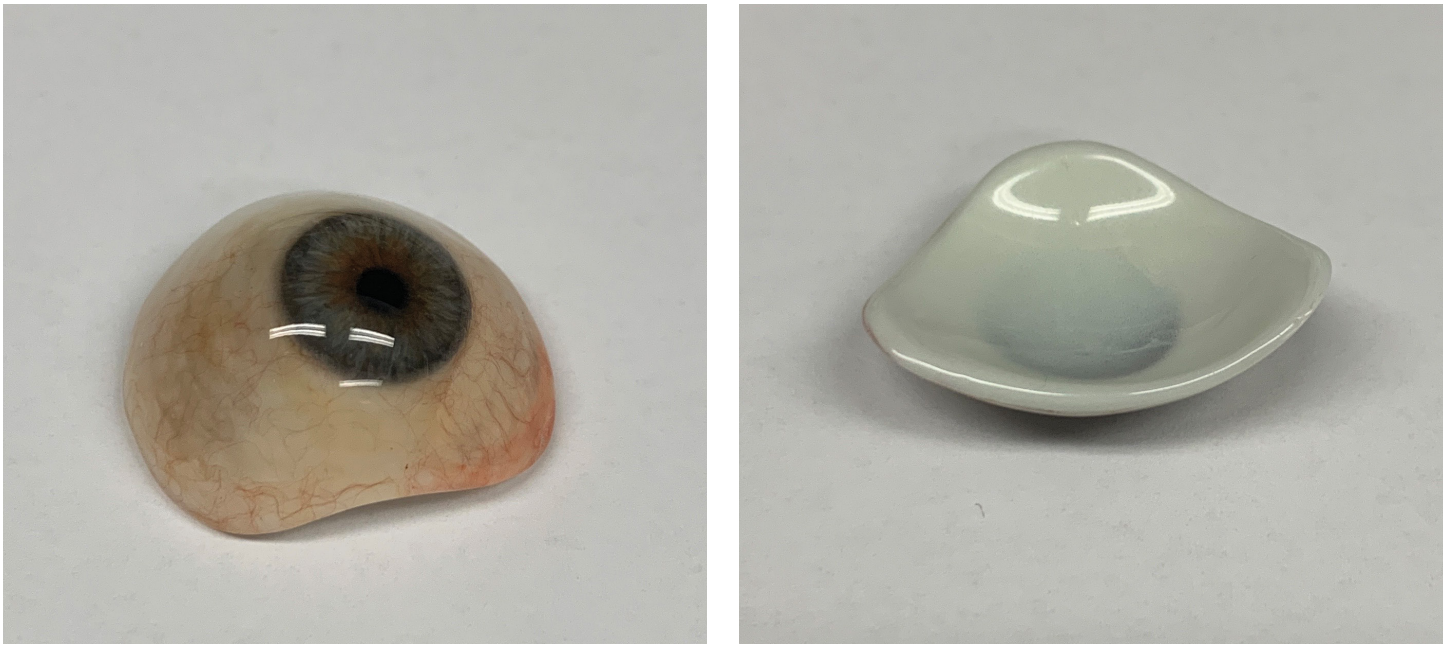

Figure 2. A) Front profile of a scleral shell showing the increased curvature vs a prosthesis. B) Under-surface of a scleral shell showing the thinner profile vs that of an ocular prosthesis; courtesy of Heather Meszaros, BCO, BADO.

Scleral Shell

In patients with a blind phthisical eye without pain, an alternative to eye removal can be the use of a scleral shell for cosmesis (**Figure 2**). A scleral shell is designed to be worn directly over a phthisical globe with an increased curvature over the cornea. However, for many patients the additional curvature makes the wear difficult. Some ophthalmic surgeons have suggested the use of lamellar keratectomy with a conjunctival flap to cover the ocular surface in order to help with the wear of a scleral shell.[20] The one significant downside to this approach is the subsequent difficulty of having sufficient conjunctiva for enucleation or evisceration should the eye start to become painful. In view of this, a scleral shell should only be considered when patients can tolerate it; otherwise, enucleation or evisceration should be considered instead.

Conclusion

The loss of an eye can be a difficult psychological journey for the patient even in the face of chronic pain. The choice of surgical technique needs to be individualized based on the underlying pathology and health of the remaining socket. A cosmetically ideal outcome for the patient depends on the interplay between socket, prosthesis and lids. Each of these components needs to be considered to achieve the optimal patient outcome.

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