Retinal interventional management of blind painful and non-painful eyes at risk for neovascular glaucoma

Abstract

Purpose: To review standard management of blind painful and non-painful eyes at risk for neovascular glaucoma, and report the management strategies of four cases.

Method: Case series and literature review.

Patients: The first two cases described are blind, painful eyes secondary to neovascular glaucoma, treated with intracameral bevacizumab injections. The third case, a blind, painful eye with uncontrolled glaucoma in a patient unsatisfied with her eye appearance due to white retained lens material at pupillary margin and a large prominent bleb, was treated with a combination of bleb revision, vitrectomy, lensectomy and endocyclophotocoagulation. The fourth case, a blind, non-painful eye with secondary radiation retinopathy at risk for neovascular glaucoma was treated with laser photocoagulation to prevent neovascular glaucoma and pain.

Results: The first two cases of blind, painful eyes with neovascular glaucoma had reduction in neovascularization and pain after intracameral bevacizumab injections and/or laser therapy. The third case had resolution of pain and transient decrease in intraocular pressure and no progression to neovascular glaucoma or pain. None of the four cases progressed to enucleation or evisceration.

Discussion: Retinal interventional management should be considered in blind painful and non-painful eyes to help control symptoms, treat or prevent progression to neovascular glaucoma and prevention of enucleation or evisceration.

Key words: Blind painful eye, neovascular glaucoma, intracameral bevacizumab (ICB), endocyclophotocoagulation, panretinal photocoagulation, retrobulbar alcohol injections, enucleation, evisceration.

Introduction

Blind, painful eye (BPE) has numerous causes with various forms of glaucoma being among the most common.1 Typical management begins with steroids and cycloplegics.2 When those treatments are not enough to control pain, retrobulbar injections with alcohol1 or chlorpromazine3 can be used. These injections produce temporary relief and can have complications ranging from eyelid edema and cellulitis to ophthalmoplegia and brainstem anesthesia.4 In refractory cases with severe pain despite retrobulbar injections, enucleation and evisceration have been shown to effectively resolve ocular pain.2 Enucleation and evisceration may also be used for cosmetic reasons;2 however, both...
procedures have risks, and complete pain resolution is not always guaranteed.5 Before a BPE undergoes enucleation or evisceration, the question asked here is: what alternatives exist to manage these eyes? Additionally, in blind non-painful eyes at high risk for NVG, what preventative treatments exist?

It is critical to target the pathology behind the blind eye. In a case series reported by Kotecha et al. (2011), pain reduction was observed in 13 blind painful eyes with NVG being treated with intravitreal bevacizumab injections.6 Similarly, Raghuram et al. (2007) reported a case in which BPE was treated with ICB injections resulting in good control of inflammation and neovascularization regression.7 This case series demonstrates alternative interventional options (injections, lasers, and combined surgery) for treatment of various blind eye conditions, which improved symptoms and prevented the need for enucleation or evisceration.

Case series report

**Case 1:** A 61-year-old female with a 4-year history of chronic retinal detachment in her right eye (RE) following trauma, secondary NVG and a BPE was referred to retina clinic. She used Combigan, atropine and artificial tears. On initial examination the RE was found to have no light perception (NLP) with an IOP of 27 mmHg. The conjunctiva was injected, the cornea was edematous, the anterior chamber revealed a few cells and there was severe neovascularization of the iris and angle. (Figure 1.) There was a hypermature cataract (thus, no fundus view was available). A total retinal detachment was seen on ultrasound. Left eye (LE) exam was unremarkable.

The patient was treated with an ICB injection (1.25mg/0.05mL). In addition she was started on dexamethasone (0.1%) eye drops QID and atropine drops BID. Four weeks later, there was a significant decrease in conjunctival injection and iris neovascularization. (Figure 2) A second ICB injection was performed at that time.

Eight weeks later, the patient reported improvement of pain. On examination, there was near complete resolution of iris neovascularization with reduced conjunctival injection. The rest of her eye exam remained unchanged. A third injection of ICB was performed without complications. Two and a half years later the patient stated that she is still pain free, with a well-controlled IOP of 20 mmHg.

**Case 2:** A 16-year-old girl with a history of congenital glaucoma in her RE status post trabeculectomy at the age of 5 was referred to retina clinic for management of her right BPE. She had severe eye pain for the past few months and was recently diagnosed with NVG. On examination, her RE was NLP with IOP of 42 mmHg, mild corneal edema, Haab’s striae secondary to her congenital glaucoma, and a neovascularized atrophic iris. Funduscopic exam of the RE showed a pale, cupped optic nerve and diffuse intra-
and pre-retinal hemorrhages with neovascularization noted in the mid-periphery of the retina. The LE was normal with a visual acuity of 20/15.

The patient was previously on latanoprost and dorzolamide drops with no IOP control, thus, they were discontinued. She was then started on atropine drops BID, Pred Forte drops QID, and a combination of timolol and dorzolamide BID which still did not control her symptoms. Thus, a 1.25mg/0.05mL ICB injection was administered without complications. In addition, panretinal photocoagulation (PRP) green laser treatment (size: 200 microns, number of spots: 800 spots, power: 400-500 mW/m) was performed that same day without complication.

At 6-week follow up, her RE pain had resolved and she was kept on atropine, prednisolone acetate 1%, and combination of timolol and dorzolamide. No further lasers or injections were deemed necessary. At 5-month follow up the patient’s eye remained pain free, with an IOP of 39 mmHg. On exam there was no corneal edema or iris neovascularization.  

Case 3: An 11-year-old girl with a history of left congenital cataract surgery, secondary aphakic angle closure glaucoma, status post Baerveldt valve placement at age 6, developed subsequent endophthalmitis requiring vitrectomy and intravitreal antibiotics injections. The infection resolved without further complications. She was seen in retina and glaucoma clinic for her blind, painful LE at age 11. She was unhappy with her LE appearance due to a large inferior temporal bleb and white pupil. She had been using a combination of timolol and dorzolamide BID for IOP control. On examination her LE was NLP and IOP was 45 mmHg. The anterior segment exam showed mild corneal edema, iris atrophy, a white pupillary margin secondary to retained lens material with a fibrotic capsular bag, posterior synechiae and a large infratemporal conjunctival bleb. There was a poor view of the retina due to the opacity of the media. The ultrasound showed an attached retina. Treatment options were discussed with the patient including enucleation, evisceration and surgical management of BPE with preservation of the globe. The patient wanted to keep her eye and ultimately underwent a combined surgery including shunt revision, pars plana vitrectomy, posterior synechiolysis, pars plana lensectomy, and endocyclophotocoagulation (ECPC). The ECPC was applied using a 20 gauge endoscopic camera with laser burns to the ciliary processes between the 3 and 7 o’clock positions. There were no complications.

One week after surgery, the patient had no eye pain and her IOP was 23 mmHg. At two month follow up the patient continued without pain, but the IOP elevated to 46 mmHg and dorzolamide and atropine were initiated. The patient was satisfied with her eye appearance.

Case 4: A 36-year-old female with a history of rhabdomyosarcoma of the sinuses and meningioma of the olfactory groove with secondary bilateral optic neuropathy, status post resection and radiation three years prior, presented to retina clinic with blind, non-painful eyes and radiation retinopathy. Both eyes were NLP. The intraocular pressures were 10 and 8 mmHg in the RE and LE respectively. The anterior exam showed 1+ subcapsular cataracts OU. Fundus exam revealed pale optic nerves without swelling OU. There were macular exudates, retinal flame hemorrhages, neovascularization elsewhere and vitreous hemorrhage OU. In addition, the LE had developed neovascularization of the optic nerve.

PRP laser treatment for prevention of NVG and secondary BPE was discussed with the patient who opted to proceed. PRP was performed on the LE, (size: 200 microns, number of spots 519, power: 180-200 mW) and one month later on the RE (size: 200, number: 462, power: 240-250). At 2, 4, 8 and 12 month follow up both eyes remained pain free with no neovascularization progression, resolving vitreous hemorrhages, and IOPs within a 7-15 mmHg range in both eyes.

Discussion

The management of BPEs presents many challenges for ophthalmologists and is often devastating for patients. First, treat with topical anti-inflammatory, anti-hypertensive and cycloplegic agents. When pain is intractable with conservative therapy, surgical removal by either enucleation or evisceration had been the treatment of choice.
Although surgical removal can resolve pain in most cases, it has significant psychological implications on patients. Enucleation and evisceration rates have decreased because ophthalmologists are favoring other less invasive procedures that control pain. Retrobulbar alcohol injections have been used since the 1900s, however, pain typically recurs 3 to 6 months after injections. Alcohol retrobulbar injection can also spread and affect other nerves that were not targeted. Interestingly, retrobulbar injection of chlorpromazine has been reported to cause pain control for one year or more, but also has complications such as phthisis, restrictive strabismus and orbital cellulitis.

Newer techniques include transscleral cyclophotocoagulation and ECPC, which have been used for the treatment of BPE with elevated IOP. Similarly, intravitreal bevacizumab has been reported to control pain in cases of refractory NVG. In Figure 3, we highlight an algorithm for the management of BPE.

We report four cases of blind eyes that underwent unconventional treatment. Three of those eyes were BPEs and the fourth one was a non-painful blind eye that underwent treatment to prevent the development of neovascularization and pain. More specifically, case 1 demonstrates a decrease in neovascularization and improvement of pain with ICB injections in a patient with BPE due to secondary NVG. Case 2 showed an example of congenital glaucoma and new NVG treated with ICB and PRP laser, resulting in complete resolution of pain. These two cases suggest that ICB injections in BPEs due to NVG can result in pain control and slow the progression of NVG. While the anti-VEGF function of bevacizumab slowing NVG is nothing new, its efficacy in pain control is unknown. Kotecha et al. (2011) propose a reasonable explanation that pain is lowered by ICB injections not only in the long term by decreasing IOP but also within a week by decreasing the concentration of intraocular inflammatory mediators as a result of decreased vascularization. Furthermore, intraocular injections such as ICB are common, safe procedures routinely done in clinic with less severe complications than retrobulbar alcohol injections. No clear guidelines for dosage of ICB in NVG exists. Further study of efficacy, dosage and safety of ICB in BPEs due to NVG is required; however, it appears this may be a reasonable first step before retrobulbar injections in cases with neovascular etiology. In addition to ICB, PRP laser management of BPEs with NVG showed effective pain control in case 2.

Case 3 highlighted a BPE due to uncontrolled glaucoma with a history of congenital cataract surgery and aphakic angle closure glaucoma, status post Baerveldt valve with secondary endophthalmitis treated with a successful vitrectomy and intravitreal antibiotics. A combined surgery of shunt revision, vitrectomy, lensectomy, endolaser and ECPC led to a complete resolution of pain. The immediate pain control seen after surgery was likely due to early lowered IOP. Though pressure re-elevated two months later, the patient reported no pain and was satisfied with the appearance of her eye. Surgical removal of the eye was no longer considered. New procedures such as endoscopic ECP used in this case have been efficacious in refractory glaucoma, which is common in BPEs. However, there is no consensus for ECPC treatment protocol, and it does have potential side effects such as postoperative IOP spike, hypotony, intraocular hemorrhage and phthisis. Nonetheless, this procedure is relatively safe and allows the patient to keep the eye.

Finally, case 4 demonstrated a blind, non-painful eye with early signs of NVG due to radiation retinopathy being treated with PRP to successfully prevent NVG progression and, ultimately, pain. PRP is a relatively minimally invasive procedure with a good safety profile and proven efficacy in common conditions such as diabetic retinopathy. We believe PRP can prevent blind eyes at risk for neovascularization from developing NVG and pain.

This case series highlights the clinical importance of intravitreal injections, PRP laser and other retina surgical options tailored to individual cases, that prevent the need for surgical removal of the eye in BPE and non-painful blind eyes. Using the management options described here does not preclude other treatments for BPE such as retrobulbar injections and enucleation or evisceration. Further comparative studies are required to address the importance of each of these approaches.

REFERENCES