Work-related open globe injury

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CLINICAL NARRATIVE

Traumatic open globe injuries are a leading cause of blindness/visual impairment in the world. A significant number of reported open globe injuries occur at the workplace and have been historically associated with non-compliance with workplace safety guidelines and not wearing eye related personal protective equipment (PPE). In this case report, we describe a 27-year-old man's workplace related open globe injury despite wearing PPE. We explore the prognostic factors in determining final visual acuity and do a literature review of case reports with good outcomes despite poor initial prognostication in severe open globe injuries. The option of enucleation and its common indications are discussed. We also examine the factors determining patient satisfaction with ocular prosthesis along with an assessment of the role of PPEs in workplace related ocular trauma.

INTRODUCTION

Ocular trauma is a leading global cause of visual morbidity.¹ It is estimated that one and a half million people worldwide are blind as a result of ocular trauma.¹ Moreover, it is estimated that an additional 19 million have unilateral blindness or low vision from eye injuries.¹ Twenty four percent of the reported eye injuries involved mechanisms that could lead to open globe injuries.²⁻⁵ According to the Birmingham Eye Trauma Terminology, open globe injuries are defined as full thickness wounds of the eye wall where the cornea and/or the sclera are breached fully breached.⁶

Furthermore, 70% of ocular traumas occur at work. A Scottish study comparing the circumstances of ocular trauma between 1991-1992 and 2008-2009 found the proportion of work-related injuries to be stable at 24% despite introduction of legislation and guidance for employers and employees regarding workplace safety.⁷ Several studies indicate the lack of adherence to workplace safety guidelines as a major factor in open globe injuries.^{2-5,8} This article describes the clinical presentation, management, and outcome of a case of work-related open globe injury despite wearing personal protective equipment (PPE).

CASE REPORT

A 27-year-old man presented to the emergency department with extreme left eye pain following a work place injury. He was cutting quartz with an angle grinder while wearing protective goggles and a mask when some of the teeth from the rotating grinding wheel broke off and struck the left side of his face. His goggles got pushed back due to the momentum of the fragments, leaving him with a left open globe injury, a full thickness left upper eyelid laceration, and a left forehead laceration. On physical exam, he had severe pain upon movement of his left eye. He had a hemorrhage in the anterior chamber obscuring the view of the iris and pupil, although some iris tissue was seen protruding through a corneal wound. He had

questionable intermittent light perception, but formal visual acuity testing was not performed due to patient discomfort and inability to comply with the testing. A CT scan of the head and facial bones showed no foreign body or fractures.

He underwent surgical repair of left globe rupture and skin lacerations on the same day. During the surgery, a conjunctival peritomy performed superiorly showed a zone III injury (defined in the discussion) with the scleral laceration extending significantly posteriorly, possibly beyond the equator of the globe. He was started on prednisolone ophthalmic suspension drops 6 times a day, atropine drops TID, moxifloxacin drops QID, artificial tears, and tobramycin ointment to the eye and the incision lines BID.

During follow-up visits in the subsequent month, he continued having bare light perception in his left eye with no further improvement. An ultrasound of the eye done 1-month post-operation suggested hemorrhagic changes in the vitreous with choroidal detachment and possible retinal detachment. Enucleation (surgical removal of an eye) of the left eye was performed 7 months after the accident for persistent pain and lack of improvement in visual acuity. He had an orbital prosthesis implant following enucleation and was satisfied with the results.

Figure 1: A, Lacerations to upper eyelid and forehead. B, Anterior chamber hyphema with protrusion of iris inferiorly from corneal perforation. C, Eight weeks following operation. D, Post enucleation and ocular prosthesis implant.

DISCUSSION

Open globe injuries are a catastrophic yet often preventable cause of severe vision loss. Open globe injuries can be anatomically classified into zone I (confined to cornea and limbus), II (involved anterior 5 mm of sclera) and III (full thickness scleral defect greater than 5 mm posterior to the limbus).^{6,9} Even with timely

and appropriate medical attention, the patient can be left with significant and permanent visual impairment.^{6,9} Previous studies have identified several prognostic factors for visual outcomes including poor initial visual acuity, presence of afferent pupillary defect, type of injury, eyelid laceration, size and posterior extent of the wound, and intraocular foreign body.^{5,10-12} Specifically for posterior open globe injuries (zone III), Knyazer et al identified visual acuity as the main prognostic indicator.¹³ Most patients presenting with no light perception (NLP) and subsequently having little to no improvement in visual acuity resulted in a final visual acuity of either NLP or hand motion.¹³

Despite prompt medical attention, some people with open globe injuries require either a primary or secondary enucleation. Retrospective observational case studies have shown that primary enucleation is done in only 0-12% of cases and mainly in the setting of lack of adequate tissue to perform the initial repair.^{10,14,15} Secondary enucleation is done weeks to months after the initial trauma, commonly for painful, blind eye, and also as prophylaxis for sympathetic ophthalmia.¹⁰ Sympathetic ophthalmia is a rare bilateral granulomatous inflammation following accidental or surgical insult to the uvea of one eye and can cause vision loss in the unaffected eye. The rates of secondary enucleation in open globe injuries have been estimated at 11-22%.^{10,14,15} In a retrospective analysis by Pieramici et al., up to 34% of patients with presenting visual acuity worse than 6/60 underwent eventual enucleation.¹⁶

Ocular trauma can also leave patients with some facial aesthetic deficits which are often improved with ocular prosthesis post enucleation.¹⁰ Ocular prosthesis development has improved significantly in the last few decades with increases in patient satisfaction. With the addition of realistic ocular prosthetic mobility, 88% patient satisfaction was noted by Song et al during a questionnaire survey of anophthalmic patients.¹⁷ Successful achievement of prosthetic mobility was identified as the main factor contributing to satisfaction whereas having ocular symptoms such as discharge from the prosthesis were found to be noncontributory.¹⁷

In the face of the poor prognosis of open globe injuries, prevention remains the best cure available today. Many studies have shown the importance of wearing PPEs in preventing/reducing the occurrence of eye injuries at the workplace.^{18,19} However, a Canadian retrospective study found that 33% of the workplace eye injuries were sustained by patients wearing eye PPE.²⁰ Although compliance rates for eye PPE are low, a significant proportion of the cohort that suffers from eye injuries were wearing PPE at the time of injury, as was the case for our patient. It is possible that the PPE chosen might have been inappropriate for the work involved, improperly fitted, or may not have performed to expected standards. According to Fong et al, the rate of appropriate use of PPE was highest among welders and metal grinders and lowest in jobs that required hammering, indicating that there is variability between occupations with regard to appropriate PPE use.²¹ As such, there is a need for further action to prevent occupational eye injuries.

CONCLUSION

This report discusses the case of a patient with a workplace related eye injury that occurred despite wearing PPE and resulted in monocular vision loss. The rate of such eye injuries that are

sustained despite the use of PPEs shows the importance of advocating for appropriate selection of PPEs for the workplace alongside increasing awareness. Ensuring quality control of PPEs is also equally important for public health. Further studies on prevention of ocular trauma and eye PPEs are also needed to better inform Canadian public health initiatives.

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