



MANAGEMENT OF OPEN GLOBE INJURIES: CASE SERIES & REVIEW OF LITERATURE

Ophthalmology

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ABSTRACT

Open globe injuries are a significant cause of permanent visual impairment and ocular morbidity worldwide. A full-thickness wound of the eyewall, due to either a laceration or an occult rupture is defined as an Open globe Injury (OGI). Globe rupture is a common sight-threatening ophthalmic emergency. Through a series of 03 cases of open globe injury, we have discussed the classification of ocular trauma, epidemiology, diagnosis and prompt management. Through this case series we have highlighted the importance of prompt assessment and timely management of open globe injuries which can lead to better visual prognosis.

KEYWORDS

Trauma, Globe rupture, Corneo-scleral laceration, Primary repair

INTRODUCTION

According to WHO globally 55 million people experience serious ocular trauma every year.¹ The worldwide incidence of Open globe injuries (OGI) is approximately 3.5 per 100,000 persons.² Around 80% of open globe injuries are seen in men and children between the age group of 10 and 30 years.³ Prompt evaluation and appropriate management of ocular injuries are paramount in the preservation of vision. In this article, we discuss the classification, epidemiology, presentation and diagnosis and management of Open Globe Injuries through a series of three cases. We also highlight the importance of immediate and prompt primary repair of an open globe injury resulting in the restoration of anatomical integrity and preserving visual potential.

METHODOLOGY

Written informed consent was obtained from all the patients. Comprehensive medical and ocular histories was obtained. Thorough and systematic ocular examination was performed. Proper documentation which included patients' details, ocular findings pre-op and post-op (including photographs) findings. Patients were subsequently followed-up on 1 day, 1 week, 6 weeks, 3 months and 6 months postoperatively and the findings including visual acuity were recorded.

CASE 1

13 years child came with history of firecracker injury in his right eye sustained 24 hrs back. On evaluation he was found to have a visual acuity of perception of light (PL), a full thickness corneal laceration, prolapsed uveal tissue. He was taken up for urgent wound exploration and primary repair which involved corneo-scleral laceration suturing and uveal tissue repositioning. He was put on a tapering course of oral steroids and topical steroid-antibiotics eye drops. Post-operative the patient had a good anatomical restoration and a Best corrected visual acuity (BCVA) of 6/24 at 06 months follow-up.

CASE 2

13 years-old boy presented to the emergency department with an alleged history of trauma in his right eye when he was accidentally hit with a pen by a fellow student. Post-trauma individual had pain, redness, watering, and the sensation of something coming out of the eye. On examination, Visual acuity was light perception (PL) in the right eye with inaccurate Projection of rays (PR), 6/6 unaided in the left eye. The right eye was digitally soft with severe conjunctival chemosis, crescent-shaped corneal laceration from 9 o'clock towards 5 o'clock with possible extension to the sclera, iris prolapse, hyphema, vitreous strands attached to the eyelashes. The rest of the details could not be visualized. The left eye examination was essentially normal with Intraocular pressure (IOP) of 16 mm Hg.

The diagnosis of globe rupture was based on history and clinical evaluation. Primary repair of the globe was done under General

Anaesthesia. The primary repair involved sealing the corneoscleral laceration using 10/0 Nylon sutures. The prolapsed iris was viable and was repositioned by the iris spatula. Hyphema was washed using a bimanual irrigation aspiration technique and an Anterior vitrectomy was done. The patient was put on oral steroids along with intensive systemic and topical antibiotic-steroid, cycloplegics, and lubricants.

The primary repair restored the integrity of the eye and the patient was referred to a Vitreo-retinal (VR) surgeon for further evaluation and management. He subsequently underwent lens aspiration with Pars plana vitrectomy and Retinal detachment surgery. The patient was left aphakic and a contact lens was placed. The patient kept on follow-up and planned for secondary Intra-ocular lens (IOL) implantation in the next 6 months.



(i) Pre-op

(ii) Intra-op

(iii) Post-op

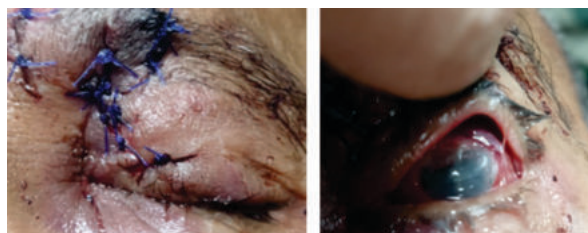
CASE3

78 years-old patient presented to the emergency department with an alleged history of trauma in his left eye due to fall from stairs and complained of painful diminution of vision. The visual acuity was 6/6 in right eye and light perception (PL) with inaccurate Projection of rays (PR) in left eye. Right eye examination was essentially WNL. Left eye was digitally soft with Multiple lid lacerations, conjunctival hemorrhage, iris prolapse, hyphema, large scleral laceration 180 degrees was noted. Rest of the details could not be visualized.



Pre-op

Intra-op



Post-op

Primary repair of the globe was done which involved suturing the corneo-scleral laceration, anterior vitrectomy. The patient was started on IV & Oral steroids along with intensive systemic and topical antibiotic-steroid, cycloplegics, and lubricants. The patient was then referred for Vitreo-Retinal (VR) consultation. The immediate and successful primary repair resulted in anatomical restoration of the eye, however, the visual acuity remained PL as there was associated retinal detachment which was repaired.

DISCUSSION

Birmingham eye trauma terminology (BETT) by 1996 Kuhn et al. describes traumatic ocular injuries.⁴ Open globe injury (OGI) is defined as a full-thickness wound of the eyewall, due to either a laceration or an occult rupture.⁵ Classical pathophysiology of a globe rupture involves application of considerable amount of blunt force to the eye. This leads to rapid rise of intraocular pressure (IOP) and which further leads to frank rupture of the eyewall by means of an inside-out mechanism. This point of impact commonly occurs at the weakest and thinnest areas of the sclera.⁶ The rectus muscle insertion points, limbus, optic nerve insertions and prior surgical sites are the areas most prone to rupture.⁷ Open-globe injuries are also classified by the anatomic region or zone of injury:⁸

Zone 1- injury involves the cornea and limbus.

Zone 2- injury involves the anterior 5mm of the sclera.

Zone 3- injury involves the sclera, more than 5mm posterior to the limbus.

The anatomic region, or zone, of an OGI is an important prognostic factor for visual potential.⁹ The presenting visual acuity, presence/absence of afferent pupillary defect, the type, location and extent of injury, lens damage, presence and severity of vitreous hemorrhage, presence of IOFB (intraocular foreign bodies) are the key factors determining the final visual outcome in open globe injuries.¹⁰

There are certain signs which point towards an occult globe rupture- Hyphema, Subconjunctival hemorrhage, Distorted/ peak shaped pupil, low intraocular pressure, prolapse of uveal tissue, and disturbed ocular motility.¹¹

Evaluation- when a patient comes with ocular trauma, the patient should be evaluated for any life-threatening injuries the management of such injuries take priority over ocular assessment and management. Once the patient is stabilised then the ocular history taking and evaluation should be done.

Meticulous history taking should be done which involves details of the time and mechanism of injury. The time is of utmost importance as ideally the repair should be done within 24 hours of injury. The mechanism of injury like involvement of a sharp object, high-impact blunt trauma, or high-velocity projectiles should raise the suspicion of an OGI. The presenting complaints post trauma should be elicited and the worsening of symptoms as the deterioration of vision or increasing severity of pain points towards the development of endophthalmitis. A thorough review of the patient's past ocular and surgical history is important in evaluating the visual potential.

Examination- Minimum manipulation of the globe whenever an OGI is suspected. External assessment of the head, face eyelids, periorbital region should be done and look for any ecchymosis, edema, or superficial lacerations. Also rule out any concurrent facial fractures.

Baseline visual acuity, pupillary reactions, should be recorded which are important for the visual prognosis as per Ocular trauma score (OTS).¹² IOP measurements should be delayed till the time an OGI is ruled out. Detailed slit lamp evaluation which involves pupillary reactions, sub- conjunctival hemorrhage, chemosis (which may conceal an underlying scleral laceration). Look for any retained foreign material by eyelid eversion. All layers of the cornea should be thoroughly inspected for Cornea should be checked for any tear, laceration, edema. Anterior chamber assessment for depth, hyphema and cells/ flare. Iris sphincteric tears, position and integrity of the lens, capsule and zonular fibres should be thoroughly checked. Rule out the presence of vitreous hemorrhage, choroidal detachment, retinal detachment and possible IOFB (Intra-ocular foreign bodies) through extensive posterior segment evaluation. Pre-op management involves keeping the patient NPO, use of protective eye shield and antibiotic prophylaxis especially in case of OGI with retained IOFB. Informed consent (incl enucleation), use of analgesics and TT injection. Pre-op

lab investigations is also required

Principles of repair- of Primary globe repair should be completed within 24 hours of injury and evaluation.¹³ Either a staged or comprehensive surgical approach may be taken.

Staged surgical strategy- primary wound closure, repositioning of prolapsed tissue, removal of blood and foreign material. This is followed by planned secondary surgeries in form of Vitreo-retinal (VR) surgeries for Vitreous hemorrhage, vitreous and/or retinal incarceration in a sclera wound, and/or retinal detachment. Lens removal and complex corneal surgeries can be done at this stage.

Comprehensive surgical approach which involves addressing the anterior and the posterior segment injuries in the same sitting and can be needed in case scenarios where there is OGI with retained IOFB especially in posterior segment.

Primary repair carried out under GA is aimed at restoration of structural integrity and preserve visual potential. The proactive management principles involve cutting externalised vitreous, prevent/ release tissue incarceration in wound, to identify and reposit vital tissue, clear hyphema, reconstruct anterior segment and correct ocular hypotony. The prevention/ treatment of endophthalmitis is very important as the incidence is 1-3 in 100 cases of penetrating injuries especially in cases with retained IOFB. In open globe injuries, one must be aware of a potential and devastating complication which is Sympathetic ophthalmitis which has an incidence of 0.2 to 0.5%^{14,15} Post- surgery the patient should wear protective glasses and not to engage in strenuous activities liking swimming, running etc.

Prognosis is based upon the OTS which takes into consideration the presence of globe rupture, perforating injury, IOFB, endophthalmitis, retinal detachment, or relative afferent pupillary defect.¹² Zone III and ruptured globe injuries carry a statistically significant poor prognosis.¹⁶

CONCLUSION

The surgical repair of open globe injury is a complex and challenging procedure, however, prompt assessment of the type and extent of the injury coupled with timely and meticulous intervention can improve the likely visual and anatomical outcomes for these patients.

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