

# EMERGENCY EVALUATION AND MANAGEMENT OF OPEN GLOBE INJURIES

ANDREEA MARIA HÂNCU<sup>1</sup>, LORANT KISS<sup>2</sup>

<sup>1</sup>PhD candidate "Lucian Blaga" University of Sibiu, <sup>2</sup>"Lucian Blaga" University of Sibiu

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**Abstract:** An open globe injury is defined as a full thickness wound of the eyeball and it is the most important cause of permanent visual impairment worldwide. It has a negative psychological impact on the patient and also on the healthcare system. A proper evaluation of the injury and a good management strategy are extremely important in order to obtain the best visual outcome. The aim of this paper is to highlight the best approach to a patient with an open globe injury in any emergency department and also the appropriate management which is necessary to restore the anatomy and visual function.

## INTRODUCTION

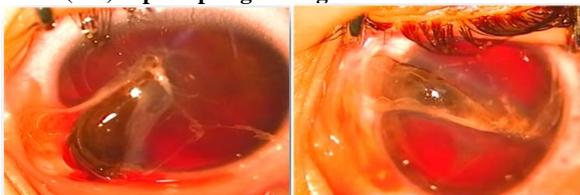
Open globe injuries might appear as an isolated event, but life threatening injuries have to be ruled out in multi-trauma patients before attention is focused on the eye.(1) The basics steps that have to be assessed in any emergency department are: the general status of the patient's well being, the vital signs and a brief check of mental status.(2,3)

### Evaluation

A complete and accurate history is the first step in evaluating a patient with open globe injury. It has to be documented the exact time of the injury, the nature and the mechanism of the injury, the place where the injury occurred and also the potential for an intraocular foreign body. The history should also include the past medical history of the patient, pre-existing ophthalmic diseases, any prior ocular surgeries, drug allergies, time of last meal and tetanus immunization status. The most common sites of globe ruptures are: posterior to the insertion of the rectus muscles, the previous surgical sites, particularly extracapsular cataract surgery or penetrating keratoplasty.(1,4) For any suspicion of an open globe, the clinician should avoid any procedure that could increase the intraocular pressure in order to reduce the risk of further extrusion of ocular contents.(4)

The clinical signs of a globe rupture or laceration are: a significant decrease in visual acuity, low intraocular pressure, relative afferent pupillary defect, teardrop pupil, an increase or decrease of the anterior chamber depth (figure no. 1), vitreous loss (figure no. 2), exposure of the uvea or other internal ocular structures (figures no. 1,2), gross deformity of the eye with obvious volume loss (figure no. 3), the presence of 360 degrees of bulbus subconjunctival haemorrhage, grade IV hyphema (2,4)

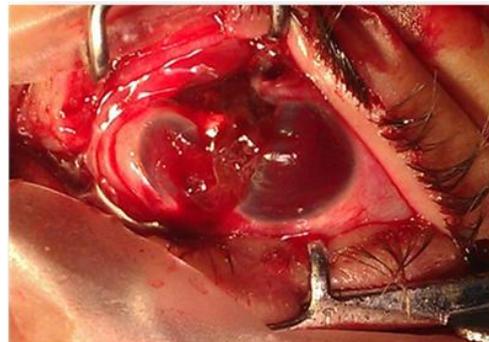
**Figure no. 1. Full thickness corneal laceration. Brown uveal tissue (iris) is prolapsing through the wound**



**Figure no. 2. Scleral rupture with vitreous loss and external prolapse of the uvea**



**Figure no. 3. Extensive globe rupture with massive extrusion of internal ocular structures**



For further assessment, axial and coronal computed tomography of the eye without contrast (CT) is required to assess the wounds with high suspicion of intraocular foreign bodies.(5,6) CT is superior to ultrasound in assessing the size and location of intraocular foreign bodies(7,8)

Ultrasonography is more accurate in showing internal ocular anatomy, but it has limited use in open globe injuries due to necessity of globe manipulation.(1)

### Management

An open globe injury has to be considered as a tetanus prone wound. For patients who have been vaccinated previously but who are not up to date, there is little benefit in administering

<sup>1</sup>Corresponding author: Andreea Maria Hâncu, Str. George Enescu, Nr. 2A, Sibiu, România, E-mail: andreansy@yahoo.com, Phone: +0749 589124  
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human tetanus immune globulin more than one week after the injury. For patients completely unvaccinated, human tetanus immune globulin should be given up to 21 days after the injury.(9)

Due to the high risk of endophthalmitis, patients with open globe injuries need prophylactic antibiotic treatment with Vancomycin (15 mg/kg, maximum dose 1,5 g) and Ceftazidime (50 mg/kg, maximum dose 2g). For those allergic to penicillin can benefit from fluoroquinolone instead of ceftazidime.

The organisms which are frequently associated with posttraumatic endophthalmitis are Bacillus species, coagulase-negative Staphylococcus, Streptococcal species, Staphylococcus aureus and gram negative organisms.(10,11)

The surgical repair of an open globe injury should be performed urgently, ideally within 24 hours of injury. Some recent studies have showed that each day of delay in surgical repair may lead to a reduced visual prognosis. The aim is to restore the normal anatomy with minimal intraoperative manipulation.(2,10)

The primary repair has to follow some important steps in order to achieve the best visual outcome:

1. Minimal manipulation of the wound;
2. Reposit or remove the exposed intraocular tissues;
3. Explore the globe for unrecognized injuries;
4. Reduce the risk of endophthalmitis at minimum.(2)

Corneal wounds are closed with 10.0 Nylon. The first stitch is central, then the wound is divided in halves at the pass of each subsequent suture (75% -90% depth). Longer passes tend to induce less postoperative astigmatism compared with short, tight sutures. At the end, the sutures have to be buried.(2)

For corneal-scleral lacerations, the first suture is done with 9.0 Nylon at the limbus, and the repair direction is from anterior to posterior, after repositioning the exposed intraocular tissues.(2)

For iris prolapse some authors have had recommended that after 24 hours of exposure the iris has to be removed, but new studies showed that the most important factor in drawing the decision is the condition of the iris rather than time. Excision is only recommended for necrotic, nonviable and contaminated iris.(1)

The exposed choroid and ciliary body should always be repositioned because the excision could lead to severe intraoperative haemorrhage, phthisis or postoperative inflammation.(1,11)

The prolapsed vitreous has to be totally removed as it can cause severe complications such as corneal decompensation, chronic inflammation, cystoid macular oedema, retinal detachment. It is recommended to be removed with the vitrectomy cutter; the scissors or sponges should be avoided because they can put a tractional force on the retina causing retinal breaks and detachment.(1,12)

**Figure no. 4. Scleral rupture repair done in general anesthesia in the first 3 hours after the injury. Visual acuity was 0,1cc at 1 month after the surgical repair**



Scleral wounds are more extensive with prolapse of intraocular contents. It is important to visualize completely the posterior extent of the scleral wound. Scleral wounds are usually repaired with 8.0 or 9.0 Nylon. However, some surgeons prefer

8.0 Vicryl or Silk. Placing one or two central sutures help to stabilize the wound, making the repositioning of prolapse tissues easier. Scleral suture has to be at least 50% depth. Full-thickness passes should be avoided.

If the scleral wound is extended underneath or through a rectus muscle, this has to be secured with a double-armed 5.0 Vicryl and disinserted from the globe.(2)

**Figure no. 5. Corneo-scleral wound repair with iris reposition**



The poor prognosis signs are: an initial poor visual acuity such as no light perception or hand movements, globe rupture with loss of intraocular contents, posterior location of the wound, relative afferent pupillary defect present at examination, associated injuries as orbital fracture, full thickness lid laceration, retinal detachment, delayed primary repair, endophthalmitis (12,13)

**Ocular trauma score (OTS)** provides reliable prognostic information which helps in counselling the patient regarding prognosis. It is based on the initial visual acuity and the presence of globe rupture, endophthalmitis, perforating injury, retinal detachment and afferent pupillary defect.

The most sight-threatening injury is an injury with an OTS score of 1. An injury with OTS score of 5 has 96% chance of achieving vision of 20/40 or better.(1,14)

## CONCLUSIONS

1. Open globe injuries are extremely challenging, but with a systematic evaluation and a proper management the best visual outcome can be achieved.
2. All patients with open globe injuries need prophylactic antibiotic treatment
3. Urgent surgical repair of the injury with minimal manipulation promote the best visual outcome for the patient.
4. Tetanus prophylaxis should be given based on the nature of the wound and the time since last immunization.

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