Case Report

Lower Eye Lid Defect Repair Following an Ocular Gunshot Injury: A Case Study and Review of Literature

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ABSTRACT

The eye, which constitutes a small portion of the human body, is the third most exposed part.It is liable to injury including gunshots. The management of gunshot injuries to the eye ball and associated lower lid defect needs to be addressed with much care because of its potential visual loss and psychosocial problems. Treatment is multidisciplinary.Surgery is multi staged and tasking to both surgeon and patient. The case presented is that of a 45-year female trader with gunshot missile that caused blunt trauma to the left eye and lower lid defect with exposure of the inferomedial aspect of the left eye and fracture of the nasal bones on both sides of the nasal bridge. She was stabilized with an antibiotics and analgesics, had maxillofacial consultation and managed conservatively for the blunt ocular trauma. Psychosocial issues were found and addressed by psychologists. Different forms of surgical approaches have been described in the literature, but we mobilized the superior tarso-conjunctival plate to close the defect in two stages because it is the most appropriate approach that ensures good cosmetic outcome.

Keywords:*Defect, Gunshot, Lid, Ocular, Trauma,Repair.*

INTRODUCTION

Gunshot injuries are a common occurrence during violent crimes, civil conflicts and war times. The increased rate of conflicts and criminality worldwide makes it assume heightened significance. Gunshot wounds are the 12th leading cause of death in the United States and more than half of all suicides are committed with guns.[1] Gunshot missile injuries are common in the extremities, but could involve any part of the body including the eye. Eye injuries include eye lid injuries, ruptured globe, corneal laceration, scleral perforation, traumatic cataract, vitreous haemorrhage, choroidal haemorrhage, retinal detachment, optic nerve injury and associated fracture of the orbital walls. Eye lid involvement in gunshot injuries becomes worrisome when associated with loss of tissue and resultant predisposition to continuous uncontrollable flow of tears. The amount of tissue loss in the face when significantly large leads to facial disfigurement with serious consequences to both patient and care givers because of its associated psychological and social effects[2]. Surgical management is vital to improve appearance and function to ameliorate the cosmetic blemish. We present a case of ocular trauma due to gunshot whose management involved lower lid reconstruction.

CASE REPORT

A 45-year old female trader presented to accident and emergency with injury to the face from a gunshot sustained during communal crisis. She complained of left eye pain, swelling, bleeding lower lid wound and loss of vision. There was associated nasal bleeding, left sided headache but no loss of consciousness. Pressure dressing was done at the site to stop the bleeding before presenting to the hospital. She had

enjoyed good vision prior to the incident and had not used spectacles before nor had she hypertension, diabetes, asthma and Sickle Cell Anaemia.

She was conscious and alert in time, place and person. Pulse rate 105 a minute, regular, full volume. Visual Acuity was 6/6 right eye and equivocal in the left eye, extraocular motility was full in all directions of gaze. The left upper lid was intact but over 50% of the medial lower lid tissue, including the canaliculus and medial canthus, was lost. A laceration extends from the defect to the nasal bones just below the bridge of the nose. The nasal bones at the point of termination of the laceration were fractured on both sides. There was soft tissue swelling around these sites. In the left eye, there were patches of sub-conjunctival haemorrhages and mild chemosis on an intact palpebral conjunctiva. Cornea was hazy anterior chamber was deep with around and mid dilated pupil. The lens, vitreous and fundus were poorly visualized. All investigations including haemoglobin concentration (Hb), full blood count and differentials, fasting blood glucose, urea, electrolytes and creatinine done were normal including screening for human immunodeficiency virus (HIV).

Intravenous fluid and, amoxicillin, intra muscular gentamicin, Tetanus Toxoid, and oral analgesics were administered to the patient. Other medications were chloramphenicol ointment, ciprofloxacin and dexamethasone eye drops for the associated blunt injury to the globe. The maxillofacial surgeon repaired the nasal injury and the lid injury was dressed daily pending secondary repair.

At 6 weeks, left eye Visual Acuity had improved to Hand Movement (HM), intra ocular pressure was 05mmHg, extraocular motility was full in all directions of gaze. The lower lid was healed and contracted with a scar extending to the medial side of the bridge of the nose, figure 1.

Figure 1: Lower lid defect with symblepharon 6 weeks after trauma

The medial 50% of lower palpebral conjunctiva was exposed and had a pool of tears, cornea was clear, anterior chamber deep, round reactive pupil, transparent lens, vitreous was hazy and only a glimpse of pink disc was seen. Patient was then scheduled for repair of lower lid defect.

Reconstruction of lower lid defect was carried using modified Hughes flap. Under general anesthesia, the patient was routinely cleaned and draped and detailed examination of the defect was done. All conjunctival adhesions were release, scarred tissues at wound margin were excised, wound exploration and mobilization of remnants of the lid inferiorly was done and haemostasis was secured by cautery. The size of the defect was measured and fashioning of an appropriate sized the Hughes flap effected. The upper lid was everted and a horizontal incision was made 4 mm from the lid margin, just about the size of the horizontal length of defect and was vertically dissected to the anterior tarsus at the superior tarsal border. Incisions were made from the two edges of the horizontal incisions and extended vertically to the superior tarsal border, figure 2. The tarsoconjunctival flap was advanced inferiorly and sutured to the medial and inferior remnants and lateral tarsal edge of the lower lid. Skin graft which was harvested from upper lid was grafted on the new posterior lamella, figure 3. Oral antibiotic and analgesics were prescribed and sutures removed at 2 weeks. At 4 weeks, a granuloma was noticed over the portion of tarsoconjunctival flap that was not grafted with skin, it persisted till the second stage of surgery, figure 4.

Figure 2: Mobilizing the tarsoconjunctival flap over the defect

Figure 3: Flap sutured to form the posterior and outlining the skin graft to form the anterior lamella of the lower lid

Figure 4: Flap separation, with granuloma on the inferior portion

Figure 5: Final stage

The second stage was performed after we were satisfied adequate blood supply was established in the flap after 4 weeks of surgery. Under local anesthesia, the flap was cut 4mm from the lid margin using a scissors and wound was dressed, figures 5,6. Patient was followed up and had good outcome, figure 6. We are currently waiting for the third stage which involves handling the tear flow.

Figure 6: Outcome

DISCUSSION

Trauma to the eye and its adnexias is the leading cause of ophthalmic emergencies seen in 54.5% [3] of ophthalmic emergency patients and has annual incidence of 0.9% for all ages and both sexes in Nigeria.[4] Gunshot is a cause and is reported to be common at war times or civil conflicts as is the case with this patient. It has also been reported to follow criminal activities such as armed robbery and other forms of assault.[5] Gunshot pellets were found to be the single leading cause of eye injury (22%) in Southeast Nigeria from violent crimes [5] and in troubled Northeast Nigeria where military is fighting insurgency, gunshot injuries were responsible for (23.1%) eye injuries.[6] In Iran [7] it is responsible for 6.1% of ocular injury.

Gun ballistics explains the phenomena that occur when amissile strikes a tissue. Paul J Dougherty *et al* [8] explained that ballistic injury has 3 components; first, tissue is crushed by the projectile as it passes through, leading to a localized area of cell necrosis that is proportional to the size of the projectile. This area of the projectile's path is called the permanent tractor permanent cavity. There is a second area in

which elastic tissue is stretched. The stretch occurs because of a lateral displacement of tissue that occurs after the passage of the projectile. There is a transient increase in pressure of a few atmospheres for a few milliseconds in duration. This transient lateral displacement of tissue macroscopically appears as blunt trauma. A third component, known as the shock wave, is a pressure wave that travels at the speed of sound preceding the bullet in tissue. This pressure wave is of very short duration, a few microseconds, although it may generate pressures of up to 100atm in magnitude. The shock wave has not been shown to cause tissue injury.

In this case, the gunshot caused blunt trauma to the patients left eye ball evidenced by the intraocular findings and an intact globe. This type of injury is often associated with vitreous haemorrhage, retinal tears and/or detachment, choroidal rupture, and macular oedema.[9]This could explain the findings of vitreous haziness and ocular hypotony (intraocular pressure 05mmHg).Other findings often associated with blunt ocular trauma are; hyphaema, globe rupture, retrobulbar haemorrhage and traumatic optic neuropathy.[9]

Managing blunt ocular trauma may be conservative as was the case with this patient except when associated with rupture, laceration, lens displacement, non-clearing hemorrhage, retinal tears and detachments. After conservative treatment for 6 weeks, visual acuity improved to HM but vision remained severely impaired. Similarly reports from studies in Nigeria support the finding of poor outcome from blunt ocular trauma; less than 3/60-NPL in 80% cases in Southeast[5] and less than 3/60 in 59.3% of cases in Southwest.[10] In other parts of the world as in the middle East a study reported that in 18 survivors of gun trauma to the head, 8(44%) suffered visual damage defined by permanent loss of vision in at least one eye to the level of counting finger or less.[11] The contribution of ocular trauma to visual impairment worldwide cannot be downplayed as the global estimate of bilateral visual impairments from ocular trauma has been put at 2.3 million and 19 million unilateral visual losses with approximately 1.6 million people blind from eye injuries.[12] Population-based survey's shows monocular blindness due to trauma ranged from 20% to 50% and of bilateral blindness 3.2% to 5.5%.[13] Therefore, every effort must be made to control this rapidly rising cause of visual impairment.

Apart from the globe, other structures such as the eyelids are also affected in ocular trauma. A study conducted in Southeast Nigeria reported 13.3% adnexal/lid lacerations[5] and in the Northeast, 8.3% lid lacerations were reported[6]. In Iran,[7] the proportion of eyelid laceration following ocular injury was 24.5%. All these studies did not show whether the lacerations were associated with tissue loss and exposure of the globe but the reviewed patient had over 50% lower lid loss and facial disfiguring exposure of the globe. This suggest that the lower eye lid was the primary site on the path of the fired missile as explained by the first phenomenon of gun ballistics that projectile crushes structures along its track, on the process avulsing the lid.

Causes of lid defects are classified into congenital as in coloboma and acquired but the major cause follows surgical excision of malignant tumors especially basal cell carcinoma[14]. These are managed through surgical closure and method used depends on thickness, location and size. Small defects less than a third horizontal lid length are corrected by direct closure, when more than 1/3 is by mobilization of adjacent tissues as in Tenzel method. But with large size 50% or more only flaps are used for correction. This explains why we used Hughes's eyelid sharing technique of lower lid closure.

Hughes first described the use of upper lid tarsoconjunctival flap to close large lower lid defect in 1935.[15] In the original technique a transverse incision to isolate the tarsoconjunctival layer was made along the lid margin midway between the anterior and posterior borders. This method was always associated with complications of the upper lid margin because incisions were made on it. This was the reason some surgeons advocate starting the tarsal incision 3 mm above the lid margin.[16] This modification is still in practice and was used in this case because it has advantage of avoiding injury to the root bulbs of the lashes.[16] Like every other method of using flaps, Hughes technique follows the basic principles of lid repair; maintaining an adequate blood supply to the tissue flap, maximizing horizontal tension, minimizing downward vertical tension, and maintaining anatomical canthal fixation.

The next surgical stage; separation of Flap pedicle has undergone modifications over time. The earlier practice was to cut the flap after 3 months of closure but in present times is done at 4-6 weeks when vascularization is sure to be established at the reconstructed posterior lamella. We followed this in separating the upper and lower lids in this

patient. However, newer evidence has shown good vascularity and results at 2 weeks[17,18] suggesting that flap separation can be done much earlier. This argument was supported by findings of George B Bartley[19] who worked on pedicle dehiscence in patients that had Hughes method of repair. He observed the dehiscence occurred at very early days of surgery 1-11 days but still ended up with good results after being allowed to heal secondarily without repeat surgery.

After pedicle separation and next few weeks of follow ups for healing, patient was noted to have good outcome which was assessed using parameters like lid function in terms of mobility, cosmetic acceptability by patient and complications.

The only complication in the procedure was a granuloma that appeared on the surface of the flap before pedicle was separated and was excised with excess flap at second stage of surgery. Although no postoperative complication was noticed in this patient but some have been reported after Hughes procedure. These are; deformities of the upper lid, Permanent loss of some or all lashes, entropion of the lid margins and retraction of the upper lid have been most frequently encountered. Starting the tarsal incision 3 mm above the lid margin avoids injury to the root bulbs of the lashes.[16] Other complications are thinning of the lid in the area of the tarsal transposition, lymph edema of the transplant, lid margin defects, and dehiscence of the wound, corneal epithelial defects, trichiasis caused by lanugo hair, keratinization of the lid margin, ectropion of the conjunctiva, retraction of the upper lid, and entropion of the upper lid.[20]

Though Hughes procedure is reliable, it has a number of disadvantages some of which lead to newer methods of correction. The eye is closed postoperatively for at least 2 weeks, and was an issue to us because the patient was on topical medication for the blunt trauma. A second stage is needed; though it does not require extensive surgery and done under local anaesthesia, it is a reason some one stage procedures were developed[21] such as Mustarde rotational cheek flaps. Other problems associated with Hughes procedure are, loss of eyelashes in the area of the flap, to overcome this, some advocated hair transplant at the lid margin; the edge of the flap can be persistently erythematous.[19,22,23]

Other methods used to correct large lower lid defects in addition to Mustarde rotational cheek grafts[16] includes use of autogenous grafts for posterior lamella reconstruction. These grafts include; auricular cartilage, hard palate and nasal septum which are combined with flap for anterior lamellar reconstruction. Mandour *et al*[24]compared the use of modified Hughes flap to auricular cartilage graft for replacement of posterior lamella in lower eyelid reconstruction and did not find any significant difference as regard reconstructed lower eyelid structure, function cosmesis and then complication rate. As for the postoperative complications in the reconstructed lower eyelid in modified Hughes procedure, they reported lower eyelid retraction in 2 cases out of 8 cases (25%). However, the authors attributed the small number of the cases included in the study to explain the higher percentage of postoperative retraction. As for use of auricular cartilage, they had 1 case with postoperative complication at the reconstructed lower eyelid (14.3%), a mild hypertrophic scar which was not related to the implanted cartilage and was cosmetically acceptable by the patient who required no further interference.

Another procedure by Perry[21] employs lateral stabilization of the posterior lamella with a periosteal strip, medial transposition of the lateral posterior lamella for central and medial defects, and a myocutaneous advancement flap to stabilize the anterior lamella. In his report, a total of 38 patients underwent the procedure to reconstruct fullthickness defects of the lower lid ranging from 50% to 75%. All patients underwent previous Mohs excision of a skin cancer. The average follow-up was 5.6 months in Perry's report. Eleven patients (29%) had postoperative sequelae, but only two patients (5%) required additional treatment.

CONCLUSION

Gunshot injury to the eye causes severe visual loss. When it involves lid defect,treatment is usually tasking to the surgeon and patient. Multidisciplinary management is more likely to give a better outcome.

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