

An eye for a lost eye: A case of self-inflicting gunshot injury

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ABSTRACT

Maxillofacial defects due to gunshot injuries can have detrimental functional and psychological effects on the patient. These occur predominantly in young males, although all are at risk. Military, civil, accidental or self-inflicted injuries employing guns of varying caliber and ballistic properties may produce a defect or deformity which encompasses the entire spectrum of reconstructive surgery. Patients with facial defects have major difficulties to re-establish their mastication, speech, soft-tissue projections and therefore social integration. Successful prosthetic rehabilitation is crucial for better quality of life in case of large facial deformities. We present a case of 24-year-old male with gunshot injury to the left side face leading damage to the eye, which was rehabilitated with oculo-facial prosthesis.

Key words: Artificial eye prosthesis, facial defects, gunshot wound, oculo-facial prosthesis

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INTRODUCTION

Gunshot injuries to the face are uncommon and more complicated emergency entity. It leads to devastating functional and esthetic consequences to the surviving patients. The incidence of gunshot injuries has been found to increase in last 2-3 decades. Firearm injury in the United States has averaged 32,538 deaths annually between 1970 and 2002. It is the second leading cause of death from injury after motor vehicle crashes and in several states, is the leading cause of injury death. It is involved in approximately 65% of homicides, 55% of suicides, 40% of robberies and 20% of aggravated assaults.^[1] A study by Ugboko *et al.*^[2] showed a profound male preponderance of 95.5%, with most common complication reported was a loss of vision.

Management of such injuries in an emergency is a challenging task. It is basically a staged procedure which involves maintenance of the airway and circulation,

control of bleeding, assessment of wound, debridement and primary repair of defect, elective management of associated soft-tissue and osseous defects, rehabilitation of associated disability. In this case report, we are presenting a case of gunshot (service rifle) injury over the face resulting in damage of left eye, which was rehabilitated with oculo-facial prosthesis.

CASE REPORT

This was a case report of a 24-year-old male defence personnel reported to the casualty department of our institution around 2:45 a.m. after a suicidal attempt by his service rifle during his night duty hours. The appearance was very horrific with total disfigured anatomy of the left half of his face [Figure 1]. His general medical condition was poor with vitals recorded as pulse-92/min, blood pressure-94/58 mm Hg and respiratory rate-16/min. He was agitated but appeared well-oriented. The patient was stabilized and on examination it was found that the point of entry of the bullet was from the submental region with a punctured wound and the exit site was in the left eye through the malar region. The tongue was bisected into two halves, with perforation of left maxilla and loss of dento-alveolar segment, ruptured nasal floor mucosa and total degloved left half of the mid face. He was bleeding from the oral and nasal cavity and the left side

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of his mid face. The left eye showed dilated pupil with no reaction to light and absence of vision. The right eye was with normal function. He was immediately shifted to the emergency operation theater. Debridement and primary repair of the wound was performed under general anesthesia [Figure 2]. His routine investigations, radiographs and computed tomography (CT) scans were performed. CT scan showed comminuted fracture of all the boundaries of the left orbit including maxilla, mandible and zygomatic bone [Figure 3]. A foreign body was seen in the infero-medial part of the left orbit and was referred to the Department of Ophthalmology. His left globe of the eye was found damaged and was exenterated [Figure 4]. After 1 week, open reduction and internal fixation of the fractured facial bones was performed along with maxillomandibular fixation for 6 weeks. The feeding was performed through nasogastric tube for 1 week followed by liquid diet for next 6 weeks.

After about 3 months, the patient reported to us with an unsatisfactory scar over the left mid face and he wanted the replacement of his lost eye [Figure 5]. On examination, it was noted that the left eye, upper and lower eyelids and partial maxilla of the left side were missing. An obturator was fabricated to facilitate speech and mastication. An intraoral and extraoral prosthesis was advised for rehabilitation of esthetics, speech and mastication for the patient. Obturator was made to facilitate speech, mastication and to separate the nasal and oral cavity. To prevent intrusion of material into the defect, a moist gauze pad with petroleum jelly, was applied. Mouth preparation was done. Impression for intraoral prosthesis was taken using irreversible hydrocolloid. The impressions were poured with Type IV die stone. Metal framework made up of Chrome-Cobalt alloy was fabricated.^[3] Inter-occlusal record, placement of teeth and wax finishing of prosthesis was done. Following wax up, flasking and dewaxing was done. It was acrylized using heat-cure acrylic resin. For extra oral impression the patient was instructed to sit in an



Figure 1: Photograph of the patient when he arrived in the emergency department showing totally distorted anatomy of the left side face with the absence of vision in the left eye



Figure 2: Photograph taken immediately after the primary repair of the degloved injury of the left side face



Figure 3: Coronal view of computed tomography scan showing comminuted fracture of the boundaries of left orbit including maxilla, zygomatic bone and mandible



Figure 4: Axial view of computed tomography scan showing completely damage of the globe of left eye with fractured surrounding bones



Figure 5: After 3 months, frontal view of patient with unsatisfactory scar over the left side mid face



Figure 6: Frontal view of the patient with the adhesive supported oculo-facial prosthesis in place

upright position with a straight gaze ahead to minimize muscular movements.^[4,5] The impression was made using irreversible hydrocolloid (Algitex) and Plaster of paris. To prevent intrusion of material into the defect, a moist gauze pad with petroleum jelly was applied. Impression was poured with Type III dental stone. Placement of custom made eye-ball, wax finishing of both upper and lower eyelid along with maxilla. Finished wax pattern was trial inserted and invested. Color matching of silicone done by mixing with intrinsic stain (Cosmesil intrinsic silicone coloration system). Eye and silicone material (Cosmesil series silicone material, M511, both part A and part B) was put into the die after painting it with separating media. The die was clamped and placed at room temp for 24 h. Artificial eye lashes were placed. The prosthesis was retained with adhesive (Principality cream adhesive G602)^[6] [Figure 6].

The patient was advised to keep wound and prosthesis clean. He was advised to gently remove any exudates over the wound with a wet cotton tip soaked with 5% povidone-iodine solution and to clean the intaglio surface of prosthesis once daily with soap water. He was advised to come after 24 h for the adjustment of the obturator. Follow-up visits were done after a week, a month and 3 months post prosthesis insertion for further adjustment and correction.

DISCUSSION

Gunshot injury to the craniofacial region results in both functional and aesthetic deformity, leading to psycho-social problems. The severity of the facial gunshot injuries varies according to the caliber of the weapon used and to the distance from which the patient sustained the injury. Close range, high velocity gunshot wounds can result in devastating functional

and esthetic consequences for the surviving patients.^[7] Biomechanics of a gunshot wound comprises of its four main components. First is penetration, it refers to the flesh which is destroyed or disrupted by the passing projectile. Second is permanent cavitation, it consists of a “shock-wave” like effect, describes the space that results from direct tissue disruption and destruction. Damage will depend on the elasticity of the organ or tissue. Muscle, blood vessels, lung and bowel are relatively elastic and therefore have a less permanent cavitation effect. Liver and brain on the other hand are relatively inelastic and cavitation becomes permanent resulting in significant damage. Third is temporary cavitation which is produced as the projectile travels through the target tissue. Fourth is fragmentation, projectile fragments or secondary fragments such as bones are sent off and create their own paths through flesh. This is a major cause of tissue disruption with high velocity bullets.^[8]

Craniofacial region is the most favorite target for gunshot injuries, most of the times especially in close range firings. The reason is that head and neck region is most complex structure in the human body which contains important contents, i.e. brain, upper portion of the spinal cord, eye, nose, oral cavity, rich vascular network due to the great vessels, damage to it results in high incidence of morbidity and mortality. Clark *et al.* found that out of 178 gunshot wounds to the face, 40% involved the frontal bone and cranium, 9% involved the orbits, 14% involved the lower midface (maxilla), 13% involved the mandible and 24% involved multiple sites.^[9] Gunshot wounds to the midface results in high prevalence of facial fracture (35%), globe injury (20%), vascular injury (20%) and intracranial penetration (20%). In case of mandible more than 50% of patients require emergency management of the airway. Complications associated with facial injuries are periorbital cellulitis, diplopia, loss

of vision, facial nerve paresis or paralysis, cerebrospinal fluid leak, soft tissue loss, bony malunion, malocclusion, trismus, oro antral fistula, nasal obstruction or stenosis, choanal stenosis.^[10] Most common vascular structures injured in case of neck injury are internal jugular vein (9%), internal and common carotid artery (7%), external carotid artery (2%), subclavian artery (2%) and vertebral artery (1%). Mostly common cause of death is due to exsanguinating hemorrhage. Other causes include spinal cord injury, cerebral ischemia, airway obstruction, air embolism and pulmonary embolism.^[11] Angiography remains the gold standard for exploration of vascular injuries of the neck. Cohen *et al.* reported that floor of the mouth and tongue are the most common soft-tissue injured and mandibular fractures occurred in 58% of cases followed by maxillary complex fractures.^[12] Demetriades *et al.* in their study have reported 4139 patients with gunshot wounds over 4 year period, 6% (247) had injuries to the face. 38% of these had isolated wounds to the face, whereas the remaining 62% had associated injuries to other body areas. Thirty six patients (15%) died following admission. All the deaths were secondary to injuries to the chest, abdomen or brain. There were no deaths associated with isolated facial injuries.^[13]

Early management of these patients should focus on resuscitation with paramount attention given to maintenance of a patent airway. Bleeding from injury and the subsequent swelling can significantly compromise the airway. Measures such as removal of clots and debris, maintenance of lateral head position, traction of tongue and if required endotracheal intubation or tracheostomy may be performed depending on the extent of the injuries. Hemodynamic resuscitation should be performed followed by thorough patient evaluation to rule out concomitant injuries.^[7] During the secondary survey, patients are examined by each body region, a review of systems is performed and a medical history is elicited. Radiologic examinations are also performed during this secondary survey. Maxillofacial injuries are not addressed until after the secondary survey has been completed and the treatment planning phase has begun. Antibiotic and tetanus prophylaxis should be administered during this period.^[14]

The surgeon managing a gunshot injury should consider the concept introduced by Manson for evaluation of four components: Soft tissue injury, bone injury, soft-tissues loss and bone loss. After evaluation of the wound, a decision is made regarding early definitive repair versus the need for delayed repair. Although primary repair is easy in the initial phase but few reported cases suggests that initial repair resulted in more chances of wound infection.^[15] Kazanjian and Converse described their approach to gunshot wounds as three phases consisting of initial debridement and suturing, immobilization of

bony fragments with splints and ligatures and finally reconstruction following healing of the soft tissues.^[16] We also worked in the similar way but instead of closed reduction, rigid internal fixation of mandible was done with 2.4 mm reconstruction plate followed by maxillomandibular fixation for 6 weeks. To correct the deformity over the left side mid-face and as per patient's need, we fabricated the definitive obturator and adhesive retained silicon oculo-facial prosthesis.

There are two modalities of prosthetic therapy for oculo-facial defects, one is adhesive retained and the other is osseointegrated implant retained. The advantages of adhesive retained prosthesis are less time required for its preparation as compared to implant retained prosthesis which takes three to 6 months for osseointegration. Another advantage is its cost-effectiveness. So, we preferred adhesive retained silicon oculo-facial prosthesis.

Mello *et al.* reported a case of facial reconstruction with a bone anchored prosthesis following ablative cancer surgery. The results suggested that a craniofacial prosthesis anchored on titanium implants is a viable alternative as a retention system and also a good alternative to other reconstructive surgeries.^[17]

Reichert *et al.* in their study used zygoma implants in patients who refused bone transplantation from the iliac crest or fibula and when the general condition did not permit major reconstruction. They reported five indications for zygoma implants: Tumor ablation maxillectomy, osteoplasty failure, osteoplasty avoidance, local stress relief after osteoplasty and an alternative to sinus-lifting or sinus lift failure.^[18] Landes in his study suggested that zygoma implants can be reliably used even in total maxillectomy. However, severe defects involving the orbito-nasal complex should remain a primary indication for reconstructive surgery.^[19]

CONCLUSION

Gunshot injuries to the maxillofacial region are not life-threatening, but have a definite impact in the post-trauma life of the patient. Reconstruction and rehabilitation of the deformities is really a challenging task. We should focus to the patient's need to maintain the form and function and also for the better quality of life.

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