Gunshot injury to the face: a case report

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ABSTRACT

Treatment of gunshot wounds in the maxillofacial region is complex. Current literature supports immediate treatment. Wounds vary widely. The nature of the injuries must be carefully assessed using the Kanzanjian and Converse's principles of plastic surgery as guidance, but always adapting to specific needs. Management is dependent upon the type of weapon, the bullet's characteristics, kinetic energy, place of impact, as well as the patient's general health status. A case is presented of a gunshot injury to the face with a review of the literature.

Key words: Gunshot injuries, extent of damage, management, antibiotics

INTRODUCTION

Gunshot injuries (GSIs) cause significant morbidity and mortality which may be instantaneous. Those involving the head and neck can be devastating especially when they affect vital structures. They present challenging surgical problems. Similar injuries occur in both military and civilian settings. Some geopolitical conflict areas in Africa have GSI as the second most common cause of death. There is an increasing incidence of GSIs worldwide, particularly those involving the face.[1-3]

The extent of damage is dependent on a number of factors including the magnitude of energy transferred, distance travelled by the missile, type of bullet, and the anatomical structures encountered. High-energy transfer gunshots fired at close range inflict the most damage. The extent of tissue damage depends on internal lacerations, compression of tissues and the temporary cavitations along the projectile path. Secondary injuries are also possible following impact with bone, which sets other missiles (bone fragments) into motion on their own paths, causing additional injury.[4-6]

The face and neck region is packed with vital structures in a relatively small volume of space. Even the smallest of movements by a penetrating missile may injure a major vein, artery and main nerve trunk simultaneously. The leading cause of death in penetrating neck trauma is major vascular injury causing uncontrollable haemorrhage. Treatment is challenging especially when the bullet or its fragments are lodged within the vicinity of vital structures. Most bullets or their fragments are highly contaminated with serious consequences especially when there is associated tissue loss. Tissue damage is both direct and as a result of energy dissipated from the inherent kinetic energy transferred to the tissues.[7, 8]

Missile injuries are described as penetrating (25%), perforating (38%) and avulsing (37%). Some gunshot wounds are through-and-through injuries, but in many patients the bullet enters with no visible exit wound. In such situations, the bullet's trajectory and final destination may be unpredictable. There may be an unknown extent of bony damage and consequences and a threat to the patient's airway from haematoma or oedema.[9, 10]

The ideal time and method of treatment remains debatable. Several surgeons maintain that because of the mechanism of injury, early aggressive primary reconstruction might not be ideal. They opt for initial conservative management

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followed by a staged secondary reconstruction to obtain satisfactory functional and aesthetic results. Alternatively, others advocate early management of facial deformity. The steps taken include: securing the airway, controlling haemorrhage, identifying other injuries and preventing additional injury, and repair and/or reconstruction of the traumatic facial deformities.[9-11]

CASE PRESENTATION

A 47-year-old African-Namibian man of black ethnicity was referred from a regional hospital to the Emergency Department of Oshakati intermediate hospital, following a GSI to his face. The injury was the result of a 'stray' bullet, shot from a gun at a distance less than one metre, while he was manipulating the gun. He experienced intense pain over the right side of his face, and bleeding from the wound. The amount of blood loss was difficult to ascertain. He was rushed to the local regional hospital after bystanders had applied improvised bleeding-control measures. Surgical wound toilet was done without extension of the wound. Augmentin and metronidazole intravenously and anti-tetanus vaccines were administered, and the wound was dressed but not sutured, leaving a large open wound.

He was referred to our intermediate hospital three days later. He had right mandibular pain, with difficulty with opening his mouth and chewing. He was fully conscious and haemodynamically stable. There was a laceration on the maxillomandibular area (8 cm in length) with features of infected granulation tissue (Figure 1).

The right side of his cheek region was swollen and tender, showing multiple pieces of bone and necrotic tissue. The mandible was fractured. There was no active bleeding, subcutaneous (surgical) emphysema, or dyspnoea and stridor. He had total loss of cutaneous sensation over the distribution of the right mandibular branches of the trigeminal nerve. The ophthalmic division of the trigeminal nerve was intact.

Figure 1. Appearance of the wound three days after injury.

A CT scan without contrast of the facial bones was done which revealed the presence of a comminuted mandibular fracture. The bullet was not seen in the CT scan images. Apparently, part of it was fragmented and the rest and was removed at the regional local hospital. (Figure 2).

We proceeded with exploration of the bullet entry wound. A comminuted fracture of the body of the mandible was confirmed. Debridement was done and the wound was dressed. The patient was started on antibiotics with clindamycin 600mg IV tds and metronidazole 500mg IV tds, plus tramadol 100 mg IV bd for the pain.

Consent was signed for surgery under general anaesthesia. The fracture was accessed through a Risdon approach

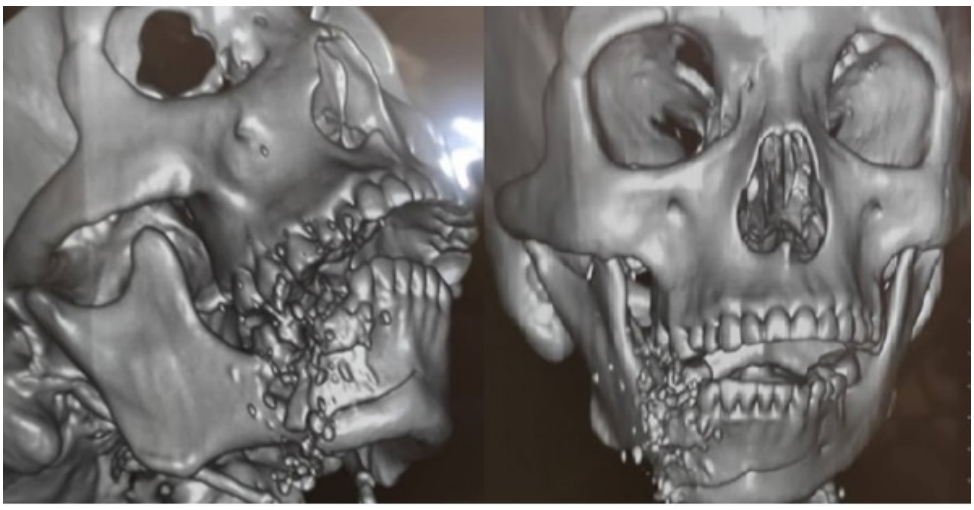

Figure 2. CT scan without contrast with 3D reconstruction of facial bones.

Figure 3. Mandible reconstruction and advance facial flap

on the neck. Loose pieces of bone without periosteum were removed from the wound and foreign bodies, which consisted of small pieces of bullet, which were not clear on the CT scan.

Intermaxillary fixation was performed to keep the bone in position and provide adequate occlusion. To treat the fractures a 2.4 mm reconstruction plate was placed on the fractures to reconstruct the mandibular body with a 2 mm titanium plate on the parasymphysis, fixed in place with screws 2mm and 1.5 mm respectively. Closure by layers of the periosteum, mucosa and the cheek muscles was done using vicryl 3-0. To reconstruct the facial skin defect, a flap was advanced from the parotid and neck region. Skin suture was done with nylon 4=0. (Figure 3).

The patient was kept in the hospital ward for two weeks after surgery to ensure proper dressing and to monitor the wound healing. Feeding was carried out using a nasogastric catheter until the wound was mostly healed and closed to avoid communication between the mouth and neck structures. After two weeks the patient was discharged and the nasogastric catheter was removed.

A review appointment was arranged every week. Unfortunately, a fistula developed on the skin close to the mandible inferior border after a month, due to suture reaction and it was removed with local anaesthesia. A piece of suture was found in relation with it. The patient progressed well, having an acceptable aesthetic and functional outcome. A CT scan was repeated to check the position of the plate and the bone healing process. (Figure 4).

DISCUSSION

Gunshot injuries of the face can be devastating often resulting in comminuted fractures of the affected bones and facial disfigurement. Many forms of treatment for this condition have been described. The closed reduction with intermaxillary fixation of the fractures has the advantage of preserving the periosteum with the maintenance of the blood supply and lower infection rate. However, the treatment time is longer, nutrition is restricted and hygiene is difficult.[8, 9]

Regarding the treatment by means of open reduction and internal fixation: it is extremely important to understand that the stage of wound debridement and removal of any and all tissues that appear to be unviable, be it part of soft or hard tissues, can dictate the success of treatment and risk of infection. In our case the debridement procedure was performed, making prognosis more favourable.[9, 10]

We used 2.0mm plates and screws to plate viable small fragments, and 2.4mm to treat large fractured fragments so to support all muscle-occlusal loads during mastication until bone consolidation. This type of fixation presents good functional results.[10, 11]

It is of fundamental importance to understand that because this trauma causes avulsion of soft and bone tissues leading to a high infection risk. Pre-operative antibiotics for at least seven days is advisable to combat infection and subsequent osteomyelitis. The antibiotics of first choice should include penicillins with beta-lactams, such as ampicillin + sulbactam or amoxicillin + potassium clavulanate or clindamycin

Figure 4. Patient appearance two months after surgery and follow up CT scan

plus metronidazole. In the case presented there was loss of bone with exposure of the intra-oral wound and because the wound was caused by a firearm, the antibiotic therapy protocol was carefully followed.[12]

Post-operative management is crucial bearing in mind the complexity of the surgical procedure and extensive tissue manipulation. There is a risk of generating severe oedema and later wound dehiscence and consequent infections even with antibiotic cover. Thus, supervision over the first two weeks postoperatively is essential, after which muscle physiotherapy is initiated through spatula therapy. The latter consists of exercises opening the mouth using a wooden tongue depressor and bi-digital mouth opening. This is essential for gaining amplitude in the mouth opening and avoiding excessive muscle fibrosis.

CONCLUSION

Facial fractures caused by firearms are of great complexity and an enormous challenge to maxillofacial surgeons in terms of initial management and reconstruction. Usually there is extensive damage to, and loss of, hard and soft tissue, the wounds are contaminated.

Within the world literature, there remains controversy concerning the approach to management. For the patient described in this report we adopted early surgical management with careful in-patient and out-patient monitoring. This resulted in a good functional outcome and aesthetic appearance.

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