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Research Article

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Facial Gunshot Trauma in Libya during The Last 10 Years

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ABSTRACT

The study was aimed to determine outline and presentation in terms of site of injury, airway, associated injuries; and management of facial gunshot trauma

In which, a total of 612 patients were treated during the last 10 years. Medical documentation of the patient was compiled. Our study based on our many previous studies from 2010 which focused on the facial gunshot trauma in Libya.

A total of 612 patients with gunshot wounds to the face were identified. Age ranged from 15 to 42 years with mean of 24+3.58 years. There were 694 bullet different calibers (7.62x39 mm, 9 mm, 12.5 mm, and 14.5 mm) & 4 land mine. All patients are males. 137 patients (22.4%) required airway management. The most frequent site involved was mandible in 441 patients (72%) while midface was involved in 171 patients (28%). Osteosynthesis were performed in 220 patients (36%), while 392 (64%) patients were managed conservatively. Out of 612 patients, 108 patients (17.6%) had some complications; trismus, sinusitis and infection, skin defect, posttraumatic osteomalytis, bone defect.

The most of patients with head and neck injuries required surgical intervention for treatment of their facial gunshot wounds. Primary treatment of soft and skeletal facial structures at the time of surgical debridement was possible in the majority of our patients. Early management and operative intervention for repair of the soft and skeletal facial structures leads to satisfactory results. Severe facial gunshot wounds frequently involve mandible and midface fractures with more likely requirement of establishment of emergency airway and open reduction and internal fixation (ORIF).

Keywords-*Internal iliac artery; Postpartum haemorrhage; Hysterectomy; Morbidly adherent placenta.*

INTRODUCTION

Management of facial gunshot wounds poses a challenge not only for the oral and maxillofacial surgeons but also for the reconstructive surgeons. Facial gunshot wounds bear a lot of morbidity for the affected patients.[1,2] Inordinate attention has been given in the past to wound classification based merely on the projectile's velocity.[1] These wounds can appropriately be classified as penetrating, perforating and avulsive wounds. Management of facial gunshot wounds has been evolving through ages from conservative delayed operative repair to early aggressive single stage approach.[1]

Penetrating and perforating wounds, mainly resulting from low velocity projectiles, are managed in the same way as blunt facial trauma, ranging from closed reduction to open reduction and internal fixation with minimal debridement and primary closure.[2,3] While management of avulsive wounds resulting from high velocity projectiles has been evolving through ages with controversies involving early and delayed reconstruction as it suffers an evolving type of tissue necrosis.[2,4,5] Recently Futran and colleagues have proposed a phased approach for management of avulsive wounds.[6]

The first phase involves evaluation of the ABC, life and limb threatening injuries, intracranial, ocular, facial nerve, vascular and other major injuries, excision of all necrotic tissue and maintenance of tissue of questionable prognosis, maintenance of occlusal relationships, maintaining mandibular segments with reconstructive plates and maxillary defects and soft tissue envelope with temporary bone grafts to avoid later tissue contracture. Pre-operative planning should also be done for anticipated definitive reconstruction with 3-D CT scan and stereo-lithography. Second phase involves definitive reconstruction which should be as early as possible (Figure 1).

The third phase focuses on aesthetic and functional refinements which may occur over weeks to years in which free flap debulking and contouring is required. Dental rehabilitation with tissue borne or implant borne prosthesis, additional cosmetics, facial prosthesis and tissue tattooing may be done.[6] The timing and sequence of different stages in the management of facial gunshot wounds with reconstruction and rehabilitation is of prime importance for successful aesthetic and functional outcomes, if inadequate may lead to graft rejection and frequent infection and as such multiple revisional operations.[7-9] With the development of microsurgical techniques and local tissue advancement to distant free flaps reconstruction, cosmetic and functional outcomes have markedly improved. Delayed definitive surgical

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management of the avulsive gunshot wounds in the past has given way to the early definitive management.[10-12] The objective of the study was to determine the pattern and presentation (site of injury, airway and associated injuries), implications for evaluation and management of patients with facial gunshot wound.

MATERIALS AND METHODS

This was an observational study carried out at A total of 612 patients were treated during the last 10 years by our surgical team in different hospitals in Libya. Medical documentation of the patient was compiled. Our study based on our many previous studies from 2010 about the head and neck gunshot trauma in Libya. All patients with gunshot wounds of the face were included by convenient sampling method. Patients were treated and operated by four participating services; maxillofacial surgeons, general surgeons, neurosurgeons and orthopedic surgeons.

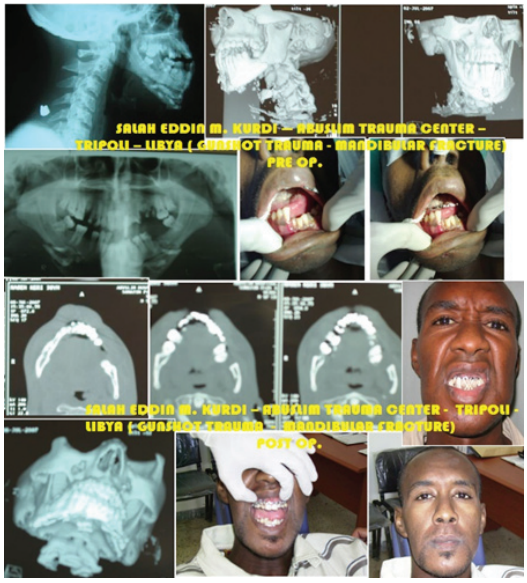

Figure 1: Gunshot trauma of mandible (pre & post)

Figure 2: Severe facial trauma as result of a landmine explosion

Most of those patients suffered gunshot wounds in the field and were managed initially there with normalization of vital signs and then referred to the study center for definitive management.

Figure 3: Mandibular fracture with bone & soft tissue defect

The face was identified to be from supraorbital margin to the chin inferiorly and the area anterior to the external auditory meatus. The entry site of projectile was further subdivided into 3 anatomic subsites i.e. midface, mandible (lower face) (Figures 2-4).

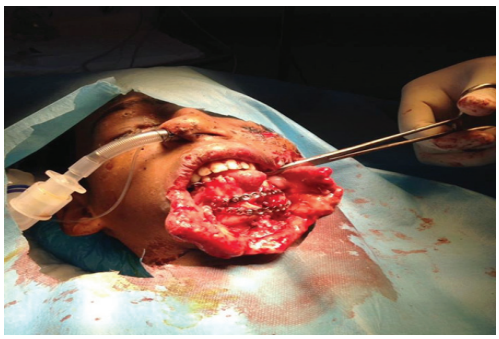

Figure 4: Open reduction and internal fixation of the mandibule

Gunshot wounds of the upper third of the face were excluded from the study due to neurological deficit. Patients with projectile entry site away from face like neck, chest etc. and secondarily involving face were excluded from the study. Data was analyzed by using SPSS version 10. Descriptive statistics were used to calculate the data. Mean and standard deviation were calculated for all quantitative variables like age.

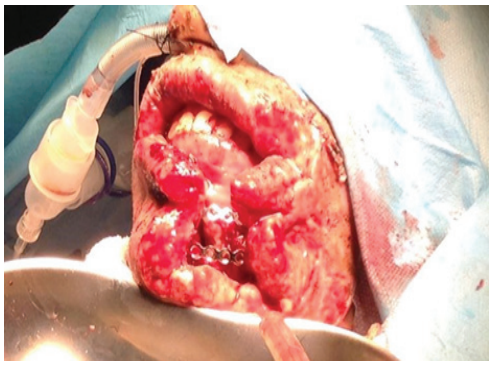

Figure 5: ORIF

Frequency and percentages were presented for qualitative variables like gender, entry site of projectile, emergency airway establishment by entry site, types of emergency airway, wounds with underlying bone fractures managed

with open reduction and internal fixation (ORIF), wounds managed conservatively, injury to associated structures (facial nerve, parotid, cranium, globe and vessel), wounds with bony reconstruction and complications following the management of those cases (Figures 5,6).

Figure 6: Closed the soft tissue defect by local flaps

RESULTS

There were a total of 612 patients with gunshot wounds to the face during the study period. Their age ranged from 15 to 42 years with mean age of 24+3.58 years. 258 patients with soft tissue injuries and 354 had soft and skeletal facial structures injuries.

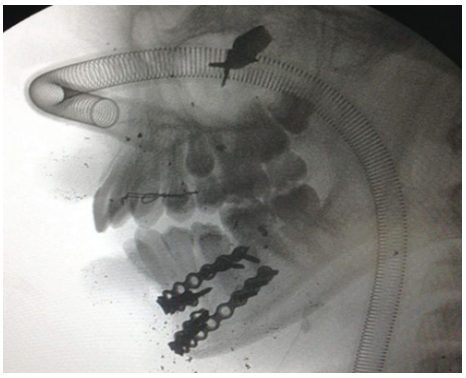

Figure 7: Foreign body in the left maxillary sinus

(intra operative picture by C-arm fluoroscopy)

All patients are males. The specific type of weapon used was unidentified (Figures 7, 8). Projectile entry site was divided into midface and mandible (lower face).

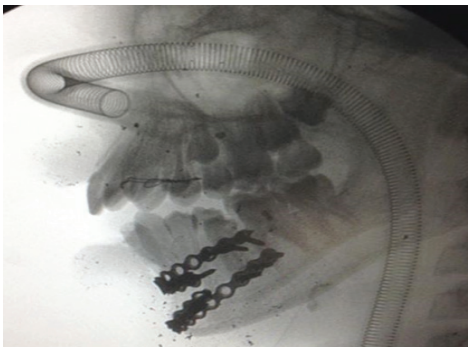

Figure 8: Foreign body has been removed from the left maxillary sinus (intra operative picture by C-arm fluoroscopy)

Out of 612 patients, 441 (72%) involved the mandible and 171 (28%) involved the midface Figure 9,10. Out of 441 patients with mandibular entry sites, 91 (20.6%) patients required emergency airway (Cricothyroidotomy, Tracheostomy), whereas out of 171 patients of midface entry sites, 32 (18.7%) patients required emergency airway (Cricothyroidotomy, Tracheostomy).

Figure 9: Sever facial soft tissue defect

Out of 612 patients, 413 (67.4%) patients required open reduction and internal fixation (ORIF) in the form of plating and trans-osseous wiring. Out of 441 patients with mandibular trauma, 318 (72.1%) treated by ORIF and 123 (27.9%) treated by closed reduction (Figure 11). Out of 171 patients with midface trauma, 89 (52%) treated by ORIF. (Open reduction & internal fixation).

Figure10: Facial soft tissue reconstruction

There were a total of 30 (4.9%) patients with injury of the facial nerve; 13 (43.3%) had complete transection of the nerve and 7 (23.3%) had neuropraxia.

Figure 11: Closed reduction by arch bar & elastic fixation

There were 23 (3.8%) patients with parotid injuries. Intracranial penetration was found in 25 (4.1%) patients. Globe was affected in 16 (2.6%) patients. There were 39 (6.4%) vascular injuries involving the facial artery.

Out of 612 patients, 43 (7.0%) underwent reconstruction. One patient with avulsion of complete midface and anterior mandible, reported with the complaints of ill-fitting dentures and poor aesthetics.

Delayed reconstruction was done with rib on-lay grafts and later on patient acquired good retention of his dentures. Out of those 43 patients, 9 (20.9%) patients underwent delay reconstruction with fibular free grafts.

Out of 612 patients, 61 (9.9%) patients suffered complications while 551 (90.1%) of the patients did not have any complications following management.

The complication included trismus, infection and sinusitis in 51 patients each; facial nerve palsy occurred in 8 and vision loss occurred in five patients.

There were 694 bullet different calibers (7.62x39 mm, 9 mm, 12.5 mm, and 14.5 mm) and 4 land mine.

DISCUSSION

Facial gunshot wounds and their management are very complex. Its management has to be refined with evolving projectiles and increasing incidence of new victims in Africa, South Asia to reduce morbidity. In this study the pattern of gunshot injury with respect to site, injury to associated structures, their management and complications (Figure 12-14).

Figure12: Mandibular fractures caused by gunshot

Figure 13: ORIF of the Mandibular fractures caused by gunshot

Figure 14: Patient at the 7th day post ORIF

Facial gunshot wounds are discussed. There are many classification systems for penetrating facial injuries but in this study entry site of facial gunshot wounds was divided into midface wounds (Figure 15), and lower third or mandible wounds as in other studies.[7,13]

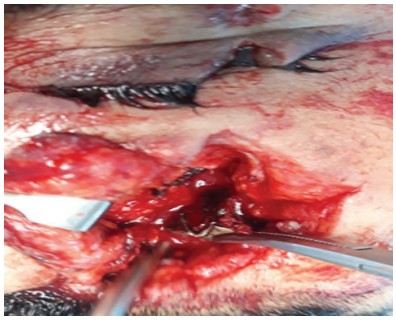

Figure 15: Foreign body removed from maxillary sinus left side

In all trauma patients securing the airway is very important. The airway of all patients with facial gunshot wounds is at the risk of collapse later on due to extensive necrosis associated with these wounds.

Studies reveal that gunshot wounds of lower face and especially with floor of the mouth entry sites are at increased risk of collapse and require emergency airway intervention.[10,14,15]

There are other studies which indicate that these patients may initially appear to have a stable airway but may decompensate rapidly due to extensive inflammatory edema associated with these wounds. They suggest airway intervention in both upper and lower jaw.[10,16,17]

Figure16: Sever facial trauma (bone and soft tissue defect)

A frequency of 39.3% for emergency airway establishment was found in this study which is greater as compared to other studies with frequency of 25% and 35%.[10]

The reason for increased frequency of emergency airway management was that the most frequent entry site was mandible. The airway of most of those patients was managed in the field by general surgeons before referral. The need for emergency airway management differed according to entry site, but this frequency 39.3% less than the frequency in our previous study 56.8%.[24]

ORIF (Figure 16-18) of the mandible 72.1% frequency in this study more than frequency in our previous study 67%.[24]

ORIF of the maxilla 52% frequency in this study more than frequency in our previous study 49%.[24]

Conservative treatment and closed reduction frequency in this study 32.5% less than frequency in our previous study 38.3%.[24]

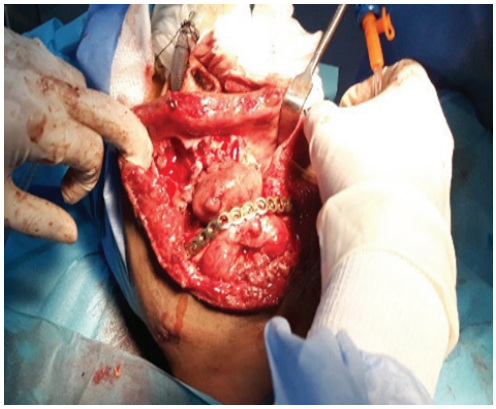

Figure 17: ORIF

20.6% of the patients with mandibular entry site required emergency airway (tracheostomy, Cricothyroidotomy) and it was also needed for later reconstructive surgeries. The airway of patients with facial gunshot wounds and especially those involving lower third of face must be managed immediately before either extensive edema or bleeding may cause life threatening emergency.

Figure 18: Close the soft tissue defect after ORIF

Facial gunshot wounds may result in injury of adjacent vital structures like facial nerve, globe, cranium, parotid gland and vascular structures. The kinetic energy of projectiles is very important.

Greater the velocity of projectile greater will be the necrosis around its track and as such increased risk of damage to adjacent structures.[18] The type of bullet and density and resilience of the tissue influence the degree of damage.[3,14]

In this study, all patients with globe injury were referred to the concerned specialist. All of these globe injuries occurred in patients with midface entry site. So patients with midface entry sites and possible involvement of globe should be referred to the ophthalmologist.

In this study, gunshot wounds were having almost equal frequency for cranial entry irrespective of entry site.

Plain face and lateral skull views should be immediately obtained in all patients to identify the path of projectile with no exit wound, to rule out potential intra-cranial penetration. Advanced imaging techniques should also be utilized to assess the potential damage of projectiles.

In this study, facial nerve injuries mainly involved distal branches which did not require repair. There were seven patients with neuropraxic injuries and were managed conservatively.

If there is need for frequent debridement than severed facial nerve branches should be tagged and repaired later on. 199 patients did not require open reduction and internal fixation (ORIF) of midface or mandible fracture which is in accordance with other studies.[14,18] The aim was to fix the unstable, grossly comminuted fractures with transosseus wires and with plates and screws in case reconstruction is later required. Maximum effort was done to remove the bullets and its secondary fragments because of early and delayed sequelae.[16,19,20]

Intraoperative C-arm fluoroscopy is recommended to check the final position of the bullet, because a bullet may move spontaneously even in paranasal sinuses.[15,21,22] Latest radiographic techniques may be used to avoid excessive radiation exposure associated with fluoroscopy.[8,22,23]

On the basis of patterns of injury, the importance of elective airway establishment is suggested in all facial gunshot patients especially with mandibular entry sites or if there is anticipated edema of airway. There must be multidisciplinary approach with active involvement of anesthetists, neurosurgeons, ophthalmic surgeons, vascular surgeons and otolaryngologists in addition to the oral and maxillofacial surgeons in the acute phase.

Path of projectile must be assessed by latest radiographic techniques for its potential damage to adjacent vital structures cranium, globe, parotid gland etc. Avulsive wounds should be managed in minimum number of stages and as early as possible if general condition of the patient precludes this to avoid the potential consequences of scar tissue on aesthetic and functional outcomes.

Complications encountered in these patients were

predominantly facial nerve palsy, sinusitis, trismus and infection requiring revisional operations.

CONCLUSION

All patient in this series required surgical intervention for treatment of their facial gunshot wounds. Primary treatment of soft and skeletal facial structures at the time of surgical debridement was possible in the majority of our patients. Early management and operative intervention for repair of the soft and skeletal facial structures leads to satisfactory results. Better pre-operative planning and early aggressive management approach towards facial gunshot wounds result in good functional and esthetic results with reduced morbidity.

Management of facial gunshot wounds is highly individualized depending upon patient presentation, general condition of the patient, available resources and experience of operating team in the management of such patients.

Facial gunshot wounds frequently involve mandible with more likely requirement of establishment of emergency airway and open reduction and internal fixation (ORIF). Facial gunshot wounds frequently involve mandible with more likely requirement of establishment of emergency airway and open reduction and internal fixation.

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