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The surgical management of facial trauma in British soldiers during combat operations in Afghanistan

Matthew Wordsworth, MRCS[a,b], Rachael Thomas, MRCS[a,c], John Breeze, PhD, MRCS, MFDS[a,c], Demetrius Evriviades, FRCS (Plast)[c], James Baden, FRCS (Plast)[a,c,*], Shehan Hettiaratchy, DM FRCS (Plast)[a,b]

[a] Academic Department of Military Surgery and Trauma, Royal Centre for Defence Medicine, United Kingdom
[b] Imperial College Healthcare NHS Trust, United Kingdom
[c] University Hospitals Birmingham NHS Foundation Trust, United Kingdom

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ABSTRACT

Introduction: The recent Afghanistan conflict caused a higher proportion of casualties with facial injuries due to both the increasing effectiveness of combat body armour and the insurgent use of the improvised explosive device (IED). The aim of this study was to describe all injuries to the face sustained by UK service personnel from blast or gunshot wounds during the highest intensity period of combat operations in Afghanistan.

Methods: Hospital records and Joint Theatre Trauma Registry data were collected for all UK service personnel killed or wounded by blast and gunshot wounds in Afghanistan between 01 April 2006 and 01 March 2013.

Results: 566 casualties were identified, 504 from blast and 52 from gunshot injuries. 75% of blast injury casualties survived and the IED was the most common mechanism of injury with the mid-face the most commonly affected facial region. In blast injuries a facial fracture was a significant marker for increased total injury severity score. A facial gunshot wound was fatal in 53% of cases. The majority of survivors required a single surgical procedure for the facial injury but further reconstruction was required in 156 of the 375 of survivors aero medically evacuated to the UK.

Conclusions: The presence and pattern of facial fractures was significantly different in survivors and fatalities, which may reflect the power of the blast that these cohorts were exposed to. The Anatomical Injury Scoring of the Injury Severity Scale was inadequate for determining the extent of soft tissue facial injuries and did not predict morbidity of the injury.

Background

As the weapons of war change so do the patterns of injury. In World War One the troops in the trenches sustained horrific facial injuries from shrapnel that required surgeons to try new combinations of techniques forming the basis of modern plastic surgery [1]. United Kingdom service personnel were operating in Afghanistan as part of International Security Assistance Forces (ISAF) from 2001 on Operation HERRICK. The Improvised Explosive Device (IED) was the defining weapon used against ISAF in this conflict; this caused higher rates of multiple amputations than previous conflicts [2,3,4]. Whilst much has been published on the blast injury patterns and outcomes to the limbs, it that has been shown that the Afghanistan conflict also generated a higher proportion of casualties with facial injuries [5–8].

Wade et al. [9] in their study of head, face and neck injuries in the last Iraq conflict postulated that the higher rates of these injuries was due to an increased proportion of blast injuries secondary to insurgent use of the improvised explosive device (IED). Tong and Beirne [10] in a systematic review of the Iraq and Afghanistan conflicts suggested that increased survivability of all injuries (due in part to combat body armour) and the lack of protection to the face were two further reasons for the increased incidence of facial trauma. Combat body armour needs to balance protection with mobility and capability, in the face it is particularly important but challenging to preserve auditory and spatial awareness. Breeze et al. identified the lower face as being

* Corresponding author at: Department of Plastic and Reconstructive Surgery, Queen Elizabeth Hospital, Birmingham, B15 2TH, United Kingdom.
E-mail address: James.baden@uhb.nhs.uk (J. Baden).

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particularly poorly protected and the potential for visors or mandibular guards to enhance protection [8,11].

Combat operations in Afghanistan finished in 2014. The aim of this study was to describe and compare all injuries to the face sustained by UK service personnel from blast or gunshot wounds during the highest intensity period of UK combat operations in Afghanistan. This would quantify the impact on the medical chain from point of injury, during evacuation, at the field hospital and the definitive surgical care. By examining the medical records of patients transferred back the UK for ongoing care it also aimed to determine injury patterns and the surgical reconstructive needs of survivors.

Patients and methods

The UK Joint Theatre Trauma Registry (JTTR) is a restricted database of all injuries sustained by British service personnel admitted to a Field Hospital on operations [12]. The JTTR uses the Abbreviated Injury Scale (AIS) as an anatomical scoring system to code every injury, the military version of AIS 2005 was used [13].

The face in the JTTR includes facial skin and soft tissues, the maxillofacial skeleton, eyes and ears. Injuries to the scalp, head and neck are separately coded. For the purpose of this study, the face was defined as the area anterior to the external auditory meatuses from the top of the forehead to the chin, the soft tissue injuries were further categorized into three zones, lower, middle and upper thirds: the chin to the base of the nose, the base of the nose to the eyebrows, above the brows respectively. The inclusion criteria were all casualties who sustained any facial injury by blast or gunshot wound mechanism in UK service personnel in the Afghanistan conflict, during the highest intensity of combat operations between 01 April 2006 until 01 March 2013.

The Clinical Information & Exploitation Team maintains the JTTR and all injuries are entered retrospectively by AIS certified nurses. Along with the injuries sustained, all airway and surgical procedures in Afghanistan were recorded. Data on the demographics, incident, pre-hospital emergency care, Injury Severity Score (ISS), hospital care in Afghanistan and subsequent care at the UK hospital was included.

All soldiers who required further treatment were aeromedically evacuated to the Royal Centre for Defence Medicine at the Queen Elizabeth's Hospital, Birmingham. The medical records, operative notes and clinic letters of this cohort were retrospectively studied.

The Medical Director of the Royal Centre for Defence Medicine and the University Hospitals Birmingham NHS trust gave permission for this study. Statistical analysis was performed using a statistical software package (Graphpad, CA, USA). Results were analysed for significance using Fisher's exact test and probabilities with $p < 0.05$ were considered statistically significant.

Table 1
Demographics of facial injury patients.

Demographic	Blast n	GSW n
Mean age	26 yrs	25 yrs
Service		
Army	431	54
Royal Marines & Royal Navy	59	6
Royal Air Force	14	2
Outcome		
Killed in Action	112	30
Died of Wounds	16	3
Wounded in Action	376	29
Mean Injury Severity Score (ISS)		
All casualties	26.7	40.7
Fatalities	64.4	66
Survivors	13.8	12

Table 2
Mechanism of injury.

	n
Improvised Explosive Device	378
Mine	40
Gunshot wound	62
Rocket Propelled Grenade	53
Grenade	14
Mortar	14
Other	5

Results

A total of 633 UK service personnel with facial injury were identified. Blast injury accounted for 563 of the facial injuries and gunshot wounds (GSWs) for 70. 59 blast injury casualties were excluded after suffering isolated tympanic membrane perforation and no other facial injury. 8 facial GSWs were excluded as the facial injury itself was not related to the GSW or miscoded. Therefore a total of 504 blast injuries and 62 GSWs were further studied. There were 405 survivors (wounded in action) with 375 returned to the UK for further medical treatment. Detailed information on groups of five or less casualties is not discussed to prevent identification of individuals in accordance with UK Ministry of Defence guidelines. The demographics of these patients are listed in Table 1.

Mechanism of injury

The predominant mechanism of injury in both survivors and fatalities was the IED. The type of gunshot injury was not specified. All mechanisms are listed in Table 2.

Pattern of injuries

Isolated injury to the face with no injuries to any other body region was uncommon in both blast (7% n = 36) and GSWs (16% n = 11) casualties. In blast injuries the most commonly associated body region injured with the face was the lower extremity, injured in 336/505 cases (66%). In casualties from blast the median number of total injuries across the body was 8 (range 1–57); the median affecting the face was 2 (range 1–9). In casualties from GSWs the median number of total injuries across the body was 7 (range 1–27) and the median number of facial injuries was 2 (range 1–8).

A facial fracture was a significant marker for more severe total body injury severity score in blast injury. In blast injuries the mean survivor ISS was 22.6 (± SD 2.1) with a fracture compared with a mean ISS of 11 (±0.7) without a fracture ($p < 0.001$). The mean fatality ISS was 68.13 (±1.5) with a fracture, the mean ISS was 58.5 (±2.2) without a fracture ($p < 0.001$). This pattern was not seen in the GSW cohort, there was no correlation between facial fracture and overall injury severity score

The mandible was the most frequently fractured bone in 118 of the 556 facial injuries studied. In blast survivors, the orbit was the most frequently fractured bony complex in 34 cases (these fractures were not sufficiently coded via AIS to differentiate the different bone components of the orbit). In GSWs the mandible was the most commonly fractured bone of the face.

Fig. 1 below demonstrates the number of fractures by bones or bony complexes for blast injuries and gunshot wounds.

The fractures were grouped into the upper, middle and lower thirds of the face. Blast injuries survivors had predominantly mid-facial injuries compared with fatalities that were predominantly lower third facial injuries. Fatalities were more likely to be injured in multiple facial zones and have associated head injuries (concurrent head injury in 86% fatalities v 28% in survivors).

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