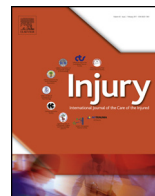




Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury



The burden of gunshot wounding of UK military personnel in Iraq and Afghanistan from 2003–14

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ARTICLE INFO

Article history:

Accepted 24 March 2018

Keywords:

Ballistic
Gunshot
Wounding
Epidemiology
Military

ABSTRACT

Introduction: Gunshot wounding (GSW) is the second most common mechanism of injury in warfare after explosive injury. The aim of this study was to define the clinical burden of GSW placed on UK forces throughout the recent Iraq and Afghanistan conflicts.

Methods: This study was a retrospective review of data from the UK Military Joint Theatre Trauma Registry (JTTR). A JTTR search identified records within the 12 year period of conflict between 19 Mar 2003 and 27 Oct 2014 of all UK military GSW casualties sustained during the complete timelines of both conflicts. Included cases had their clinical timelines and treatment further examined from time of injury up until discharge from hospital or death.

Results: There were 723 casualties identified (177 fatalities, 546 survivors). Median age at the time of injury was 24 years (range 18–46 years), with 99.6% of casualties being male. Most common anatomical locations for injury were the extremities, with 52% of all casualties sustaining extremity GSW, followed by 16% GSW to the head, 15% to the thorax, and 7% to the abdomen. In survivors, the rate of extremity injury was higher at 69%, with head, thorax and abdomen injuries relatively lower at 5%, 11% and 6% respectively. All GSW casualties had a total of 2827 separate injuries catalogued. A total of 545 casualties (523 survivors, 22 fatalities) underwent 2357 recorded surgical procedures, which were carried out over 1455 surgical episodes between admission to a deployed medical facility and subsequent transfer to the Royal Centre for Defence Medicine (RCDM) in the UK. This gave a median of 3 (IQR 2–5) surgical procedures within a median of 2 (IQR 2–3) surgical episodes per casualty. Casualties had a combined length of stay (LoS) of 25 years within a medical facility, with a mean LoS in a deployed facility of 1.9 days and 14 days in RCDM.

Conclusion: These findings define the massive burden of injury associated with battlefield GSW and underscore the need for further research to both reduce wound incidence and severity of these complex injuries.

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Introduction

Between 2003 and 2014, UK military forces were engaged in conflicts in Iraq and Afghanistan. Gunshot wounding (GSW) was shown to be the second most common mechanism of injury (MOI) for UK personnel in warfare after injury from explosive weapons in these prolonged conflicts [1]. It has also been demonstrated however, that GSW form a much greater proportion of injuries

during the initial phases of military operations i.e. ‘theatre entry’ operations [1,2].

While a substantial proportion of recent UK military research has focused on blast injury [3–7], there has been far less examination of GSW. There are several studies from the USA looking at gunshot wounding epidemiological data within US military casualties throughout the same conflict period from Iraq and Afghanistan [8–14], and although some recent UK studies have examined other aspects of combat injury from Iraq and Afghanistan [1,15–17], the burden and injury pattern of GSW to UK military personnel throughout the Iraq and Afghanistan conflict period has not previously been examined.

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Quantifying the burden of injury is challenging; while mortality is clearly an extremely important measure, the use of mortality alone fails to capture the efforts required in treating survivors of GSW. Patient reported outcomes (PROMs) have been used to measure 'recovery', but only in specific injury sub-groups [18,19]. Whilst PROMs do represent a measure of the success of reconstructive and rehabilitative efforts, the resources required in this process are not captured. This study therefore seeks to measure the injury burden of caring for large numbers of GSW casualties by examining the resources involved in their care. This has significant relevance for those in both the military and civilian sectors within the UK who may need to plan for the care of large numbers of GSW casualties.

The aim of the current study was to characterise the spectrum of GSW injuries and define their clinical burden in UK forces from the conflicts in Iraq and Afghanistan between 2003 and 2014.

Patients and methods

This study was a retrospective review of registry data using the UK Military Joint Theatre Trauma Registry (JTTR). Ethical approval was obtained (CURES/2076/2016).

The JTTR prospectively captures data on all trauma cases admitted to deployed UK military medical facilities who trigger a 'trauma alert', or are subsequently repatriated for treatment of their injuries [20]. The JTTR is operated by UK Defence Statistics (UKDS) and injuries are coded according to the 2005 military version of the Abbreviated Injury Scale (AIS) [21] by Trauma Nurse Coordinators in both deployed and UK medical treatment facilities. It is important to note that as per the AIS system, a single GSW can result in several injuries being coded separately.

The JTTR was searched to identify records of all UK military casualties sustaining GSW during the Iraq and Afghanistan campaigns within the 12 year period of conflicts between 2003 and 2014. The dates were chosen to cover the invasion of Iraq on the 19th March 2003 and cessation of major combat operations by UK Forces in Afghanistan on the 27th October 2014, thus spanning the totality of both campaigns. The term 'casualty' refers to both those killed and those who were injured and survived. Killed in Action (KIA) and Killed Non-Enemy Action (KNEA) refers to those who died before receiving medical care; Died of Wounds (DoW) refers to those who die after reaching medical care. Wounded in Action (WIA) and Wounded Non-Enemy Action (WNEA) refers to those survivors whom received medical care for their injuries (Table 2). Data on GSW casualties was extracted to establish their clinical timelines and surgical treatment between injury up until discharge from hospital or death. The relationship between anatomical injury location and probability of survival was also assessed using the chi-squared test [22] and binomial confidence intervals [23] with a null hypothesis of no association between them.

To put casualty numbers in proportion to the number of deployed UK troops exposed to risk, Population Years at Risk (PYAR) figures were calculated for the study period. From UKDS data between 2008 and 14, the PYAR was based on computerised records of every day spent in either of the two operational theatres by each UK service person. These figures were summed for each calendar year and divided by 365 to give the PYAR i.e. the equivalent number of personnel deployed for 12-months. For 2003–7, detailed pay records were not available, therefore the information was extrapolated from Ministry of Defence (MoD) figures on troop levels contained in memoranda to the UK Parliament and is regarded as less precise [24].

A surgical procedure was defined as any procedure undertaken by surgical teams to treat a casualty's wounds. Whilst the majority (92%) of this data set involved formal surgical procedures with at

least one surgeon conducting the procedure, the remaining 8% of the data also included procedures such as central line insertion and dressing changes, which still required the use of personnel and resources within the operating theatre environment.

A surgical episode was defined as any visit to the operating theatre for a casualty under the care of a surgical team, where single or multiple procedures could take place within each surgical episode.

Length of stay (LoS) was defined as the amount of time in days spent within any medical treatment facility, worldwide, from the time of injury up until their discharge from the Role 4 treatment facility in the Royal Centre for Defence Medicine (RCDM), Birmingham, UK. This did not include any subsequent readmissions to RCDM following their initial discharge, and also did not include any time spent by casualties undertaking rehabilitation either with their home unit medical centres or at Defence Medical Rehabilitation Centre (DMRC) Headley Court.

Results

Over the 12-year study period, there were 2986 British military casualties recorded in the JTTR. Explosive weapons remained the most frequent MOI, responsible for 1694 casualties, or 57% of the total. The second most common MOI was GSW with 723 (24%) of the total casualties with further detail on MOI given in Table 1. Amongst the GSW casualties, there were 177 fatalities and 546 injured survivors. With GSW casualties representing the group of interest to this study, those injured by other mechanisms will not be discussed further.

The breakdown of casualties with GSW sustained by conflict location and by military casualty classification is summarised in Table 2. The median age of GSW casualties at the time of injury was 24 years (range 18–46 years), with all but three casualties being male. The proportion of GSW casualties sustained against all deployed UK troops in the form of PYAR data shows the variation in casualty numbers per year of the study period (Table 3). The worst year of conflict during the study period for GSW casualties, both survivors and fatalities, was 2010 where there were over 14 GSW casualties per 1000 PYAR (140 survivors, 31 fatalities).

In terms of numbers of casualties, the different anatomical locations of injury were catalogued (Table 4) where the most

Table 1
Mechanism of injury data.

MOI	Number
Explosive	1694
GSW	723
MVC	163
Fall	111
Other	93
Crush	71
Aircraft Incident	67
Burn	43
Assault	21
Total	2986

MVC = Motor Vehicle Collision.

Table 2
GSW casualty classification.

Casualty classification	Iraq	Afghanistan	Total
KIA/KNEA	38	115	153
DoW	11	13	24
WIA/WNEA	71	475	546
Total survivors	71	475	546
Total fatalities	49	128	177
Total casualties	120	603	723

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