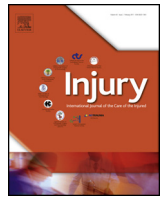




Contents lists available at [ScienceDirect](#)

Injury

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



Gun-shot injuries in UK military casualties – Features associated with wound severity ^{☆,☆☆}

Jowan G. Penn-Barwell ^{a,*}, Ian D. Sargeant ^b, J.G. Penn-Barwell ^c, P.M. Bennett ^c, C.A. Fries ^c,
J.M. Kendrew ^c, M. Midwinter ^c, J. Bishop ^c, R.F. Rickard ^c, I.D. Sargeant ^c, K. Porter ^c,
T. Rowlands ^c, A. Mountain ^c, A. Kay ^c, D. Mortiboy ^c, T. Stevenson ^c, R.W. Myatt ^c,
On behalf of the Severe Lower Extremity Combat Trauma (SeLECT) Study Group

^a Institute of Naval Medicine, Trauma and Orthopaedic Registrar Royal Navy, United Kingdom

^b Queen Elizabeth Hospital, Birmingham, United Kingdom

^c RCDM/Queen Elizabeth's Hospital, Birmingham, United Kingdom

ARTICLE INFO

Article history:

Accepted 7 February 2016

Keywords:

Gun-shot wounds
Ballistics
Firearms
Combat war
Injuries
Debridement

ABSTRACT

Introduction: Surgical treatment of high-energy gun-shot wounds (GSWs) to the extremities is challenging. Recent surgical doctrine states that wound tracts from high-energy GSWs should be laid open, however the experience from previous conflicts suggests that some of these injuries can be managed more conservatively. The aim of this study is to firstly characterise the GSW injuries sustained by UK forces, and secondly test the hypothesis that the likely severity of GSWs can be predicted by features of the wound.

Methods: The UK Military trauma registry was searched for cases injured by GSW in the five years between 01 January 2009 and 31 December 2013: only UK personnel were included. Clinical notes and radiographs were then reviewed. Features associated with energy transfer in extremity wounds in survivors were further examined with number of wound debridements used as a surrogate marker of wound severity.

Results: There were 450 cases who met the inclusion criteria. 96 (21%) were fatally injured, with 354 (79%) surviving their injuries. Casualties in the fatality group had a median New Injury Severity Score (NISS) of 75 (IQR 75–75), while the median NISS of the survivors was 12 (IQR 4–48) with 10 survivors having a NISS of 75. In survivors the limbs were most commonly injured (56%). 'Through and through' wounds, where the bullet passes intact through the body, were strongly associated with less requirement for debridement ($p < 0.0001$). When a bullet fragmented there was a significant association with a requirement for a greater number of wound debridements ($p = 0.0002$), as there was if a bullet fractured a bone ($p = 0.0006$).

Conclusions: More complex wounds, as indicated by the requirement for repeated debridements, are associated with injuries where the bullet does not pass straight through the body, or where a bone is fractured. Gunshot wounds should be assessed according to the likely energy transferred, extremity wounds without features of high energy transfer do not require extensive exploration.

Crown Copyright © 2016 Published by Elsevier Ltd. All rights reserved.

[☆] The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Ministry of Defence or Her Majesty's Government.

^{☆☆} This work has previously been presented at the Combined Services Orthopaedic Society Conference, Newcastle, UK, May, 2015.

* Corresponding author at: Institute of Naval Medicine, Gosport, Hampshire, United Kingdom. Tel.: +44 07810867555.

E-mail address: jowan@doctors.net.uk (J.G. Penn-Barwell).

<http://dx.doi.org/10.1016/j.injury.2016.02.004>

0020-1383/Crown Copyright © 2016 Published by Elsevier Ltd. All rights reserved.

Introduction

Gun-shot wounds (GSWs) are the second most common mechanism of injury on the battlefield after those from explosive weapons [1]. In civilian settings GSWs are typically a result of low-energy firearms (hand-guns) and shot guns [2,3]. Higher-energy firearms such as those used in military conflicts can produce more complicated wounds due to the potential for greater amounts of energy to be transferred from the projectile into body tissues.

Please cite this article in press as: Penn-Barwell JG, et al. Gun-shot injuries in UK military casualties – Features associated with wound severity. Injury (2016), <http://dx.doi.org/10.1016/j.injury.2016.02.004>

Military surgeons have an obvious expectation that they will be treating such injuries. However, in recent years the proliferation of civil conflicts in Iraq, Syria, North Africa and the Ukraine together with terrorist mass shootings in Paris and Mumbai have meant that civilian orthopaedic surgeons in these countries have been required to care for patients with high-energy GSWs with little or no preparation or training.

Management decisions regarding the surgical treatment of high-energy GSWs to the extremities can be challenging. It is recognised that the size of external wounds can belie the extent of deeper tissue damage [4]. Some authors have therefore recommended that the bullet tract of GSWs from high-energy, military firearms should be surgically laid open and damaged tissue along its length excised [5,6].

GSWs are not homogeneous however and high-energy firearms do not necessarily produce 'high-energy' GSWs. Fundamental to understanding the nature of GSWs is the recognition that it is not the kinetic energy possessed by the projectile when it strikes the body that dictates the severity of the wound, but the amount it transfers into the tissues.

Based on the results of experimental studies, some features of GSWs are likely to be predictive of transfer of greater amounts of energy. We hypothesise features of higher-energy transfer will be associated with a requirement for a greater number of debridements.

The aim of this study is to firstly characterise the gun-shot injuries sustained by UK forces and secondly, test the hypothesis that the likely severity of GSWs can be predicted by features of the wound.

Methods

This is a retrospective study approved by and registered with the UK Joint Medical Command. The UK Joint Theatre Trauma Registry (JTTR) is an electronic database that prospectively gathers data on casualties sustained overseas and is administered by UK Defence Statistics. Data are gathered on all casualties either killed immediately or who are injured and trigger a trauma alert on arrival at a deployed medical facility, or those whose injuries subsequently require repatriation to the UK. Injuries are coded according to the 2005 Military version of the Abbreviated Injury Scale (AIS) [7]. The data is collected by research nurses at deployed medical facilities and at the Royal Centre for Defence Medicine (RCDM), Birmingham, United Kingdom [8].

The registry was searched for cases injured by GSW in the five years between 01 January 2009 and 31 December 2013: only UK personnel were included. Casualty demography, Abbreviated Injury Scale (AIS) coding [9] and New Injury Severity Score (NISS) were recorded from the JTTR with NISS used as a measure of overall injury [10]. Clinical notes and radiographs were then reviewed.

Radiographs and/or CT scans taken immediately at time of presentation and prior to initial surgical treatment were reviewed to determine the bullet fragmentation or retention. A complete through-and-through GSW was one with two wounds and no fragments or complete bullet retained. A partial through-and-through GSW was one with two wounds and fragments of a partial bullet. GSWs with only an entry wound were divided into retained intact bullets, and retained complete fragments.

Cases with GSWs to the limbs and pelvis were examined in greater detail. Bones were counted as fractured even if they had fragments 'chipped-off' but still retained their overall integrity. Fractures of multiple small bones (i.e. metatarsals) in the same limb were counted as a single injury cohort and recorded collectively.

Surgical episodes that involved debridement of tissue were recorded separately from those involving fixation or any other procedure, i.e. if a procedure involved debridement and fixation it was recorded, but purely fixation procedures were not. The number of surgical debridements required to treat each wound was regarded as a surrogate marker for wound severity.

The following wound variables were examined in the limb/pelvis GSW cohort for their association with the number of surgical debridements each wound required:

1. Presence of bony fracture.
2. Evidence of bullet fragmentation, in soft tissues or following bone strike.
3. Complete through-and-through wound with no retention of bullet components.

Analysis

Data was presented as a median with an inter-quartile range. Dichotomous variables were compared using Pearson's Chi-squared test using a 2×7 contingency table and Graph Pad Prism V6 (La Jolla, California, USA). A threshold for significance was set at 0.05.

Results

There were 450 cases which met the inclusion criteria. The median age of those injured was 24 (IQR 21–28), and all but 2 cases (0.4%) were male. Ninety-six (21%) were fatally injured, with 354 (79%) surviving their injuries. The median NISS of the casualties in the fatality group was 75 (75–75) with 20 having a NISS < 75, while the median NISS of the survivors was 12 (IQR 4–48) with 10 survivors having a NISS of 75, all of whom had penetrating head injuries [10].

Overall, the chest was the most common region injured according to AIS coding [7]. In survivors the limbs were most commonly injured. Full breakdown of injured regions is shown in Table 1.

Of the non-fatal cases 29 (8%) clinical records were unavailable. Two hundred and ninety of the survivors with full records (62%) were shot only once, with 35 cases shot multiple times, including those who sustained injuries to more than one anatomic region from a single bullet.

Of the 325 survivors with full records, 236 had GSWs to the limbs and pelvis with Fig. 1 showing more detail of GSW distribution in the limbs and pelvis. The median length of hospital stay in this group was 9 days (IQR 6–19).

One hundred and thirty four (57%) of GSWs to the limbs or pelvis involved fractures, all of which are, by definition, open. The femur, humerus and tibia were the most commonly fractured bones with further detail given in Fig. 1.

Table 1
Regional distribution of GSWs in all casualties.

	Fatalities	Survivors	All wounds
Head	220 (26%)	52 (6%)	272 (16%)
Face	67 (8%)	65 (7%)	132 (8%)
Neck	66 (8%)	22 (2%)	88 (5%)
Chest	269 (31%)	133 (15%)	402 (23%)
Abdomen	102 (12%)	68 (8%)	170 (10%)
Spine	55 (6%)	53 (6%)	108 (6%)
Upper limb	37 (4%)	190 (22%)	227 (13%)
Lower limb	38 (4%)	300 (34%)	338 (19%)
Total wounds	854	883	1737

Download English Version:

<https://daneshyari.com/en/article/6082820>

Download Persian Version:

<https://daneshyari.com/article/6082820>

[Daneshyari.com](https://daneshyari.com)