Injury, Int. J. Care Injured xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Injury

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

# Combat-related acetabular fractures: Outcomes of open versus closed injuries

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ARTICLE INFO

*Keywords:*
Open
Fracture
Acetabulum
Combat
Transfusion
Amputation
Heterotopic ossification

ABSTRACT

*Introduction:* Since the onset of the Global War on Terror close to 50,000 United States service members have been injured in combat, many of these injuries would have previously been fatal. Among these injuries, open acetabular fractures are at an increased number due to the high percentage of penetrating injuries such as high velocity gunshot wounds and blast injuries. These injuries lead to a greater degree of contamination, and more severe associated injuries. There is a significantly smaller proportion of the classic blunt trauma mechanism typically seen in civilian trauma.

*Methods:* We performed a retrospective review of the Department of Defense Trauma Registry into which all US combat-injured patients are enrolled, as well as reviewed local patient medical records, and radiologic studies from March 2003 to April 2012. Eighty seven (87) acetabular fractures were identified with 32 classified as open fractures. Information regarding mechanism of injury, fracture pattern, transfusion requirements, Injury Severity Score (ISS), and presence of lower extremity amputations was analyzed.

*Results:* The mechanism of injury was an explosive device in 59% (n = 19) of patients with an open acetabular fracture; the remaining 40% (n = 13) were secondary to ballistic injury. In contrast, in the closed acetabular fracture cohort 38% (21/55) of fractures were due to explosive devices, and all remaining (n = 34) were secondary to blunt trauma such as falls, motor vehicle collisions, or aircraft crashes. Patients with open acetabular fractures required a median of 17units of PRBC within the first 24 h after injury. The mean ISS was 32 in the open group compared with 22 in the closed group (p = 0.003). In the open fracture group nine patients (28%) sustained bilateral lower extremity amputations, and 10 patients (31%) ultimately underwent a hip disarticulation or hemi-pelvectomy as their final amputation level.

*Discussion:* Open acetabular fractures represent a significant challenge in the management of combat-related injuries. High ISS and massive transfusion requirements are common in these injuries. This is one of the largest series reported of open acetabular fractures. Open acetabular fractures require immediate damage control surgery and resuscitation as well as prolonged rehabilitation due to their severity. The dramatic number of open acetabular fractures (37%) in this review highlights the challenge in treatment of combat related acetabular fractures.

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## Introduction

After over one decade of combat operations in Operations Iraqi Freedom and Enduring Freedom (OIF/OEF) there have been greater than 50,000 service members wounded in action [1]. The incidence of combat related extremity trauma has been well documented, with a 54–88% incidence of extremity trauma among those wounded in action [2]. Almost 82% of extremity fractures in combat are open fractures, much higher than that often seen in a civilian trauma setting [1,2]. This is likely due to the penetrating, or outside-in mechanism of combat-related injuries- namely blast and high-velocity gunshot. With a generally increased rate of open fractures in general, we would anticipate a similarly increased number of open acetabular fractures. No attempt to characterize the nature of acetabular fractures in these conflicts has been

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https://doi.org/10.1016/j.injury.2017.11.035
0020-1383/Published by Elsevier Ltd.

published. Fractures of the acetabulum can have a devastating impact on a patient's quality of life, with many patients left with debilitating posttraumatic arthritis and infection. Poor long-term outcomes have been associated with associated injuries, inadequacy of reduction, and weak hip musculature [3–6].

With the advent of improved body armor and improved medical evacuation systems there has been an increase in the number of service members surviving injuries, which would previously have been fatal. This has led to orthopaedic surgeons treating an increased number of acetabular fractures. Acetabular fractures also represent a devastating injury, which service members sustain in Iraq and Afghanistan. The previous reports detailing extremity injuries did not report on pelvic girdle trauma, including acetabular fractures [1,2]. This study represents one of the first case series to detail the treatment strategies and outcomes of open acetabular fractures, particularly after blast-induced trauma.

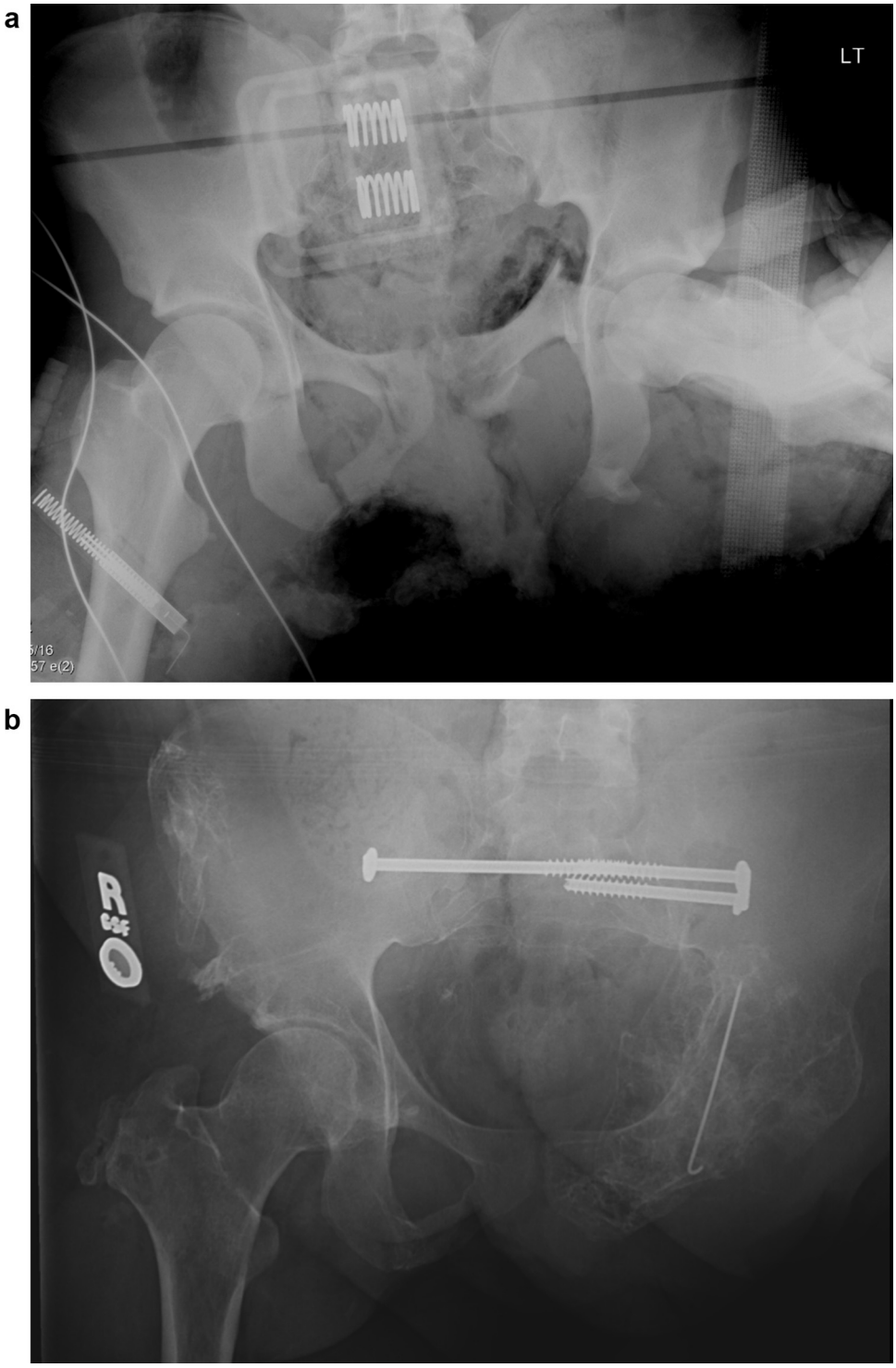


**Fig. 1.** a. Radiograph demonstrating a left sided acetabular fracture. This patient sustained an open injury as a result of a blast mechanism with significant soft tissue loss as well as an associated pelvic ring injury. b. Subsequent radiograph of the same patient demonstrating progression to a hip disarticulation with fixation of the posterior pelvic ring and heterotopic ossification formation around the right acetabulum.

Please cite this article in press as: R.L. Purcell, et al., Combat-related acetabular fractures: Outcomes of open versus closed injuries, Injury (2017), https://doi.org/10.1016/j.injury.2017.11.035