



Quality of life after major trauma with multiple rib fractures



Silvana Marasco^{a,*}, Geraldine Lee^a, Robyn Summerhayes^a, Mark Fitzgerald^b, Michael Bailey^c

^a CJOB Cardiothoracic Surgery Department, The Alfred Hospital, Australia

^b Trauma Service, The Alfred Hospital, Australia

^c Department of Epidemiology & Preventive Medicine, Monash University, Australia

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ABSTRACT

Introduction: Rib fractures are a common injury presenting to major trauma centres and community hospitals. Aside from the acute impact of rib fracture injury, longer-term morbidity of pain, disability and deformity have been described. Despite this, the mainstay of management for the vast majority of rib fracture injuries remains supportive only with analgesia and where required respiratory support. This study aimed to document the long-term quality of life in a cohort of major trauma patients with rib fracture injury over 24 months.

Methods: Retrospective review (July 2006–July 2011) of 397 major trauma patients admitted to The Alfred Hospital with rib fractures and not treated with operative rib fixation.

The main outcome measures were quality of life over 24 months post injury assessed using the Glasgow Outcome Scale Extended and SF12 health assessment forms and a pain questionnaire.

Results: Assessment over 24 months of major trauma patients with multiple rib fractures demonstrated significantly lower quality of life compared with published Australian norms at all time points measured. Return to work rates were poor with only 71% of those who were working prior to their accident, returning to any work.

Conclusions: This study demonstrates a significant reduction in quality of life for rib fracture patients requiring admission to hospital, which does not return to the level of Australian norms for at least two years.

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Background

Rib fractures are a common injury presenting to both major trauma centres and community hospitals. Rib fracture injuries extend across a broad spectrum of severity from a single fractured rib which may be sustained in a fall or sporting injury, to multiple fractured ribs resulting in a flail chest with paradoxical chest wall movement and respiratory failure. Fractured ribs are present in approximately 21% of patients admitted to trauma centres with blunt chest trauma [1]. Mortality rates of up to 33% have been reported for flail chest injury reflecting the high impact nature of the injury as well as associated life threatening injuries such as

splenic or liver lacerations [2]. Aside from the acute impact of rib fracture injury, longer-term morbidity of pain, disability and deformity have been described [3,4]. Despite this, the mainstay of management for the vast majority of rib fracture injuries remains supportive only with analgesia and where required respiratory support. However, in many patients this acute management does not address the potential longer-term morbidity of such injuries.

The aim of this study was to examine the long-term morbidity and quality of life outcomes in a single centre cohort of rib fracture patients over 24 months post injury.

Methods

Morbidity and quality of life data were collected from a consecutive cohort of patients from The Alfred Hospital, Australia. The Alfred Hospital is one of two adult major trauma services in the state of Victoria, Australia. Approximately 1200 major trauma patients are treated at The Alfred each year with an overall mortality of 8%. Approximately 600 major chest trauma patients

* Corresponding author at: CJOB Cardiothoracic Department, The Alfred Hospital, Commercial Road, Prahran 3181, Australia. Tel.: +61 390762558.

E-mail addresses: s.marasco@alfred.org.au (S. Marasco), gerry.lee@kcl.ac.uk (G. Lee), r.summerhayes@alfred.org.au (R. Summerhayes), m.fitzgerald@alfred.org.au (M. Fitzgerald), michael.bailey@med.monash.edu.au (M. Bailey).

are treated each year with a mortality of approximately 5%. The Alfred Hospital data were collected from Traumanet – a prospective database on all trauma patients admitted to the hospital. All the patients admitted to the hospital between July 2006 and July 2011 with major thoracic trauma and a diagnosis of multiple fractured ribs were considered for inclusion in this cohort. Patients not classified as major trauma, or with a single fractured rib or who were treated for fractured ribs in the emergency department without being admitted to the hospital were not included in this group. Patients who underwent operative fixation of their fractured ribs were excluded. Follow-up data were collected on the enrolled patients by the Victorian State Trauma Registry (VSTR). Institutional ethics approval was granted and the requirement for individual patient consent was waived. Data are prospectively collected into the VSTR and Traumanet databases with a retrospective opt out consent process in place. VSTR has ethics approval from all trauma receiving hospitals in the state and Alfred Hospital institutional ethics approval has been given for the collection of data in the Traumanet database. Thus major trauma patients received by other regional hospitals and transferred to The Alfred were also included in this cohort.

VSTR data are collected by telephone interview with either the patient or by proxy. VSTR collects data about all major trauma patients in the state with major trauma being defined as any of:

- 1) death after injury;
- 2) an Injury Severity Score (ISS) > 15;
- 3) an intensive care unit (ICU) stay > 24 h, requiring mechanical ventilation for at least part of their ICU stay;
- 4) urgent surgery for intrathoracic, intracranial, intra-abdominal procedures, or fixation of pelvic or spinal fractures [5].

The instruments used are the Glasgow Outcome Scale Extended (GOS-E), the twelve-item short form (SF-12) health survey, and a pain questionnaire using a numerical rating scale for pain ranging from 0 (no pain at all) to 10 (worst possible pain). The GOS-E provides a global measure of function taking into account domains such as social and leisure activities, relationships, return to work, self care and mobility in the community, and is rated on a scale of 1 (death) to 8 (upper good recovery) (Table 1) [6]. Follow-up rates in the database have been reported as 86%, 83% and 82% for 6 months, 12 months and 24 months, respectively [5]. The Abbreviated Injury Score 2008 version (AIS08) has been used in this dataset.

446 consecutive major trauma patients who were admitted to The Alfred Hospital with multiple fractured ribs over the five-year review period were identified. VSTR collects data on major trauma patients only, and so only major trauma patients are included in

Table 1
Glasgow Outcome Scale-Extended [6].

1	Dead
2	Vegetative State
3	Lower Severe Disability (carer required for all activities of daily living)
4	Upper Severe Disability (able to look after themselves for up to 8 h per day but unable to perform tasks out of the house such as shopping without assistance)
5	Lower Moderate Disability (able to shop, drive or use public transport without assistance but unable to work or study, and rarely participates in social or leisure activities)
6	Upper Moderate Disability (able to shop, drive or use public transport without assistance and able to work or study but at a reduced capacity. Extensive restriction to social or leisure activities)
7	Lower Good Recovery (returned to preinjury work or study capacity but still reporting some disruption to social and leisure activities)
8	Upper Good Recovery (essentially no problems relating to their injury that affect daily life)

this analysis. Furthermore, the fractured ribs may not necessarily have been the primary diagnosis. Twenty-six patients underwent rib fixation over the time period of this review as part of a pilot study and a randomised controlled trial and have been excluded from this analysis [7,8]. Follow-up data were missing or incomplete on 23 patients leaving 397 patients in the analysis. To separate out those patients in whom other injuries may have dictated their outcomes, the cohort of 397 patients was divided into those in whom the thoracic injury was the primary diagnosis (coded as a thoracic AIS08 ≥ 3 out of 5 without a score ≥ 3 in any other body region) (“Thoracic group”). The remainder of the patients had a thoracic AIS08 score ≥ 3 but also had an AIS08 score ≥ 3 in another body region (“Multi-trauma group”).

A flail segment was defined as three or more consecutive ribs fractured in more than one place leading to a floating segment of chest wall. The diagnosis was primarily made on radiological evidence. However, the clinical finding of paradoxical chest wall motion in the setting of multiple fractured ribs was also recorded as a flail chest.

Statistical analysis

Univariate analysis was conducted using continuity adjusted chi-square tests for equal proportion, Student's *t*-tests or non-parametric tests where appropriate with results presented as numbers (percentages), mean (standard deviation) or median (interquartile range) respectively. Multivariate analysis was performed using generalised linear modelling with a compound symmetric error structure (PROC MIXED procedure in SAS) adjusting for age, gender, and time. Results have been reported as least square means (standard errors). To determine if changes over time differed significantly between covariates, interaction terms with time were fitted; however no significant interaction terms were found to exist. All the analyses were performed using SAS version 9.3 (SAS Institute Inc., Cary, NC, USA) and a two-sided *p*-value of 0.05 was used to indicate statistical significance.

Results

Demographic data on the 397 consecutive major trauma patients admitted to The Alfred Hospital with multiple fractured ribs are presented in Table 2. Division of the entire cohort into a predominant thoracic injury group ($n = 216$) and a multi-trauma group ($n = 181$) showed a significant difference in ISS between the two groups ($p < 0.0001$) with a higher ISS in the multi-trauma group (Table 3). Over the same time period, 855 patients were seen in the emergency departments of The Alfred and the affiliated Sandringham community hospital who did not require admission

Table 2
Demographics entire cohort.

Variable	N = 397
Age years [mean (SD)]	53.9 (18.8)
Sex (M/F)	298/99
Mechanism of injury	
Motor vehicle driver	118
Motor vehicle passenger	43
Motorcycle	54
Bicycle	27
Pedestrian struck by car	38
Fall from height	72
Struck by or collision with person or object	19
Other	26
Flail segment	211
ISS (AIS08) [mean (SD)]	22.5 (11.8)

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