

FIRST RIB FRACTURES AS AN INDICATOR OF INJURY SEVERITY IN MAJOR TRAUMA

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Introduction

First rib fractures are traditionally considered indicators of increased morbidity and mortality in major trauma. However, this relationship has not been definitively proven. With an increase in CT imaging in major trauma, and the likely increase in detection of first rib fractures, this study re-evaluates whether first rib fractures are an indicator of injury severity.

Methods

Patients sustaining rib fractures between from 2012 to 2013 were reviewed using prospectively collected data from the UK Trauma Audit and Research Network (TARN) database. Patients with first rib fractures were compared to patients with rib fractures other than first rib fractures. The mean Injury Severity Score (ISS), mortality and severity of chest injury were compared, as well as the prevalence of intrathoracic and extra-thoracic injuries.

Results

First rib fractures were associated with a higher mean injury severity score (26 vs 22) as well as an increased likelihood of associated poly-trauma compared with other rib fractures (58.4% vs 32.4%). These effects was independent of age, mechanism of injury and gender. Mortality was higher in poly-trauma patients with first rib fractures (20.7% vs 14.8%), but not in those with isolated chest injuries (5.8% vs 5.3%). First rib fractures had a association with significant intra- and extra-thoracic injuries. In particular, first rib fractures had a higher association with head injury (51.2% vs 19.1%) and c-spine fractures (28.8% vs 6.8%).

Discussion

This study suggests that major trauma patients with first rib fractures have increased ISS, a higher likelihood of poly-trauma and significant intrathoracic and extra-thoracic injury. Patients with multiple injuries and first rib fractures also have a higher mortality.

| Factors | 1st rib fracture (n=1710) | Other rib fracture (n=8457) | p-value |
|------------------------------|---------------------------|-----------------------------|---------|
| Median age (IQR) | 51.9 (31.9 - 70.1) | 64.6 (36.2 - 80.3) | P<0.001 |
| Mechanism of injury | | | |
| RTC | 1046 (61.2%) | 2863 (33.9%) | P<0.001 |
| Fall < 2m. | 168 (9.8%) | 3199 (37.8%) | |
| Fall > 2m | 418 (24.4%) | 1699 (20.1%) | |
| Shooting/stabbing | 4 (0.2%) | 99 (1.2%) | |
| Other | 74 (4.3%) | 597 (7.1%) | |
| Injury | | | |
| Median ISS (IQR) | 26 (13 - 41) | 22 (9 - 35) | P<0.001 |
| Poly-trauma | 998 (58.3%) | 2736 (32.3%) | P<0.001 |
| Intrathoracic injury | | | |
| Flail ribs | 451 (26.4%) | 1409 (16.7%) | P<0.001 |
| Rib fracture ≥3 | 752 (44.0%) | 3726 (44.1%) | P=0.97 |
| Lung AIS ≥3 | 759 (44.4%) | 1885 (22.3%) | P<0.001 |
| Vascular AIS ≥3 (chest only) | 39 (2.3%) | 68 (0.8%) | P<0.001 |
| Aorta (chest only) | 23 (1.3%) | 54 (0.6%) | P<0.001 |
| Heart/pericardium | 27 (1.6%) | 41 (0.5%) | P<0.001 |
| Extra-thoracic injury | | | |
| All head | 875 (51.2%) | 1614 (19.1%) | P<0.001 |
| Brain AIS ≥ 3 | 497 (29.1%) | 1073 (12.7%) | P<0.001 |
| All C-spine | 493 (28.8%) | 580 (6.9%) | P<0.001 |
| C- Spine AIS ≥ 3 | 112 (6.6%) | 129 (1.5%) | P<0.001 |
| All T-spine | 618 (36.2%) | 1293 (15.3%) | P<0.001 |
| T- Spine AIS ≥ 3 | 114 (6.7%) | 247 (2.9%) | P<0.001 |
| All L -spine | 303 (17.7%) | 1110 (13.1%) | P<0.001 |
| L- Spine AIS ≥ 3 | 39 (2.3%) | 168 (2.0%) | P=0.43 |
| Abdominal | 118 (6.9%) | 371 (4.4%) | P<0.001 |
| Liver AIS ≥ 3 | 69 (4.0%) | 150 (1.8%) | P<0.001 |
| Spleen AIS ≥ 3 | 60 (3.5%) | 237 (2.8%) | P=0.11 |
| Pelvic Ring AIS ≥ 3 | 146 (6.9%) | 355 (4.2%) | P<0.001 |
| Brachial Plexus | 18 (1.1%) | 16 (0.2%) | P<0.001 |