

Surgical Fixation of Rib Fractures Improves 30-Day Survival After Significant Chest Injury in Polytrauma: An Analysis of 10 Years of Prospective National Registry Data From England and Wales

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Purpose: Surgical rib fixation (SRF) is gaining in popularity for both flail and non-flail chest wall injuries, including in patients not requiring mechanical ventilation. The evidence to support this increase is mixed, coming from largely retrospective studies. Many patients are polytraumatized; adjusting for the effect of other injuries is challenging and may introduce bias to a study. The purpose of this study is to analyze the outcomes following SRF for patients with severe chest injuries, both with and without other significant injuries.

Methods: Prospective registry data from the Trauma Audit and Research Network (TARN) formed our sample. TARN records data from over 80% of hospitals in the UK and is the largest trauma database in Europe. Patients with a chest wall injury between January 2008 and March 2018 were analyzed. Patients were excluded if they had died within 24 hours of injury. Outcomes assessed were 30-day mortality, length of stay (LoS), and need for tracheostomy. Patients who underwent SRF were compared to those who received supportive care alone. Two groups were analyzed: (1) all patients with a chest injury and (2) patients with a significant chest injury but without significant polytrauma (defined as a thoracic AIS [Abbreviated Injury Scale] of 3 or more and no other body system with a score of over 2). Further subgroup analysis on patients requiring intubation was performed. Multivariable logistic regression was performed to adjust for potential confounders including concomitant injuries, age, sex, ISS, comorbidities, and intubation. Statistical analysis was performed using SPSS v.24.

Results: 96,548 patients with chest trauma were identified across the study period. 1411 sustained penetrating trauma, leaving 95,137 cases of blunt trauma for analysis. Out of these, 40,693 patients were classified as having a serious chest injury without significant polytrauma. The rate of SRF was 0.9% for the overall cohort and 1.3% in patients with severe chest trauma only, increasing to 3.3% in patients who required emergency room intubation. SRF significantly reduced mortality from 8% to 3.6% (odds ratio [OR] 0.24, $P < 0.001$) and need for tracheostomy (OR 0.22, $P < 0.001$) after adjustment for other co-variables across the whole cohort. SRF reduced mortality from 22% to 7% in patients with isolated severe chest wall injuries requiring intubation (OR 0.49, $P = 0.01$). While mortality was lower after SRF in patients not requiring intubation, this difference was not statistically significant (from 4.5% to 2.0%, OR 0.62, $P = 0.145$). Interestingly, mean LoS for patients who survived was longer in the SRF group (16 days vs 12, $P < 0.01$, t test), this is likely to reflect selection bias.

Conclusion: Surgical rib fixation reduces mortality after significant chest trauma both in isolation and in the setting of multiple injury. The role of rib fixation in isolated chest trauma not requiring intubation is unclear and should form the focus of future study.