Rib Plating versus Nonsurgical Treatment of Flail Chest: Comparison of Adverse Events

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INTRODUCTION:
No definitive guidelines exist for the management of flail chest, defined as three or more segmental rib fractures. Some evidence suggests that surgical management may be associated with lower mortality and pulmonary complications, but extant data is often underpowered and includes non-flail rib fracture patterns.
METHODS:
This retrospective, matched cohort study leveraged a large national administrative database of over 90 million orthopaedic patients. Patients with flail chest were identified using International Classification of Disease (ICD) codes. Operative treatment (rib plating) was identified with Current Procedural Terminology (CPT) codes. Patients with and without surgical treatment were matched 1:4 based on age, sex, and Elixhauser Comorbidity Index (ECI) score[1,2]. Length of hospital stay from diagnosis and adverse events including pneumonia, pulmonary embolism, acute respiratory distress syndrome (ARDS), tracheostomy, and thoracostomy were analyzed within 30 days of flail chest diagnosis. The database was used for all matching and statistical analyses with significance defined as $p<0.05$.
RESULTS:
Prior to matching, 9,643 patients with flail chest were identified. Nonsurgical management was elected for 9,235 (96.0%), and rib plating was elected for 408 (4.0%). Matched cohorts consisted of 1,550 patients managed nonsurgically and 391 patients managed with rib plating. Within matched cohorts, patients with nonsurgical treatment were more than twice as likely to have ARDS than patients managed with surgical fixation (23% vs. 11%, $p<0.001$). Patients with nonsurgical treatment had longer hospital lengths of stay (17 days vs. 15 days, $p=0.027$). These results were maintained in multivariate analysis, with the surgical cohort significantly less likely to develop ARDS at both 30 and 90 days postsurgically ($p<0.001$ and $p<0.001$, respectively). No between-group statistically significant differences were identified in 30- or 90-day rates of pneumonia, pulmonary embolism, tracheostomy, or thoracostomy.
DISCUSSION AND CONCLUSION:
This paper finds that only 4% of flail chest patients were managed with surgical fixation, but that these patients had shorter hospital stays and lower rates of ARDS. That surgical management was associated with improved morbidity supports the consideration of this approach for patients with flail-segment rib fractures.