Rib Fracture Fixation

Indications and Outcomes

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KEYWORDS

• Rib fracture • Chest trauma • Flail chest • Surgical fixation

KEY POINTS

- Thoracic trauma is common and rib fractures are frequently identified after blunt injury.
- History, physical, and symptoms may suggest fracture, but computed tomography scan is the best imaging modality to diagnose rib fractures.
- Rib fractures increase the risk of complications including pneumonia, prolonged ventilator days, and increased hospital stay. Rib fracture management requires significant resources, especially in the elderly.
- Treatment of rib fractures currently involves pain control and respiratory therapy.
- There is some evidence that surgical fixation may improve outcomes, but well-designed clinical trials with sufficient sample size are warranted to confirm these results.

INTRODUCTION

Managing patients with multiple rib fractures or flail chest requires significant health care resources. These patients may require critical care, ventilator management, and intensive pain control to minimize the risk of complications. Frequently seen in patients who sustain thoracic trauma, patients with rib fractures may also be diagnosed with blunt cardiac injury, pulmonary contusion, or great vessel injury. Patients with thoracic trauma, in particular with rib fractures, may develop complications such as pneumonia, prolonged ventilator times, prolonged hospitalization, and chronic debilitating pain after discharge. Current evidence indicates that a greater number of rib fractures is associated with an increased risk for pneumonia and death, particularly in the elderly. Treatment of rib fractures is controversial, but the goal of management is to prevent or minimize associated complications.

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PATIENT EVALUATION

Epidemiology of Thoracic Trauma and Rib Fractures

It is common for patients with thoracic trauma to present to the emergency department with severe injury. Often chest trauma includes rib fractures. In 2000, the National Center for Healthcare Statistics estimated that more than 300,000 people were treated for rib fractures in the emergency department.[1] Of these roughly 180,000 were admitted to the hospital with multiple fractures with total hospital charges close to $8 billion dollars.[2] More than one-third of these patients are over the age of 65. The elderly population has a disproportionately higher degree of morbidity, mortality and cost of care after sustaining multiple rib fractures compared with younger patients. Elderly patients with similar fracture pattern have a 33% incidence of major pulmonary complications compared with 12% in younger patients.[3]

Flail chest is radiographically defined as multiple consecutive rib fractures (>4) on 1 side of the chest with fractures in 2 or more locations. Clinically, flail chest is defined as a segment of the chest wall exhibiting paradoxic movement with inspiration. As expected, this fracture pattern has greater impact on patient outcomes than individual rib fracture.[4] A metaanalysis of 29 studies of blunt thoracic trauma identified that age 65 years and older, 3 or more rib fractures, the presence of preexisting disease, and the development of pneumonia after injury were significant risk factors for mortality.[5] The mean number of mechanical ventilation days required for patients with multiply displaced rib fractures or flail chest ranges from 7 to 30 days in several studies.[6–9] Nosocomial pneumonia occurs significantly more frequently in elderly patients than in their younger counterparts in a dose–response relationship, showing higher rates of nosocomial pneumonia in those with greater numbers of ribs fractures (**Fig. 1**).[3]

Not surprisingly, there is a disproportionate use of resources among elderly patients when evaluating the number of ribs fractured. The elderly have a much higher complication rate than the younger population.[3] Elderly flail chest patients (>64 years of age) incur a mean hospital charge that is $39,125 greater and a hospital duration of stay that is 3.2 days longer than younger flail chest patients (18–44 years of age). As many as 40% of patients with multiple rib fractures require critical care resources,

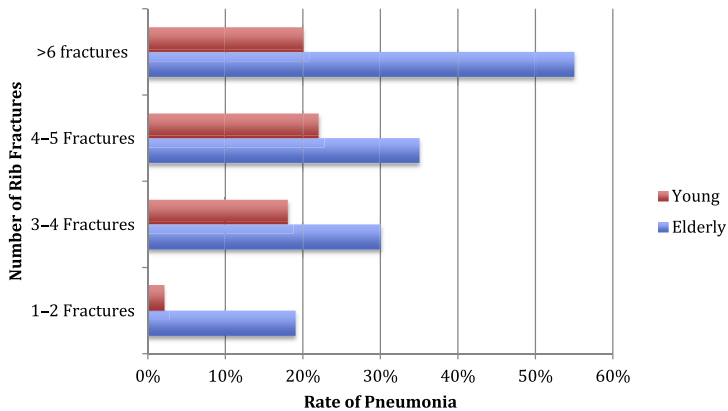

Fig. 1. Relationship between pneumonia and number of rib fractures. The pneumonia rate increases as the number of rib fractures increases, most notably for the elderly group. (*From* Bulger EM, Arneson MA, Mock CN, et al. Rib fractures in the elderly. J Trauma 2000;48(6):1040–6. [discussion: 1046–7].)