Risk Factors for Pulmonary Complications Among Patients with Operative Spine Fractures

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Purpose: Cervical and thoracolumbar fractures are relatively common injuries after high-energy trauma, and most patients have injuries to other body systems. The spinal column's intimate association with multiple vital structures contributes to frequent complications in prior reports. The purpose of this study is to identify risk factors for complications among patients with operative spinal injury.

Methods: Data were collected for 305 consecutive adult patients who had fixation of cervical (n = 138) or thoracolumbar (n = 181) fractures (33 patients with operative thoracic spine injury at or proximal to T6, and 148 patients with injury inferior to T6). 14 had fixation of both cervical and thoracolumbar fractures. 102 (33%) had concurrent spinal cord injury (SCI). Patient and injury features were characterized, treatment and hospitalization details were recorded, and complications including pneumonia, acute respiratory distress syndrome (ARDS), organ failure, infections, sepsis, and thrombotic events were noted.

Results: 64 patients (21%) developed 87 complications, with complications occurring in 25% of patients with fractures at or proximal to T6 versus 17% for distal thoracolumbar fractures (P = 0.12). Pulmonary complications accounted for 46/87 (53%) of complications, and occurred in 42 (21 cervical and 21 thoracolumbar) patients with pneumonia (n = 35) and ARDS (n = 9). After multiple logistic regression pulmonary complications were associated with SCI (odds ratio [OR] 6.8, P = 0.001), history of tobacco use (OR 3.1, P = P 0.02), higher American Society of Anesthesiologists (ASA) classification (mean 3.3 vs 2.8, OR 2.6, P = 0.01), and lower Glasgow Coma Score (GCS; mean 9.6 vs 12.8, OR 0.9, P = 0.03). Severe chest injury (Abbreviated Injury Scale [AIS] = 2) was associated with pulmonary complications (55% vs 13%, P <0.001). Patients with thoracic fractures at or proximal to T6 had a rate of 22% for pulmonary complications, versus 8.8% for lower thoracic fractures (P = 0.032). Among thoracolumbar patients, pulmonary complications were associated with SCI (OR 4.5, P = 0.047) and tobacco use (OR 4.3, P = 0.02). Among patients with cervical injury, pulmonary complications were associated with SCI (OR 7.3, P = 0.01), chest injury (OR 6.5, P = 0.03), ASA (OR 4.7, P = 0.002), and ISS (OR 1.1, P = 0.049), but not tobacco use (OR 2.0, P = 0.17). Overall, pulmonary complications were associated with longer length of stay (LOS; mean 22.1 vs 9.5 days, all P <0.001), longer intensive care unit LOS (mean 20.4 vs 9.5 days, all P <0.001), and more time on mechanical ventilation (mean 13.8 vs 3.7 days, all P <0.001).

Conclusion: We identified several risk factors for pulmonary complications, including tobacco use, GCS, ASA, and SCI, and severe chest injury. Pulmonary complications occurred most often in patients with upper thoracic injury and were associated with substantial morbidity in terms of LOS and mechanical ventilation times, which translate into greater costs of care. Future studies with larger sample size will be able to further elucidate risk factors based on more specific injury characteristics. Mitigation of risks through treatment strategies and modifiable factors is desirable.