

Clinical Study

Risk factors for pulmonary complication following fixation of spine fractures

Douglas S. Weinberg, MD, Brian Z. Hedges, BS, Jonathan E. Belding, MD,
Timothy A. Moore, MD, Heather A. Vallier, MD*

Department of Orthopaedic Surgery, MetroHealth Medical Center, Case Western Reserve University, 2500 MetroHealth Dr., Cleveland, OH 44109, USA

Received 14 September 2016; revised 27 February 2017; accepted 2 May 2017

Abstract

BACKGROUND CONTEXT: Previous studies have suggested pulmonary complications are common among patients undergoing fixation for traumatic spine fractures. This leads to prolonged hospital stay, worse functional outcomes, and increased economic burden. However, only limited prognostic information exists regarding which patients are at greatest risk for pulmonary complications.

PURPOSE: This study aimed to identify factors predictive of perioperative pulmonary complications in patients undergoing fixation of spine fractures.

STUDY DESIGN/SETTING: A retrospective review in a level 1 trauma center was carried out.

PATIENT SAMPLE: The patient sample comprised 302 patients with spinal fractures who underwent operative fixation.

OUTCOME MEASURES: The outcome measures were postoperative pulmonary complications (physiological and functional measures).

MATERIALS AND METHODS: Demographic and injury features were recorded, including age, gender, body mass index (BMI), American Society of Anesthesiologists (ASA) classification, mechanism of injury, injury characteristics, and neurologic status. Treatment details, including surgery length, timing, and approach were reviewed. Postoperative pulmonary complications were recorded after a minimum of 6 months' follow-up.

RESULTS: Forty-seven pulmonary complications occurred in 42 patients (14%), including pneumonia (35), adult respiratory distress syndrome (ARDS) (10), and pulmonary embolism (2). Logistic regression found spinal cord injury (SCI) to be most predictive of pulmonary complications (odds ratio [OR]=4.4, 95% confidence interval [CI] 1.9–10.1), followed by severe chest injury (OR 2.7, 95% CI 1.1–6.9), male gender (OR 2.7, 95% CI 1.1–6.8), and ASA classification (OR 2.3, 95% CI 1.4–4.0). Pulmonary complications were associated with significantly longer hospital stays (23.9 vs. 7.7 days, $p<.01$), stays in the intensive care unit (ICU) (19.9 vs. 3.4 days, $p<.01$), and increased ventilator times (13.8 days vs. 1.9 days, $p<.01$).

CONCLUSIONS: Several factors predicted development of pulmonary complications after operative spinal fracture, including SCI, severe chest injury, male gender, and higher ASA classification. Practitioners should be especially vigilant for of postoperative complications and associated injuries following upper-thoracic spine fractures. Future study must focus on appropriate interventions necessary for reducing complications in these high-risk patients. © 2017 Elsevier Inc. All rights reserved.

Keywords:

Perioperative complication; Postoperative pulmonary complications; Spinal fixation; Spine trauma; Traumatic spine fracture; Unstable spine fracture

FDA device/drug status: Not applicable.

Author disclosures: **DSW:** Nothing to disclose. **BZH:** Nothing to disclose. **JEB:** Nothing to disclose. **TAM:** Nothing to disclose. **HAV:** Nothing to disclose.

This study was not funded.

This study was performed at MetroHealth Medical Center, Cleveland, OH, USA, affiliated with Case Western Reserve University.

This study was approved by the Institutional Review Board.

This study was presented at the 2017 Annual Meeting of the American Academy of Orthopaedic Surgeons, March, 2017.

* Corresponding author. Department of Orthopaedic Surgery, 2500 MetroHealth Dr., Cleveland, OH 44109, USA. Tel.: 216-778-7361; fax: 216-778-4690.

E-mail address: hvallier@metrohealth.org (H.A. Vallier)

Introduction

Cervical and thoracolumbar fractures are common after high-energy trauma. The spinal column's intimate association with multiple vital structures contributes to injury complexity and propensity for related complications [1]. Notably, pulmonary complications are especially responsible for morbidity and mortality in this patient population [2]. Pulmonary complications often result in prolonged hospital course and intensive care unit (ICU) stays, and generate substantial economic burden [3].

Much research has been dedicated to identifying risk factors for pulmonary complications after fixation of appendicular fractures [4–6]. This had led to development of several treatment algorithms and refinement of decision making regarding surgical timing [7]. However, there remains very limited predictive criterion to suggest which patients with spine fractures are most at risk for postoperative pulmonary complications [8,9]. Trauma patients, unlike those choosing elective surgery, have little preprocedural counseling or preparation. Therefore, recognition of risk factors remains especially important in these often critically injured patients [10]. Accordingly, we designed a study to identify those at increased risk for complications following stabilization of traumatic spinal fractures.

Materials and methods

Following Institutional Review Board approval, a retrospective chart review was conducted of patients who had stabilization of traumatic spine fractures between 2009 and 2014 and minimum 6 months' follow-up. Fractures secondary to neoplasm (n=9) and those in skeletally immature patients were excluded (n=23), as well as those with fatal injuries (n=17). A total of 302 patients with 324 fractures were identified. Patients with preexisting pulmonary conditions such as smoking or chronic obstructive pulmonary disease were included in the analysis.

Fractures were categorized as cervical (C1–C7), upper thoracic (T1–T6), and lower-thoracic/lumbar (T7–L5). Fractures isolated to the sacrum or atlanto-occipital junction were not included. Demographic and injury characteristics were documented, including age, sex, body mass index (BMI), mechanism of injury, Injury Severity Score (ISS), Glasgow Coma Scale, American Society of Anesthesiologists (ASA) classification, American Spinal Injury Association examination, and associated injury to the head, spinal cord, chest, or abdomen [11,12]. Associated injury to the chest was further classified by Abbreviated Injury Scale (AIS) score as minor (AIS 1 or 2) or severe (AIS >2). The AIS is an anatomical and systems-based quantification measure of a specific injuries' threat to life, which incorporates the body region, type of injury, amount of area involved, and the severity of injury [13].

Details of treatment included surgery duration, approach, timing, length of stay, and length of mechanical ventilation. Decisions regarding clearance for surgery were made based on a common treatment algorithm [14]. Surgery was performed

at the discretion of the attending spine physician on-call, and was advised for patients with unstable fracture patterns or those with neurologic deficits [15,16]. Surgical duration was defined as time from incision to closure. Surgical delay was defined as more than 36 hours from time of injury [17].

Pulmonary complications included pneumonia, adult respiratory distress syndrome, and pulmonary embolism (PE), and other complications were sepsis, surgical wound infection, renal failure, and deep venous thrombosis [18–21]. Pneumonia was defined as new pulmonary infiltrate and purulent sputum, temperature >38°C, and white blood cell count >10,000/mL [22]. Adult respiratory distress syndrome was defined as PaO₂/FiO₂ ratio <200 for more than 4 consecutive days with diffuse infiltrate on chest radiographs [21]. Sepsis was defined as white blood cell count >10,000/mL with positive blood cultures [19]. Wound infection was defined as purulent drainage requiring surgical debridement. Acute renal failure was defined as blood urea nitrogen >100 mg/dL, creatinine ≥3.5 mg/dL, and urine output <150 mL per day for ≥2 days [18]. Deep venous thrombosis was defined as a positive result on duplex scan proximal to the knee.

Statistical analysis

Chi-square and analysis of variance was used to evaluate the sample populations for homogeneity and identify baseline differences among the three groups. Normality was assessed with the Shapiro-Wilk test; Q-Q plots were generated. Binary logistic regression was used to calculate odds ratios (ORs) and 95% confidence intervals (CIs) for potential risk factors associated with pulmonary complications. Subsequent multiple logistic regression was used to evaluate predictors of pulmonary complications while controlling for potential confounders. Covariates were those found to be associated with postoperative complications through univariate analysis at the level of p<.10. Significance was set at p<.05 in the final multiple logistic regression model.

Results

A total of 302 patients underwent fixation of cervical (n=138), upper-thoracic (T6 and above, n=43), and lower-thoracic/lumbar (n=143) spine fractures. Twelve patients had operative cervical and upper-thoracic fractures, two had operative cervical and lower-thoracic fractures, six had operative upper and lower-thoracic fractures, and one patient had operative fractures in all three locations. Demographic and injury characteristics are shown in [Table 1](#). Mean age and standard deviation of all patients was 45.5±19.6 years, with upper-thoracic injuries occurring more often in younger patients (mean age 36.5±14.8 years, p<.001). Mean BMI was 26.8±8.7, with 30% of all patients having a BMI >30. Cervical fractures were most likely to occur after a fall, whereas upper-thoracic fractures were most frequent after motor vehicle collisions.

Download English Version:

<https://daneshyari.com/en/article/5712706>

Download Persian Version:

<https://daneshyari.com/article/5712706>

[Daneshyari.com](https://daneshyari.com)