



## Case Report

# Tension Pneumothorax as a Complication of Inadvertent Pleural Tears During Posterior Spinal Surgery

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## Abstract

**Objective:** To review and expose the occurrences of tension pneumothorax as a result of pleural tear during posterior spinal surgery.

**Methods:** Intraoperative reports were retrospectively reviewed for 2 patients who underwent posterior spinal fusion and experienced pleural tear and subsequent tension pneumothorax. Surgical decisions for recognition and treatment were also reviewed.

**Results:** Unrecognized pleural tearing led to the formation of tension pneumothorax in both patients studied. Onset of respiratory signs and symptoms were delayed, occurring in the recovery room for the first patient and intraoperatively for the second. Both patients were successfully treated with conversion to open pneumothorax and placement of chest tubes.

**Conclusions:** Tension pneumothorax is a complication that can arise during posterior thoracic spinal surgery as a result of an inadvertent pleural tear. Awareness of this potentially fatal complication will greatly help in the timely recognition and treatment of this condition if this situation occurs. The authors recommend a low threshold for chest tube placement in patients with known or suspected pleural tears or in patients with undiagnosed respiratory failure undergoing posterior thoracic spine surgery.

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**Keywords:** Tension pneumothorax; Pleural tear; Posterior spinal surgery; Osteotomy; Chest tube

## Introduction

Pedicle screws have become the preferred method of fixation in posterior spinal instrumented constructs owing to their biomechanical advantages and relative safety [1,2]. Unfortunately, complications associated with pedicle screw insertion may occur, including malposition, loosening or breakage of the screws, infection after surgery, and potential injury to visceral or neurologic structures [1-5].

Pneumothorax is a described complication of posterior spinal surgery. It can occur through deep dissection between the transverse processes or placement of pedicle

finders, taps, or screws that breach the lateral or ventral walls of the vertebra [2,6,7]. Rarely do these pleural breaches lead to serious sequelae; however, the possibility exists that these pneumothorax can lead to the development of a 1-way valve and pressurizing of the pleural space [5].

Physiological findings with tension pneumothorax include increases in heart rate, respiratory rate, central venous pressure (CVP), airway pressure, and end tidal CO<sub>2</sub>; decreased oxygen saturation; hypotension; or tracheal deviation [8,9]. Not all physiologic changes that indicate tension pneumothorax may be present, which makes clinical assessment difficult. Upright chest X-rays can provide a tool for correctly diagnosing pneumothorax; however, time limitations in managing tension pneumothorax often prevent its use, and thus clinical evaluation is the predominant approach [8]. Conventional treatment involves opening of the pleural space and the subsequent placement of a chest tube to relieve pleural pressure [1,2].

Tension pneumothorax is an uncommon but potentially fatal complication [10,11]. Nevertheless, surgeons and

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anesthetists cannot neglect the importance of recognizing and appropriately managing tension pneumothorax. Tension pneumothorax has a rapid onset, and if untreated it can have serious implications including death [10]. No studies to date have examined tension pneumothorax as a complication of posterior spinal surgery.

This case study investigated 2 separate instances of tension pneumothorax associated with spinal surgery that occurred during posterior spinal procedures with 3-column osteotomies using pedicle screws. These patients presented with delayed but progressive respiratory dysfunction. Both were managed with opening of the pleural space and subsequent management with chest tubes.

### Materials and Methods

The authors performed a retrospective review of the radiographs and medical charts of 2 patients with acute respiratory distress associated with posterior spinal surgery for deformity corrections. Both patients underwent 3-column posterior-based spinal osteotomies with thoracic and lumbar pedicle screw insertions. In both patients there was respiratory compromise and both required conversion to open pneumothorax to relieve the hemodynamic instability.

#### Patient 1

A 42-year-old, otherwise healthy woman had undergone a posterior Harrington rod fixation for scoliosis at the age of 13 years. She was treated with a posterior revision of the

distraction rod at the age of 25 years with extension of the fusion to L4 (Fig. 1A, C). She presented with a solid fusion from T6 to L4 with degeneration of L4–5 and L5–S1 associated with persistent coronal and sagittal deformity. The patient underwent removal of the previous implants and a revision posterior instrumented fusion with extension to the sacrum and pelvis with decompression from L4 to S1 with posterior lumbar interbody fusions at both levels. A partial T12 vertebrectomy through a bilateral costotransversectomy was performed to correct the persistent deformity (Fig. 1B, D).

No noticeable complication arose during the operation and the patient was taken to the recovery room after an uneventful extubation (see anesthesia record in Fig. 2). Before extubation, the heart rate (HR) was 90 beats per minute (bpm), the airway pressure was 14 mm Hg (after ranging between 11 and 24 mm Hg throughout the case), blood pressure (BP) was 90/50 mm Hg, CVP was 11 mm Hg, and end tidal CO<sub>2</sub> (ETCO<sub>2</sub>) was 27. Upon arrival in recovery, the patient had an increased respiratory rate (RR) of 29 breaths/minute, BP of 92/40 mm Hg, and HR of 128 bpm. Oxygen (O<sub>2</sub>) saturation was 98% on 8 L of O<sub>2</sub> by nasal prongs. Over the ensuing 30 minutes, the patient reported increasing shortness of breath and difficulty breathing. The O<sub>2</sub> saturation dropped to 86% on 8 L O<sub>2</sub> and the RR remained around 30 breaths/minute. A chest X ray revealed a pneumothorax of the right lung (Fig. 3) with slight deviation of the trachea to the left. The patient was immediately taken back to the operating room and a right-

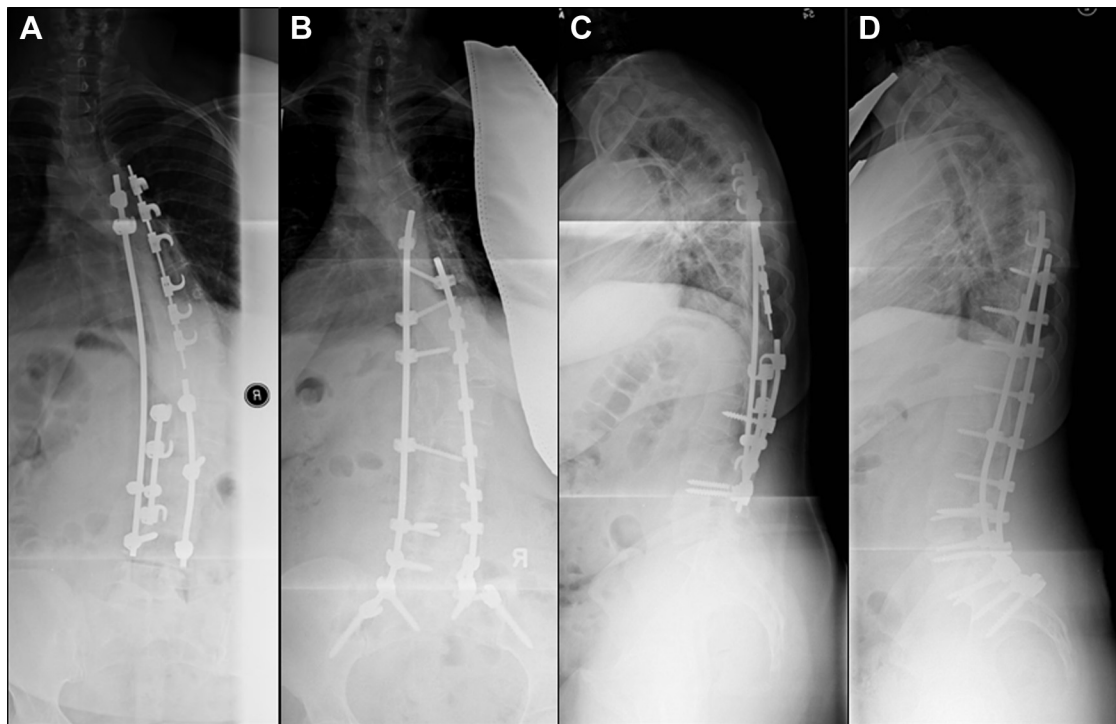


Fig. 1. Preoperative anteroposterior (A) and lateral (C) radiographs of Patient 1. Postoperative radiographs (B, D) after extension of the fusion to the sacrum and pelvis and T12 posterior 3-column osteotomy.

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