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CASE REPORT

Severe pulmonary injury leading to death during thoracic rod removal: a case report

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Abstract

Purpose Removal of hardware procedures following posterior spinal fusion is most commonly performed for hardware irritation without overt infection. It is imperative that surgeons realize that serious complications may arise from this procedure. The purpose of this report is to report a case of a pneumothorax that developed in a thoracolumbar removal of hardware case that resulted in a patient death.

Methods Retrospective review of a patient's medical record and imaging.

Results A 74-year-old patient with a history of T4-10 anterior discectomy and fusion with rib autograft and T4-L2 posterior fusion underwent a removal of hardware procedure for delayed surgical site infection. During the procedure, the tip of the bolt cutter jaw broke and entered the pulmonary cavity leading to a pneumothorax. The patient developed pneumonia 1 month postoperatively and passed away.

Conclusions This case report highlights one of the rare but potential complications of spinal removal of hardware surgery. It is essential that surgeons are aware of the possibility of pulmonary complications during thoracolumbar removal of hardware cases so that they may fully counsel their patients on the potential risks.

Keywords Thoracolumbar spine surgery · Removal of hardware · Pulmonary · Death · Pneumothorax · Case report · Literature review · Complication · Bolt cutter · Pneumonia

Introduction

Removal of hardware procedures following posterior spinal fusion is known to be frequently complicated by loss of sagittal plane correction, large vessel injuries and compression fractures [1–3]. However, there are no reports to our knowledge that detail serious pulmonary complications following a removal of hardware procedure performed on the spine. Here, we report a case of pneumothorax secondary to a removal of hardware procedure performed on the thoracolumbar spine with a resultant patient death.

Case report

A 74-year-old female had undergone T4-10 anterior discectomy and fusion with rib autograft and T4–L2 posterior spinal fusion with Harrington rods and allograft in 1998 for a 95-degree kyphotic deformity of her thoracic spine. The T4–T10 discectomies were performed through a costotransversectomy with the assistance of a general surgeon, and the T4–L2 spinal fusion was performed from the standard posterior approach. The diameter and material composition of the Harrington rods were not detailed in the operative record. However, it was documented that there were no intraoperative or immediate postoperative complications.

In February 2018, the patient developed upper respiratory symptoms, increasing back pain and fevers up to 102° Fahrenheit. She presented to her primary care physician (PCP) who prescribed the patient a five-day course of azithromycin which improved her symptoms. She initially felt improved, but she developed recurrent back pain and malaise one week after the completion of her antibiotics. Because of this, she was re-evaluated by her primary care physician

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who obtained labs notable for an elevated C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR). The patient was subsequently prescribed a 10-day course of cephalexin. The patient again noted that her symptoms had improved, however, she again noted recurrence of her back pain, and she noted erythema surrounding the proximal fifth of her costotransversectomy incision one week after the cessation of her antibiotics. She presented to the emergency department for evaluation at that time. X-rays suggested proximal disengagement of the hook and rod construct with ensuing dorsal displacement (Fig. 1), and a computerized tomography (CT) scan confirmed this (Fig. 2). The diagnosis of proximal hardware failure was made, and the patient was scheduled for removal of hardware.

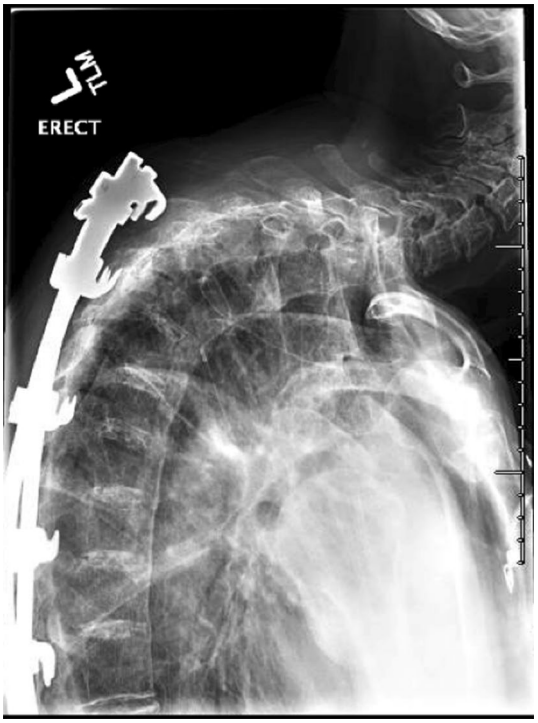

Fig. 1 Pre-operative lateral x-ray of the upper thoracic spine

The patient was taken to the operating room, and her prior midline incision was utilized. Purulent tissue was removed from the area surrounding the proximal end of the posterior construction, and the hooks and rods were exposed. The purulent tissue was sent to the laboratory for analysis, and cultures ultimately were positive for methicillin-resistant Staphylococcus aureus (MRSA). While the patient had never been known to be infected or colonized with MRSA, her daughter had a history of MRSA skin infections. On the right-hand side, a bolt cutter was used to cut the rod and it was brought out proximally through the hooks, which were subsequently removed. The same procedure was followed for the left-hand side; however, two bolt cutters broke while attempting to cut the left-side rod. One of these bolt-cutters broke at the handle, and the other bolt-cutter broke at the tip. A third bolt-cutter was then used and also broke, sending a piece of the tip of the jaw into the chest cavity, creating a pneumothorax (Figs. 3, 4). General surgery was emergently consulted. In the meantime, a Midas Rex pneumatic drill was used to cut and remove the rest of the rod.

The general surgeon partially closed the pleural defect and placed a left-side chest tube. Thoracic surgery was consulted and recommended a CT scan to localize the fragment (Fig. 5). The patient remained intubated and went emergently for this. A video-assisted thoracoscopic surgery

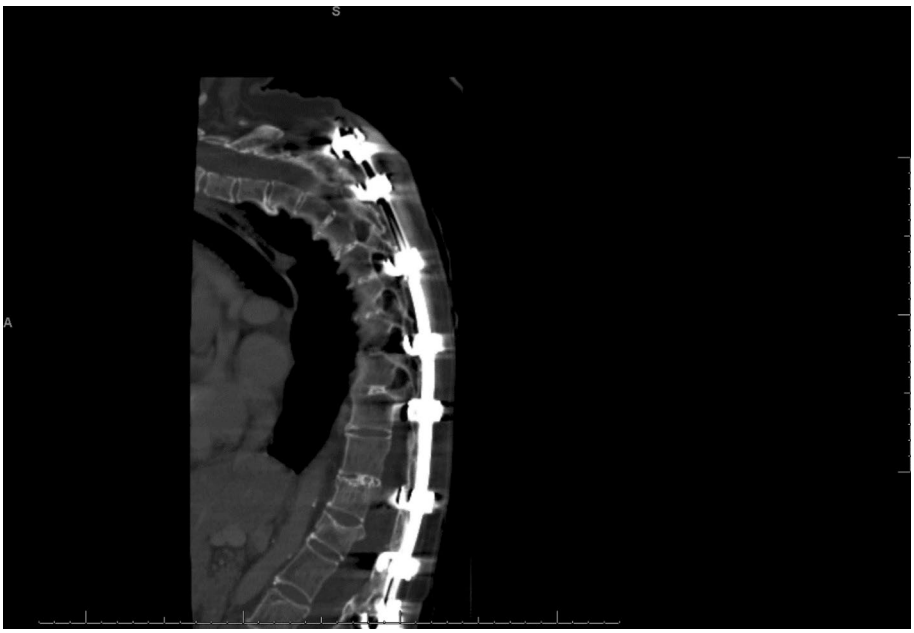

Fig. 2 Pre-operative mid-sagittal computed tomography scan of the thoracic spine

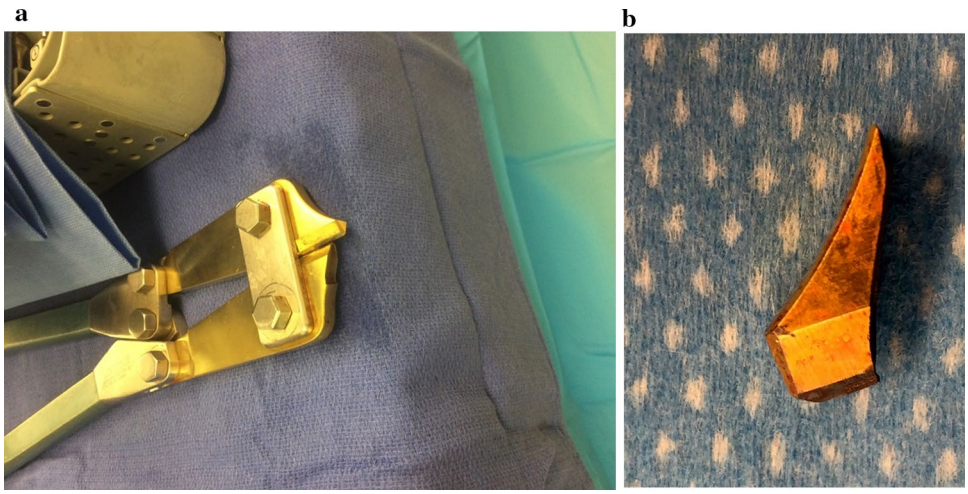

Fig. 3 Bolt cutter after breakage, including picture of piece retrieved from thorax

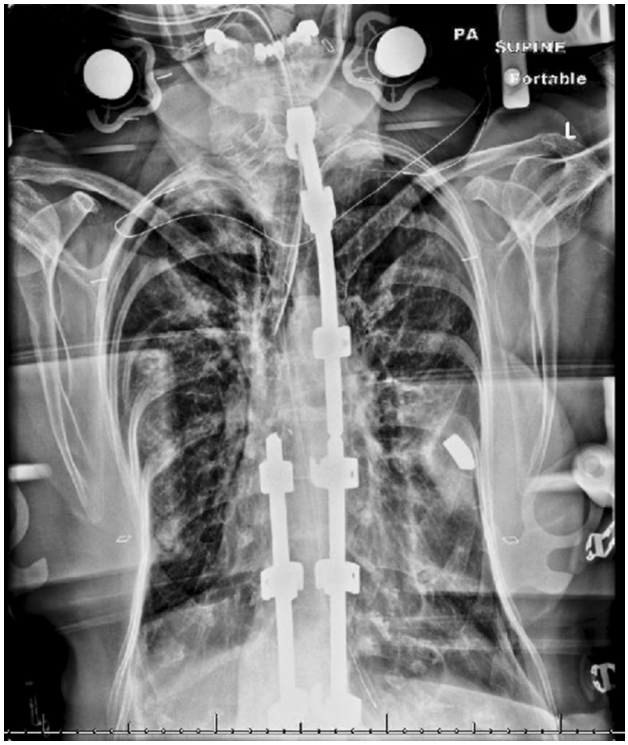

Fig. 4 Intra-operative x-ray demonstrating lodged fragment of bolt cutter after breakage

(VATS) procedure was then performed to successfully identify and retrieve the fragment, and a left lower lobe wedge resection was performed at the same time.

The patient was poorly oxygenating on the seventh postoperative day and was found to have a left-sided basilar pulmonary effusion on chest x-ray. This was drained by thoracic surgery, and she recovered uneventfully. She was discharged on the 14th postoperative day. As her intraoperative cultures from around the spine hardware grew MRSA, she was kept on 1.25 g of intravenous vancomycin twice daily for intended six weeks postoperatively per recommendations from the infectious diseases team. The patient did not receive any medications known to increase the risk of acute kidney injury (AKI) in combination with vancomycin [4], and her preoperative renal function was normal. The infectious disease team planned to monitor the patient outpatient with weekly complete blood counts (CBCs), comprehensive metabolic panels (CMPs) and vancomycin troughs.

One week after discharge, the patient returned to the hospital with mental status changes. She was found to have a toxic vancomycin level and subsequent AKI. On further workup, she was also found to have a right upper lobe (RUL) pneumonia and a urinary tract infection (UTI). Over the next two weeks, she had worsening respiratory failure and required care in the intensive care unit (ICU), with trial of bilevel positive airway pressure (BiPAP) but eventually requiring intubation. Given her worsening respiratory failure, renal failure, severe pneumonia and poor prognosis for a reasonably functional outcome, the patient's family made her comfort measures only (CMO), and she passed away shortly afterward.

Discussion

Implant removal after a successful fusion remains a controversial topic in spine surgery. With the substantial increase in the number of instrumented spinal fusions, there has been growing concern about the risk–benefit ratio inherent to implant removal [3]. Despite this, implant pain without clear evidence of infection remains the most common reason for implant removal [3]. In contrast, delayed surgical site infection, which was the case in this patient, remains a clear indication for removal of spinal hardware [2, 5, 6].

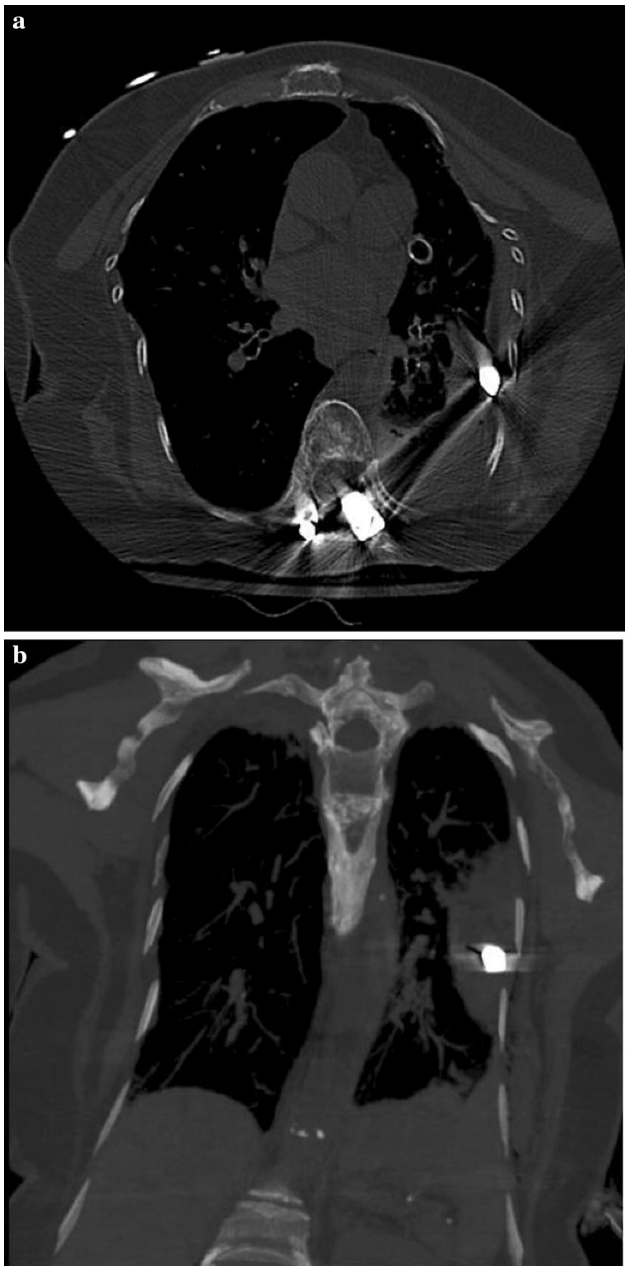

Fig. 5 Peri-operative axial and coronal computed tomography scans demonstrating the lodged fragment of bolt cutter after breakage

The case above highlights one of the potential dangers of removal of hardware procedures performed on the spine. While pulmonary complications are a known complication of thoracic spine surgery due to the proximity of the thoracic spine and pleural space [7], pneumothorax has been found to occur in only 1–4% of all thoracic cases where a posterior approach was utilized [8–10]. Nevertheless, this case demonstrates that surgeons should remain vigilant.

This case additionally highlights the risks with multiple attempts to cut a rod during removal of hardware. The history of the bolt-cutters utilized in this case is unclear, and it is possible that these instruments were fatigued. Therefore, the authors advocate for utilization of newer instruments for removal of hardware cases and periodic disposal of potentially fatigued instruments. In addition, the authors of this study advocate for the early use of a metal-cutting tool, such as a burr, to remove hardware that has been found to be difficult to excise with the bolt cutter with the acknowledgement that this method has its own issues, such as debris creation. Lastly, the general condition of this patient likely contributed to the fatal outcome, suggesting that individualized determination of the risk of each patient can help avoid the fatal complication noted in this case. In this case in particular, the diagnosis of MRSA in a close relative suggests the patient may have been infected with MRSA preoperatively and may have benefited from preoperative disinfection.

Conclusion

This case report highlights one of the rare but potential complications of removal of hardware procedures performed on the thoracolumbar spine. It is essential that surgeons counsel patients on the potential risks of this procedure and perform it only when deemed absolutely necessary.

Compliance with ethical standards

Conflict of interest None of the authors has any potential conflict of interest.

Sources of support None.

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