

Case Report

Compartment syndrome of lumbar paraspinal musculature after percutaneous pedicle screw fixation

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Abstract

Background: Compartment syndromes have been reported in nearly every anatomical area of the extremities. Similarly, in the lumbar spine, there is a risk of a compartment syndrome following either direct or indirect injury to the paraspinal muscles. In this study, we present a case of lumbar paraspinal compartment syndrome after percutaneous pedicle screw fixation for a spine fracture.

Case Description: A 27-year-old obese female sustained a fall and an L1 fracture. Her neurological examination was normal. She underwent a minimally invasive percutaneous posterior pedicle screw fixation from T12 to L2 to stabilize the L1 fracture. Postoperatively, the patient developed hypoesthesia in the back, and sterile serous wound discharge. Because of the persistent discharge, an open debridement was performed that revealed multiple cavities within the necrotic avascular paraspinal musculature. Once these were completely excised, the wounds healed uneventfully.

Conclusion: Patients undergoing minimally invasive posterior thoracolumbar (TL) pedicle screw fixation can develop a compartment syndrome involving the TL paraspinal musculature. This case highlights the need for early consideration of a compartment syndrome when patients develop persistent sterile discharge after spine surgery. In this case, urgent decompression prevented any long-term sequelae.

Key Words: Compartment syndrome, lumbar paraspinal musculature, percutaneous posterior instrumentation

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INTRODUCTION

Multiple studies document that compartment syndromes can involve the thoracolumbar (TL) paraspinal musculature following surgical manipulation.^[1,5,6] The pathophysiology is attributed to an increased pressure within a non-compliant, closed fascial space, leading to ischemia, and venous congestion. Most TL compartment syndromes are characterized by acute lumbar pain, elevated creatine

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kinase (CK), the presence of urinary myoglobin, and muscle edema/necrosis on magnetic resonance imaging (MRI). TL compartment syndromes have been reported in the literature due to downhill skiing,^[2,5] surfboarding, weight lifting,^[6] direct injury to the paraspinal muscles, or to surgical positioning.^[3]

Various studies in literature have shown that minimally invasive pedicle screw fixation is a safe and effective surgery.^[4,7] Its benefits include minimal tissue dissection, reduced blood loss, less, postoperative pain, fewer complications, and shorter hospital length of stay. In this study, however, we report a patient with an L1 lumbar fracture who was treated with a minimally invasive TL posterior pedicle screw fixation from T12-L2 who developed a compartment syndrome involving the paraspinal musculature.

CASE REPORT

Clinical presentation and surgery

A 27-year-old female sustained a fall in the bathroom following which she presented with severe TL pain, and the inability to stand or walk. Although her neurological examination was normal, the X-rays and MRI studies confirmed an L1 burst fracture without accompanying neural compression [Figures 1 and 2]. Under general anesthesia in the prone position, she underwent a short segment T12-L2 percutaneous pedicle screw fixation; the blood loss was just 50 ml, and the operating time was only 37 min.

Postoperative course: Initial washout

Postoperatively, she did well until the third postoperative day at which time she developed severe back pain and serous discharge from the right L2 pedicle wound [Figure 3]. This progressed, and the fifth postoperative day, it started coming out of the left-sided wounds as well. She developed hypoesthesia from T11-L1, and an intermittent low-grade fever. Laboratory studies (e.g., CBC, differential count, ESR, and CRP) remained within normal limits, and wound cultures were sterile. Although she was started on empirical intravenous antibiotics, the discharge continued. On the tenth postoperative day, she returned to the operating room for a washout; the wound was left open [Figure 4]. Although repeat wound cultures were negative, the serum CK was significantly elevated.

Secondary open debridement

As the patient continued to have discharge without symptomatic improvement, she was taken back to the operating room. At this time, all incisions were opened, and the entire bilateral subfascial tracts were explored; the paraspinal muscles were pale, avascular, and non contractile [Figure 5]. Dead muscle was excised bilaterally until vascularized/bleeding muscle tissue was seen.



Figure 1: Preoperative X-ray of the patient showing Stable burst fracture of L1 vertebra with local kyphosis



Figure 2: Preoperative magnetic resonance imaging of the patient showing Stable burst fracture of L1 vertebra without disruption of posterior ligaments



Figure 3: Clinical picture showing bloody serous discharge from the Right lower wound

The irrigation fluid includes saline, 1% betadine, and gentamicin solution. The wound was closed in layers over

a negative suction drain. Postoperatively, there was no further discharge; the drain was kept in place for 4 days. The wounds healed completely after 14 days when sutures were removed. Biopsy of the muscle tissue confirmed avascular muscle necrosis [Figure 6]. The patient resumed to her activities after 1 postoperative month, and at 1 year, she returned to normal activities [Figure 7].

DISCUSSION

Etiology of paralumbar compartment syndrome following percutaneous T12-L2 pedicle screw/rod placement

Acute compartment syndrome involving the paraspinal muscles has been reported in various settings including trauma, surgery, and non-traumatic situations.^[2,3,5,6] However, it is very rare the compartment syndromes involve the paraspinal musculature after minimally invasive TL spine surgery. The posterior TL spinal muscles, enclosed by the thoracolumbodorsal fascia, form a potential space for the development of a

compartment syndrome. In this case, percutaneous insertion of the paraspinal rods into the T12-L2 pedicle screws most likely injured the dorsal branches of the posterior intercostals arteries or the longissimus thoracis muscle. The surgical manipulation produced edema within the confined fascial space between the posterior and middle layer of the lumbodorsal fascia; the acute edema compromised the vascular supply to the muscle resulting in ischemia.

Symptoms and signs of paraspinal compartment syndrome

The physical signs for TL paraspinal musculature compartment syndrome includes loss of lumbar lordosis, sensory loss over the affected muscles, elevated serum CK, and elevated AST (Aspartate aminotransferase) levels; only one study additionally showed an elevated WBC count and increase in amylase.^[2,5,6] The patient presented exhibited back stiffness, hypoesthesia in the T11-L1 dermatomes, and significantly elevated serum CK levels.



Figure 4: Clinical picture during the wound wash showing serous discharge on tenth postoperative day



Figure 5: Intraoperative photo during debridement showing necrosed muscle tissue

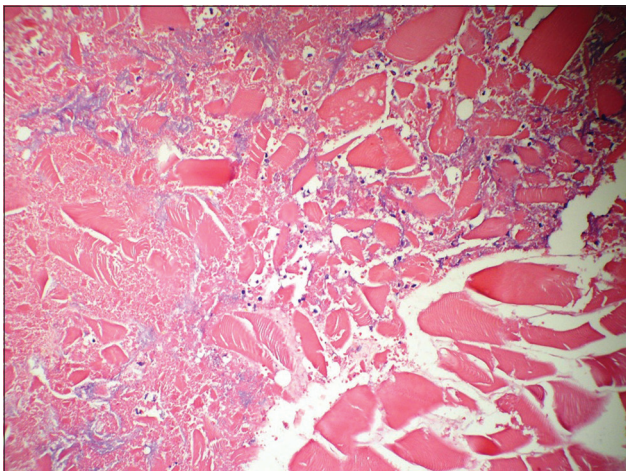


Figure 6: Biopsy picture



Figure 7: One-year postoperative X-ray showing consolidation of the fracture with no implant failure or increase in kyphosis

Minimally invasive trend

There is presently a trend toward minimally invasive TL spine surgery. Patients with acute and chronic lumbar paraspinal compartment syndromes typically demonstrate raised compartment pressures ranging from 70 to 150 mm Hg. Conservative treatment with medication and rest often results in successful recovery.^[2,5] However, some patients, as shown in this case, should undergo early surgery to prevent long-term sequelae (e.g., to avoid avascular necrosis, and fibrosis of the muscles resulting in chronic pain and long-term disability).^[5]

CONCLUSION

A compartment syndrome involving the TL paraspinal musculature should be considered as a cause of persistent sterile drainage when patients have undergone posterolateral pedicle screw fixation. Here, this occurred in a patient with an L1 fracture undergoing a T12-L2 minimally invasive pedicle screw fusion. In cases like this one, urgent surgical decompression may prevent long-term sequelae resulting from avascular necrosis and fibrosis of the paraspinal musculature.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/

their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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