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## Case Report

# Abdominal Wall Vascular Injury by Drain Insertion After Anterior Lumbar Spinal Fusion

## 前路腰椎融合術後腹壁血管被引流管插傷：案例報告

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### ABSTRACT

A 64-year-old gentleman presented with haemoglobin drop and an increase in fresh blood output in abdominal drain after anterior lumbar spinal fusion. Urgent re-exploration was performed, and injury to abdominal wall vessel during drain insertion leading to active bleeding was noted. Here, we report this rare case and summarize the characteristics of vasculature of abdominal wall, which may help reduce the possibility of this rare complication.

### 中文摘要

一名六十四歲的男子於接受腰椎前路椎間融合術後，被發現血色素驟降和腹腔引流管大量出血。緊急探查手術發現插入引流管時令腹壁血管受傷以致流血不止。我們報告此案例及綜合腹壁血管分佈的特徵，希望可以減少此併發症的機會。

## Introduction

Anterior lumbar spinal surgery requires adequate exposure of the vertebral body and disc space. Vascular injury during mobilization of arteries and veins is not uncommon, which ranged from 1% to 24%.<sup>1–7</sup> Among those cases complicated with vascular injury, venous laceration and branch vessel avulsion are most common, and arterial injuries constitute only 0.45–1.5%.<sup>8</sup> Arterial injuries primarily consist of vessel tear or thrombosis. Active bleeding from abdominal wall vessels due to injury by drain insertion has not yet been reported.

## Case report

A 64-year-old gentleman, with a history of diabetes and chronic obstructive pulmonary disease, presented with low back pain with sepsis. Magnetic resonance imaging of the spine showed L4–S1 epidural abscess. Left hemilaminectomy L4–S1 for pus drainage and right posterolateral fusion L4–S1 were performed. The procedure was uneventful, but his back pain persisted after operation. Magnetic resonance imaging was repeated 3 months after the operation, which showed residual infective spondylodiscitis with

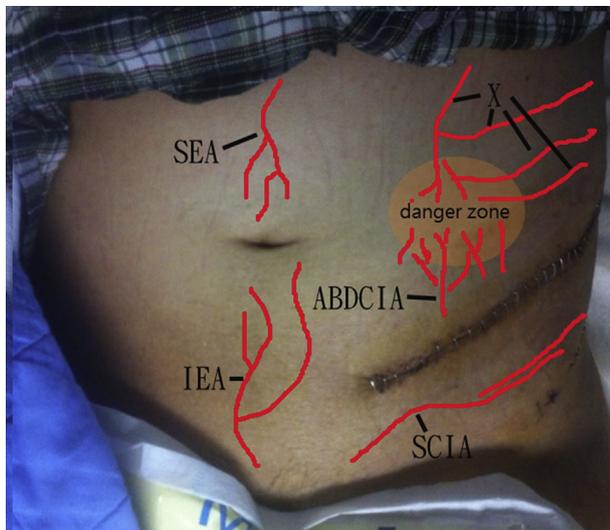
anterior paraspinal collection and newly occurred destruction of superior endplate of L5.

Surgical debridement and L4/L5 anterior spinal fusion with autologous tricorticate bone graft were performed through a retroperitoneal approach. The left common iliac vein was torn during mobilization of the vessel. Repair was performed and tissue glue was applied. Intraoperative blood loss was recorded to be 2100 mL, and 4 units of packed cell were transfused. Drains were inserted into the abdominal and iliac bone graft wound. He was admitted to the intensive care unit for immediate postoperative care. He had tachycardia postoperation and was noted to be pale 3 hours after the operation. His haemoglobin level dropped from 11.0 mg/dL to 5.0 mg/dL. The clotting profile was normal. A large amount of fresh blood output was noted from the abdominal drain, which was inserted at the level of the umbilicus and 12 cm away from the midline at the left side.

Emergency re-exploration was performed in view of unstable haemodynamic status, significant drain output, and a history of venous tear during the operation. A large retroperitoneal haematoma of the size of 1 L was found with active small arterial bleeding at the site of abdominal muscle punctured by the drain. The previous left common iliac vein repair site did not reveal any bleeding. Abdominal wound bleeder was plicated, and no further active bleeding was noted. Postoperatively, his vital signs were stable with minimal drain

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**Figure 1.** The danger zone for abdominal wall vascular injuries is just above the level of the umbilicus and approximately 4–8 cm away from the midline. ABD CIA = ascending branch of the deep circumflex iliac artery; IEA = inferior epigastric artery; SCIA = superficial circumflex iliac artery; SEA = superior epigastric artery; X = anastomoses with lower intercostal, subcostal, and lumbar arteries.

output. Four units of pack cells were transfused during and shortly after the exploration. The haemoglobin level was stabilized at 10.0 mg/dL. The drain was taken off on Day 4 after the operation.

## Discussion

Intra- or postoperative bleeding after anterior spinal fusion was not uncommon, and the most common causes are accidental injury to arteries and veins during mobilization of the abdominal vasculature during exposure of the anterior aspect of lumbar spine. Based on our literature review, there is no previous report of injury to the abdominal wall artery by drain insertion, although arterial injury of the laparoscopic portal sites has been reported.<sup>9</sup> The surgeon did not notice active bleeding in the abdominal wall while inserting the drain before closing the wound. It may be because the size of the artery that was injured was small, bleeding was not too alarming, and significant haematoma took time to develop. Moreover, the drain passed through a subcutaneous tunnel, and the bleeding and haematoma would have been concealed in the subcutaneous tissue. The surgeon should be aware of this potential source of postoperative bleeding and should examine the abdominal wall for any bleeding vessel caused by drain insertion before wound closure.

To prevent such a complication, it is essential to understand the vascular anatomy of the abdominal wall. Human cadaveric studies showed wide variations in the abdominal vasculature pattern. Within the upper and central regions of the abdominal integument, the upper third region was supplied mainly by perforators of the superior epigastric systems, arising from the femoral artery, while the central region was predominated by the deep inferior epigastric systems, arising from the external iliac artery.<sup>10</sup>

A study for anterior abdominal wall vasculature showed relatively consistent superior epigastric artery perforation distribution, piercing rectus sheath within 4 cm of the costal margin.<sup>10</sup> By contrast, orientation and course of the deep inferior epigastric perforators showed marked variations without any single predominated morphology.<sup>10</sup> The deep inferior epigastric artery can be a single branch (29%), double branches (57%), or triple branches

(14%).<sup>11</sup> Another study<sup>12</sup> showed that the deep inferior epigastric artery is divided into two branches in 82.4% of the specimens, and the lateral branch gives more perforator branches in 74% and is dominant in 88.2% of the specimens. Generally speaking, the area lateral to and slightly above the umbilicus is richest in perforator vessels. The zone that is ~4–8 cm away from the midline is named as the danger zone for abdominal wall vascular injuries (Figure 1).<sup>13–15</sup>

In our case, although our drain insertion site is more lateral to the danger zone, it still lied at the level of the umbilicus, which is the area of increased perforator vascularity. Avoidance of drain insertion in the area at and slightly above the level of the umbilicus may reduce the chance of injury to the perforator branch of the deep inferior epigastric vessels.

Finally, although major vessel injury is still the most important cause of significant haemoglobin drop and unstable haemodynamic status after anterior spinal fusion, abdominal vascular injury at the drain insertion site should not be overlooked.

In summary, abdominal vascular injuries may be caused by drain insertion, and the zone that is approximately 4–8 cm away from midline is called the danger zone for abdominal wall vascular injuries.

## Conflicts of interest

The authors declare that they have no conflicts of interest related to the subject matter or materials discussed in the manuscript.

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