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Case Report
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# The Pancake Sign: A Case Report

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## Abstract

**Background:** Complications resulting from spinal surgery are known to involve injury to the contents anterior to the spine and the retroperitoneal space. This includes, but is not limited to the arterial and venous structures such as the aorta, vena cava, iliac arteries and veins. A case study provided by Postacchini et al elaborated on a posterior approach related to a lumbar interbody fusion which resulted in a lesion to the abdominal vessels. A separate case study illustrates a more severe complication in which improper pedicle screw placement culminated in penetration of the thoracic aorta, which was not detected until a six month follow up. While several incidents pertaining to direct injury of arterial and venous structure are well documented in clinical literature, there is a gap in knowledge related to delayed complications such as adhesions. This lack of understanding may implicate anterior spine surgery in being more detrimental than a posterior approach.

**Case Report:** We illustrated the case of a 46 year old, male patient who underwent a posterior lumbar procedure without any known or documented case of entry into the retroperitoneal space in 2016. This patient subsequently developed scarring which was noted on CT and MRI scans spanning from the left common iliac vein to the L5-S1 disk space. Upon attempting to mobilize that common iliac vein, the patient incurred a life threatening tear in the lining of the vein.

**Conclusion:** The incidence at which this type of injury occurs post spine surgery is unknown and warrants further study. The radiographic sign of this clinical finding is described.

**Keywords: Neurosurgery; Spine; Spondylolisthesis; Pseudoarthrosis; Vascular; Case report; Common iliac vein; Radiology**

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## Abbreviations

MRI: Magnetic Resonance Imaging; CT: Computer Tomography; RCIV: Right Common Iliac Vein; LCIV: Left Common Iliac Vein; LCIA: Left Common Iliac Artery; RCIA: Right Common Iliac Artery

## Introduction

A posterior approach to spine surgery is known to present several complications. While both the surgical approach and procedure related details can compound potential complications, the incidence of major injuries resulting from entry into the retroperitoneal space have been well described? The most common major injuries involve accidental entry and injury to either the hollow viscera such as the small intestine or other structures including the venous and arterial system, the ureter and other nerves [1-9]. However, minor injuries to these structures that are self-limited, but result in scarring that can complicate subsequent anterior retroperitoneal procedures are not well described or documented. Accidental entry into the retroperitoneal space is known to occur, but have an uncertain incidence and significance on a patient to patient basis. We documented the case of a 46 year old, male patient with no prior anterior abdominal or retroperitoneal procedures or significant history to suggest an etiology of the scarring. This patient had undergone a complicated posterior laminectomy and fusion utilizing a percutaneous K-wire approach. We believe that the anterior procedure resulted in a minor injury that was self-limited to the left common iliac vein. This culminated in extensive scarring of the iliac vein to the L5-S1 disk space which ultimately prevented adequate mobilization and resulted in a life threatening tear during a subsequent mobilization attempt. Minor injuries to retroperitoneal structures can produce major consequences down the road and with adequate surgical precautions, the surgeon can mitigate such potential compilations.

## Case Presentation

The patient underwent a workup for his mechanical back and leg pain and was identified on

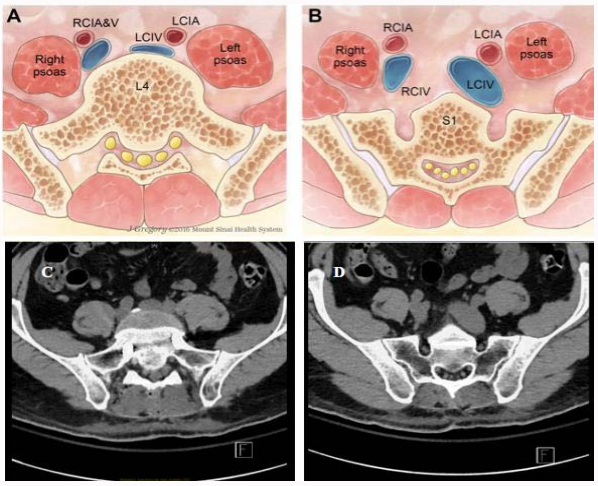


**Figure 1:** (A) An illustration of the Pancake Sign showing the LCIV flattened against the body of L4. The small layer of fat that normally lies in between the LCIV and the spine is not present. (B) The LCIV at a lower level showing normal structure and a normal layer of fat in between the bone and the vessel. (C) CT-scan of the pancake sign showing the LCIV flattened against the body of L4. (D) CT-scan Showing the LCIV at the level of S1 showing normal structure and a normal layer of fat between the bone and the vessel.

CT and MRI to have a grade 1 to 2 spondylolisthesis of L5-S1. He subsequently underwent percutaneous pedicle screw placement. There is no mention made of any anterior violations of the cortex or vertebral body by any structures in the operative note. However, the left L5 pedicle screw was immediately noted to be medially placed and the patient experienced severe left leg pain as a result. The patient returned to the operating room a few days later and attempt to replace the screw was made. A lateral breach of the screw occurred during the subsequent attempt which resulted in removal of the screws. This left the patient with unilateral fixation as well as pedicle fracture. The patient developed a pseudoarthrosis at the level of the unilateral fixation which necessitated the patient returning to the operating room for a posterior pedicle screw revision. The patient subsequently developed a recurrence of both leg and back symptoms 5 months after the revision, and he elected to undergo an anterior lumbar inner body fusion with or without instrumentation to correct the presumed repeat pseudoarthrosis. A vascular surgeon was consulted preoperatively for exposure and a discussion of the risks, benefits and alternatives with the patient occurred to ensure full understanding of the hazards pertaining to an anterior abdominal approach. Since the patient had not undergone previous anterior spinal surgery, he was not deemed to be high risk or possess intra-abdominal or retroperitoneal scarring that would complicate the procedure. The course of the left common iliac vein anterior to the center of the disk space was noted preoperatively, but was not noted at the time to be significantly scarred to the disk space. The patient underwent the proposed operation and during mobilization, multiple small lacerations of the iliac vein complex were encountered. These lacerations ultimately resulted in 10 liters of estimated blood loss which was treated with massive transfusions and abortion of the anterior procedure after repair of the vascular injuries. The patient ultimately recovered without significant complications from this difficult procedure other than some venous swelling in the leg. He later underwent a posterior revision that resulted in improvement to his preoperative condition.

## Conclusion

We propose that the posterior pedicle screw fixation during the patient's subsequent procedure resulted in a small puncture to either the iliac or iliolumbar vein (which is usually at L4-L5, but may have been in proximity to the L5 pedicle screw). This complication resulted in bleeding into the retroperitoneal space during subsequent mobilization. The injured vessel became sealed of due to its small nature and being able to tamponade against itself. In addition we advocate that radiographic evaluation of any patient, who has had any prior lumbar procedure, such as discectomy or instrumentation procedure, should be assessed for this radiographic marker of scarring to the vessel to the spine. We propose we call this radiographic finding the Pancake Sign for the flattening of the vessel as it scars down (Figure 1). Due to this post-surgical complication, the LCIV flattens against the body of L4. The small layer of fat that normally lies in between the LCIV and the spine is not present (Figure 1A). The mechanism of scarring is a result from contraction of tissue that evolves overtime without the thin protective layer of fat in between the vein and bone surface (Figure 1B). This subsequently leads to a distortion, slight thinning, and lateral expansion of the vessel. This Pancake Sign should be considered a sign of increased risk of vascular injury and complications for an anterior based approach if mobilization of the vessels is required.

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