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Case Report

# Lumbar Intradiscal Invaginated Inferior Vena Cava Aneurysm

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The objective of this study is to present a rare case of an invaginated inferior vena cava (IVC) aneurysm in the lumbar intradiscal space. A 73-year-old woman with lower back pain and bilateral lower extremity swelling presented to the clinic. She had undergone spinal surgery performed thrice at the same site (L4–L5) in another hospital and a separate posterolateral fusion surgery procedure 3 years previously. On plain radiography, pseudarthrosis was observed at L4–L5 segment. Contrast computed tomography (CT) imaging revealed a dilatation of the IVC in the intradiscal space of L4–L5. On the anterior side, anterior discectomy was performed. Following insertion of the allograft bone chip and cage, the invaginated IVC aneurysm was repositioned. Implant removal and screw fixation were performed posteriorly. Post-surgery, the patient's lower back pain improved, and the start of anticoagulation treatment after vascular evaluation was planned. Although there have been numerous case reports of patients with intradiscal cysts or gas requiring surgical treatment, there have not yet been any reports of those with invaginated IVC in an intradiscal space. It is important to provide the appropriate treatment based on a thorough prior understanding of the patient's anatomy.

**Keywords:** IVC aneurysm, IVC reposition, invagination, lumbar intradiscal space, pseudarthrosis

## Introduction

Major vessel injury is a rare complication in spine surgery, but when it occurs, it can be fatal. In particular, severe vascular complications are often reported during interbody fusion,[1–3] and it is important to have a thorough understanding of the anatomy, preoperatively. Venous aneurysm is a rare disease that can be arise anywhere in the body. Aneurysms have especially been reported in the inferior vena cava (IVC), but there are no reports of an aneurysm in an intradiscal space yet. Thus, we present the first such case here.

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## Case Report

A 73-year-old woman presented at our hospital with lower back pain and neurogenic intermittent claudication (NIC), including bilateral lower extremity swelling. On examination, she complained of having an increased level of pain while in the sitting position, and there was a notable decrease in her blood pressure (BP), that is, mean 108/72 mmHg than in the supine position (mean 131/81 mmHg). She had previously undergone spinal surgery three times performed at the same site (L4/L5) in another hospital, and had had posterolateral fusion surgery that was no interdiscal procedure 3 years prior to presentation at our clinic.

On dynamic plain radiograph, screw loosening in and instability of the L4–L5 segment, and of the thoracic to L2 bamboo spine, were observed (Figs. 1A and 1B).

Contrast multi-dimensional computed tomography (CT) imaging revealed a dilatation (diameter: 3.3 cm) of the IVC in the intradiscal space of L4–L5 (Fig. 2).

On magnetic resonance imaging (MRI), IVC aneurysm invagination in the L4–L5 intradiscal space was observed, with central stenosis of L4–L5 and bilateral foraminal stenosis of L5–S1 in the sagittal and axial scans (Fig. 3).

We planned to perform an anterior lumbar interbody fusion (ALIF) procedure of L4–L5–S1 and IVC aneurysm repositioning with a conventional retroperitoneal approach on the anterior side. Implant removal and L4–L5–S1 screw fixation were also planned on the posterior side.

The patient was admitted for surgery. On the anterior side, after vertical incision, L5–S1 ALIF was performed, L4–L5 anterior discectomy revealed an empty space and fluid collection, and a sufficient discectomy was performed to observe the IVC aneurysm (Fig. 4). The common iliac vein was carefully dissected caudal to the L4/L5 disc level to inspect the location of IVC invagination, and an orifice was observed. Taking care not to damage the invaginated IVC, the allograft bone chip and polyetheretherketone (PEEK) cage were inserted, and the invaginated IVC aneurysm was repositioned. Implant removal and screw fixation were performed posteriorly. After surgery, the patient's lower back pain and leg pain improved, and the start of anticoagulation treatment was planned after vascular evaluation. On the post-operative 3 months follow up image, the invaginated IVC aneurysm was repositioned and significantly reduced in size than preoperative (Fig. 5A). CT assessment at 7 months also showed IVC aneurysm was maintained stable (Fig. 5B). Because there is no symptom associated with IVC aneurysm after our surgery. We did not perform further surgical manipulation to the aneurysm itself.

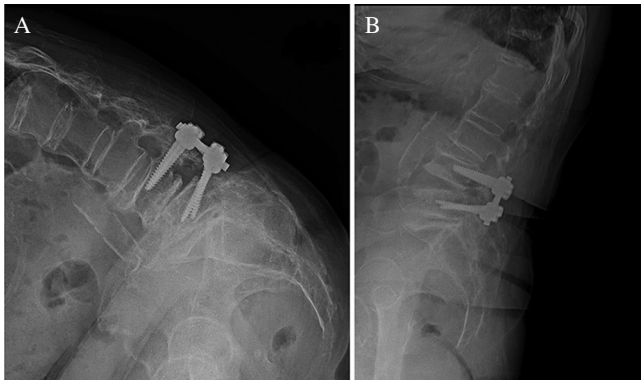


**Fig. 1** Dynamic plain radiography showing screw loosening in and instability of the L4–L5, with the thoracic to L2 bamboo spine observed in the flexion and extension views (A) flexion view, (B) extension view.

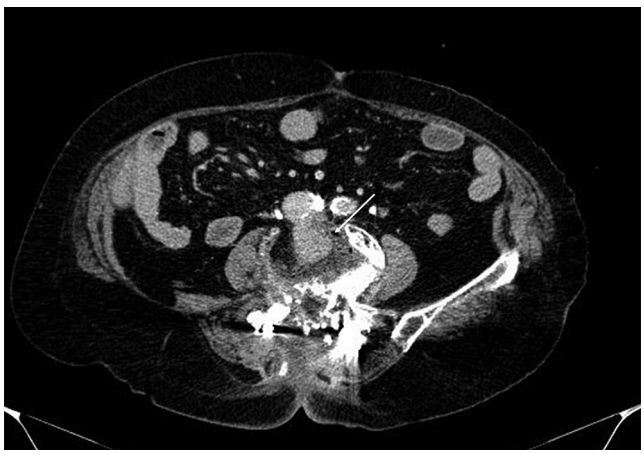

**Fig. 2** Contrast CT in the axial view showing a dilatation of the inferior vena cava (IVC) in the intradiscal space of L4–L5 (arrow, venous phase).

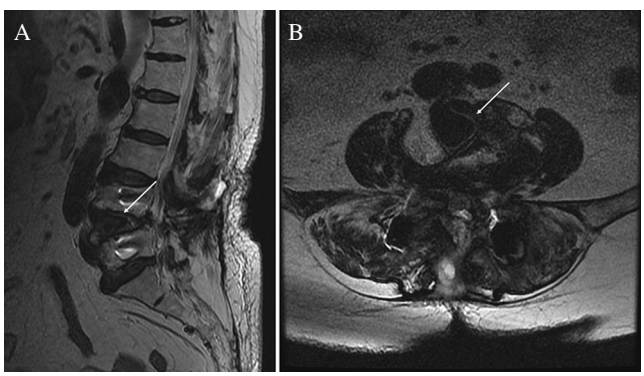


**Fig. 3** A T2-weighted MRI in sagittal (A) and axial (B) views showing a hypointense signal IVC in the intradiscal space of L4–L5 (arrow).

## Discussion

Although cases of low back pain or radiculopathy due to the presence of an intradiscal cyst or gas are rare, they have been reported previously.[4–9] Intradiscal cysts or gas developed in the central canal and show similar symptoms as those of disc herniation due to compression of the thecal sac or nerve root; typically, treatment can be achieved simply by removal.[8,9] However, there have been almost no reported cases of spinal symptoms caused by venous aneurysm, or of intradiscal invagination of the IVC, and the mechanisms of pathogenesis and treatment methods are not well-known.

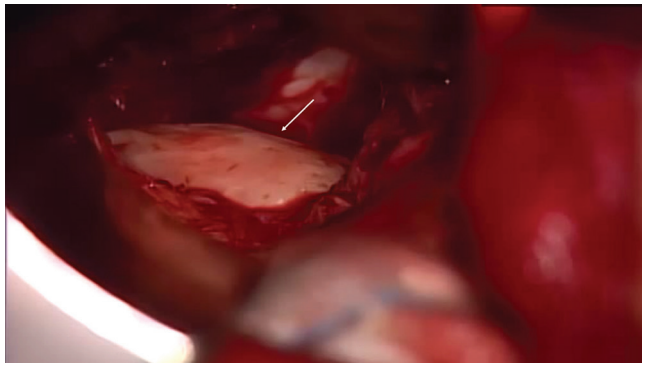

**Fig. 4** Intraoperative microscopic image showing the IVC aneurysm (arrow) in the intradiscal space following anterior discectomy.

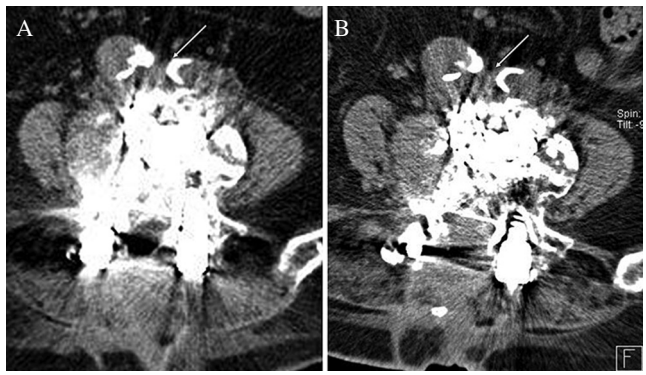


**Fig. 5** Post-operative CT showing the IVC aneurysm (arrow) was repositioned and maintained (A) post-operative axial CT at 3 months, (B) post-operative axial CT at 7 months.

Previously there have been case reports of venous aneurysm, in which venous aneurysm is defined as a persistent isolated venous dilatation measuring twice the normal diameter, with the normal range being 1.5–3.7 cm[10–12] According to a recent literature review, IVC aneurysm is so rare that only a total of 53 cases have ever been reported.[13] It is known that IVC aneurysm can be caused by trauma, inflammatory process, longstanding systemic venous hypertension, and/or congenital defects.[14,15] IVC aneurysm is usually asymptomatic, but it can present with complications, such as leg swelling, abdominal/lower back pain, deep venous thrombosis, massive penile bleeding, and in severe cases, pulmonary embolism or paradoxical cerebral embolism.[10]

Our case showed low back pain, decreased BP, and leg swelling while in the sitting position due to compression of the invaginated IVC. Laboratory tests were HLA B-27-negative, and radiography showed a bamboo spine, which was consistent with seronegative spondyloarthropathy. It is

thought that the patient had previously developed pseudarthrosis following L4/L5 posterolateral fusion, that inflammation had caused injury to the anterior longitudinal ligament (ALL), and that the IVC had invaginated into the L4/L5 disc space, after which repetitive trauma had resulted in IVC aneurysm.

Gradman and Steinberg classify IVC aneurysms into four types according to the association of the aneurysm with the hepatic vein and resultant obstruction.[16] Montero-Baker et al. reported that it is recommended that aneurysms types II–IV undergo resection, ligation, and endovascular management, and that it is that type I, small (<5 cm) and stable aneurysms undergo conservative management.[13]

Our case appeared to be a type III IVC aneurysm; according to the literature, of 21 type III aneurysm patients, satisfactory outcomes were achieved after 15 patients were treated with resection or embolization, and after six patients were given conservative treatment.[13] However, there is still no established treatment for invaginated IVC, but in cases such as the present case, we believe that the proper treatment involves repositioning of the invaginated IVC, followed by vascular evaluation for a precise diagnosis, then commencement of anticoagulation medication to prevent embolism, and maintaining conservative treatment without additional surgical manipulation if the aneurysm is stable.

## Conclusions

The patient in our case was found to be HLA B-27-negative as per her laboratory results, but was suspected to have seronegative spondyloarthropathy. In the unstable L4–L5 disc space, IVC invagination showed repetitive trauma and inflammation, leading to dilatation of the IVC. There have been numerous case reports of intradiscal cyst or gas requiring surgical treatment, but there have been any reports of invaginated IVC in the intradiscal space, yet. It is important to provide the patient with the appropriate treatment according to their IVC type, with selection based on a thorough understanding of their anatomy prior to treatment.

## Conflicts of Interest Disclosure

None.

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