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Spinal Dural AVF Mimicking Degenerative Disc Herniation: Tips and Strategy

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ABSTRACT

Introduction: Spinal dural arteriovenous fistula is a rare vascular disorder of uncertain etiology and represents the most common spinal vascular malformation, accounting for approximately 60–80% of cases. Its clinical manifestations and radiological findings are often nonspecific, leading to frequent misdiagnosis as degenerative spinal disease or demyelinating disorders. This article describes a case of spinal dural arteriovenous fistula that initially mimicked lumbar disc herniation and was unexpectedly identified during surgery.

Case Description: A 65-year-old man presented to the outpatient clinic with pain in his right thigh radiating to his right leg. He had experienced chronic low back pain for five years, which had progressively worsened over the preceding four months. Initially, symptoms improved with rest and analgesics, including tramadol and codeine. However, during the last two months, neither medication nor physiotherapy provided relief. Lumbosacral MRI revealed herniated nucleus pulposus at L1-L2, L2-L3, and L4-L5, with associated spinal canal stenosis. Electroneuromyography showed L4-L5 nerve root compression. Based on these findings, decompressive laminectomy with fusion and stabilization from L3-L5 was planned. Intraoperatively, a vascular mass with active bleeding was discovered near the dura mater at L3-L4. After hemostatic control, the lesion was suspected to be an SDAVF and sent for histopathological examination. Pathology demonstrated fibrocollagenous tissue, adipose tissue, and abnormal blood vessels, confirming the diagnosis. Postoperatively, the patient experienced significant pain relief and remained symptom-free during follow-up.

Conclusion: Although rare, spinal dural arteriovenous fistula can mimic lumbar disc herniation. Careful preoperative assessment and planning for unexpected intraoperative findings are essential for optimal management.

Keywords: Dural arteriovenous fistula, Herniated Nucleus Pulposus,

INTRODUCTION

Spinal vascular lesions, although uncommon, should be included in the differential diagnosis for patients with generalized characteristics of myelopathy. Spinal dural arteriovenous fistulas referred to as Type I spinal arteriovenous malformations, contribute to 70% of spinal vascular malformations and represent the most frequent vascular malformations of the spinal cord and its surrounding dura mater;

nonetheless, they are often not properly diagnosed.

Spinal dural arteriovenous fistula (d-AVF) is an arteriovenous malformation that can be treated surgically or with embolization. Early detection and treatment are critical for achieving a favorable prognosis. Spinal vascular malformations are uncommon spinal cord lesions. They can be an important contributor to neurological morbidity. These lesions can cause paresthesias, myelopathy, pain, hemorrhage, paresis, bowel/bladder dysfunction and radiculopathy in patients.

This case report presents an adult with a herniated nucleus pulposus (HNP) who presented with pain in his right thigh radiating to his right leg, which was ultimately identified as a spinal dural arteriovenous fistula.

CASE REPORT

A 65-year-old man presented to the Neurosurgery Outpatient Clinic at Prof. I.G.N.G. Ngoerah Hospital, Bali, with a chief complaint of pain in his right thigh radiating to his right leg He reported chronic low back pain for 5 years, which worsened 4 months prior to presentation. The pain initially improved with rest and oral analgesics (tramadol and codeine). However, after 2 months of analgesics and physiotherapy, the pain persisted. Preoperative lumbosacral MRI demonstrated multi-level herniated HNP at L1–L2, L2–L3, and L4–L5, accompanied by prominent spinal canal stenosis at L1–L2, L2–L3, and L4–L5 (Figure 1). No subtle perimedullary flow voids or spinal cord edema were initially identified due to the dominating degenerative changes. Electroneuromyography (ENMG) further confirmed a compression lesion of the L4–L5 nerve root. Based on these findings, the neurosurgery team planned a decompressive laminectomy with fusion stabilization from L3 to L5.

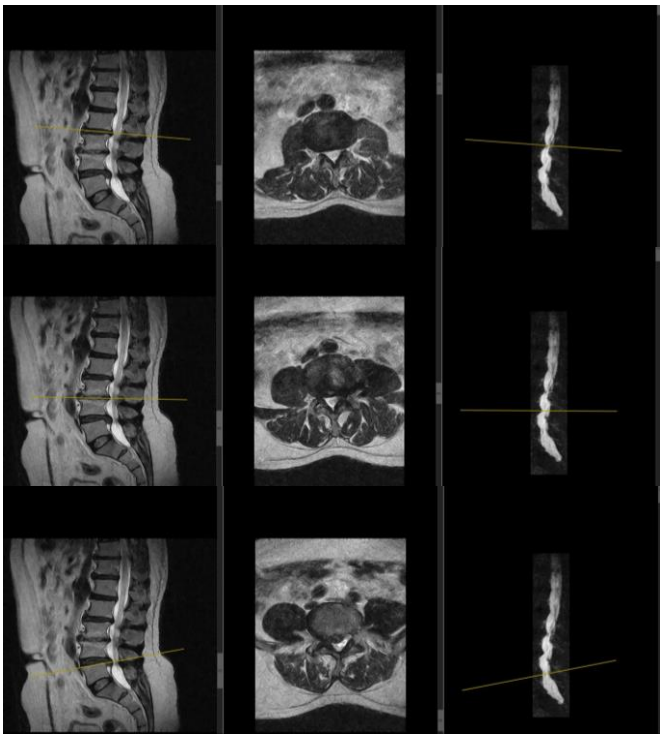


Figure 1. MRI Results of the patient

Intraoperatively, during laminectomy and dissection at the L3–L4 level, a hypervascular lesion with tortuous, thick-walled vessels and active bleeding was encountered adjacent to the dura mater. The bleeding was controlled and suspected of a

spinal dural arteriovenous fistula. The results of the pathology anatomy state there was a fibro collagen, fat and blood vessel that fit with initial suspicion of a spinal dural arteriovenous fistula.

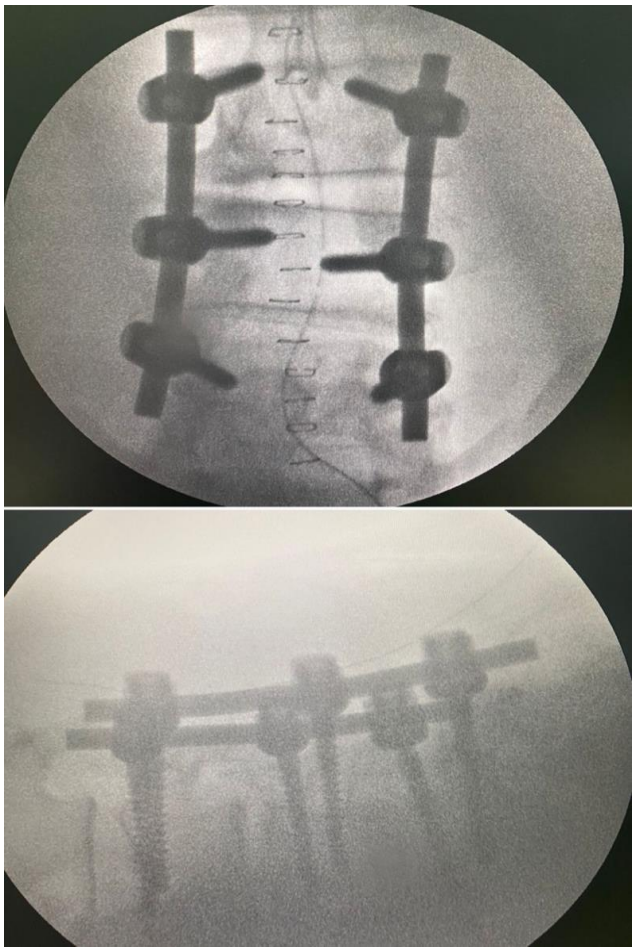


Figure 2. C-Arm Result After Placing the Pedicle Screw

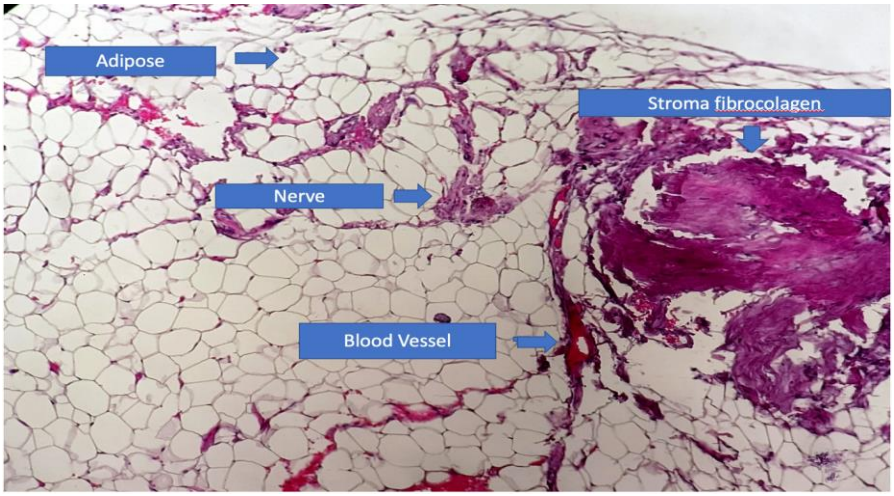


Figure 3. Pathological Anatomy Result of Suspected Spinal Dural AVF

Postoperatively, the patient experienced immediate radicular pain relief. The surgical drain yielded minimal output and was removed on the third postoperative day. At the latest follow-up, neurological examination demonstrated complete motor strength recovery. No postoperative complications, such as cerebrospinal fluid

leakage or surgical site infection, occurred. Following a structured course of postoperative physical therapy, the patient successfully returned to his daily activities and remained completely symptom-free.

DISCUSSION

Spinal dural arteriovenous fistulas (SDAVFs), classified as Type I spinal vascular malformations, represent approximately 70% of all spinal vascular lesions and are among the most common vascular lesions of the spine; nevertheless, they are frequently misdiagnosed.[1] Although most cases arise spontaneously without a clear etiology, a post-traumatic origin cannot be ruled out in a subset of patients. Demographic studies consistently demonstrate a strong male predominance (80%), with diagnosis typically occurring in the sixth or seventh decade of life and rarely prior to age 30.[2] The present case of a 65-year-old male aligns directly with these established demographic patterns. Given their age, many patients have coexisting pathologies that may confound clinical and imaging findings, including disc degeneration, previous surgery, spinal stenosis, and trauma. SDAVF has also been misdiagnosed as a tumor, amyotrophic lateral sclerosis, Guillain–Barré syndrome, degenerative disc disease, peripheral vascular disease, and diabetic neuropathy. [3] In this case, the complete symptomatic and radiological masking of the vascular lesion by multi-level degenerative disease (HNP at L1–L2, L2–L3, and L4–L5 with canal stenosis). While SDAVFs typically present with progressive myelopathy and patchy sensory deficits, this patient presented primarily with lower extremity radicular pain mimicking standard lumbar disc herniation, creating a significant diagnostic pitfall.

There are no pathognomonic clinical features for SDAVF. Most patients present with myelopathic symptoms and, less frequently, radiculopathy, depending on lesion pathophysiology. Nearly all patients exhibit lower extremity sensory deficits, such as patchy, ill-defined paresthesia or hypoesthesia, which may be asymmetric and either unilateral or bilateral.[4]

Lower extremity weakness varies in severity, often accompanied by generalized back pain and subsequent bowel or bladder dysfunction. These symptoms can mimic polyradiculopathy or anterior horn cell disorders, potentially progressing to paraparesis or tetraparesis. Initially, patients present with mild sensory disturbances or back and leg pain that insidiously worsen, resulting in an average diagnostic delay ranging from 15 to 23 months. Upper motor neuron signs typically predominate; however, because these features overlap significantly with common degenerative spine conditions, misdiagnosis is frequent. In this case, the patient presented primarily with lower extremity radicular pain mimicking degenerative lumbar disc herniation rather than overt myelopathy, which, combined with concordant multi-level HNP on MRI, further compounded the diagnostic challenge.

SDAVFs require immediate treatment, with intervention options including surgical occlusion or endovascular embolization, both of which are safe and effective. For decades, microsurgical treatment was recognized as the gold standard; however, endovascular options have increasingly been utilized due to recent technological advancements. Optimal functional outcomes are achieved when treatment is initiated early before significant neurological deterioration occurs, as postoperative recovery correlates strongly with preoperative status in intrinsic spinal cord pathologies. In this case, the patient underwent surgery for suspected HNP based on MRI findings. Intraoperatively, a spinal dural arteriovenous fistula was suspected due to active bleeding encountered during dissection of the presumed HNP. Subsequent histopathological examination revealed abnormal blood vessels, confirming the diagnosis.

Overall, favorable clinical outcomes are observed following treatment, with roughly

75% of patients reporting a high level of satisfaction. Motor strength and gait show faster and more substantial recovery compared to sensory and sphincter dysfunction. In less than 10% of cases, neurological deterioration occurs, while 10–15% of operated patients remain neurologically stable. Over the subsequent months, postoperative neurological recovery progresses gradually, with patients experiencing maximum improvement typically within six months.[5] Significant reduction of postoperative pain is a key feature of successful surgical management. In our case, we found a significant improvement in motoric strength and decrease of pain compared to before doing the surgery.

CONCLUSION

This case report presents an adult with a HNP that actually was a dural arteriovenous. Although spinal dural arteriovenous fistulas are rare, neurosurgeons should be adequately prepared for surgery, regardless of its perceived complexity, as unexpected intraoperative findings may be encountered. With progressive myelopathy of uncertain cause in a middle-aged patient, Spinal dural arteriovenous fistulas should be considered. MRI, particularly T2-weighted imaging (T2WI), is an effective initial diagnostic modality for identifying tortuous veins around the spinal cord and spinal cord oedema. All physicians who manage and diagnose patients with spinal disorders should have a comprehensive understanding of spinal dural arteriovenous fistulas. Misdiagnosis and diagnostic delay all seem to be common. In some patients, prompt diagnosis and treatment could lead to improved neurological results.

Declaration by Authors

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