

Dissecting a radiculomedullary artery as an infrequent cause of low back pain: illustrative case

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BACKGROUND There is currently no case described in the literature of epidural hematoma associated with subarachnoid hemorrhage due to dissection of a spontaneous radiculomedullary artery at the lumbar level and therefore its incidence and prevalence are not known. However, its etiology is thought to be similar and may not be diagnosed given its nonspecific symptomatology.

OBSERVATIONS The authors present the case of an adult patient who consulted the emergency department for 2 weeks of low back pain. On physical examination there were negative signs of radiculopathy without neurological focalization. The patient was evaluated by neurosurgery via thoracic and lumbosacral spine magnetic resonance imaging, with findings of epidural hematoma associated with subarachnoid hemorrhage in the lumbosacral region. After that, panangiography was done. In the study, it was possible to visualize a dissection of the radicular artery at the L2 level. The patient was not a candidate for surgical management and continued with medical pain management. The patient has a good clinical evolution and was discharged.

LESSONS The aim of the present case is to describe a unique case of radiculomedullary artery dissection as a cause of spontaneous epidural hematoma associated with a subarachnoid hemorrhage in the lumbar region.

<https://thejns.org/doi/abs/10.3171/CASE22405>

KEYWORDS radiculomedullary artery; dissection; spinal epidural hematoma; subarachnoid hemorrhage; low back pain

Spontaneous spinal epidural hematoma (SSEH) associated with spinal subarachnoid hemorrhage (SAH) caused by dissection of a radiculomedullary artery is a pathological entity not described in the literature and therefore its prevalence is unknown.^{1,2} SSEH due to dissection of a radiculomedullary artery is usually associated with minor spinal trauma or spinal puncture as in the case of spinal anesthesia.³ On the other hand, spontaneous SSEH are even more rare and have been described mainly in patients with some type of coagulopathy, anticoagulant therapy, intraspinal tumors, or arteriovenous fistulas, and cases with no underlying structural cause are a diagnostic challenge as a cause of low back pain.⁴ On the other hand, SAH can have similar etiologies; however, its association with SSEH is not sufficiently described and is less frequent in the lumbar region, therefore, this association is not frequent even though the causes are similar.³

The clinical manifestations are generally nonspecific and can manifest with symptomatology consisting of low back pain associated with

neurological symptoms and alterations in sphincter control.⁵ Initially, the gold standard for the diagnosis of hematoma is magnetic resonance imaging (MRI), which characterizes the location of the hematoma and its relationship with the spinal cord.⁶ On the other hand, spinal angiography has been used to rule out possible arteriovenous malformations, aneurysms, or dissections of radiculomedullary arteries being still discussed its role in the diagnosis of these entities.⁷

Understanding SSEH associated with SAH by dissection of a radiculomedullary artery as an atypical cause of low back pain, the present case report aims to describe a unique case in the literature and correlate the findings with the available evidence in its diagnosis.

Illustrative Case

The case refers to an adult female with a history of arterial hypertension with low back pain of approximately 2 years of evolution that was exacerbated in the last 2 weeks for which the patient

ABBREVIATIONS MRI = magnetic resonance imaging; SAH = subarachnoid hemorrhage; SSEH = spontaneous spinal epidural hematoma.

INCLUDE WHEN CITING Published February 6, 2023; DOI: 10.3171/CASE22405.

SUBMITTED November 1, 2022. **ACCEPTED** November 29, 2022.

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consulted the emergency department. In the initial evaluation, the patient referred to pain in the lumbosacral region with an intensity of 10/10 with radiation toward the posterior aspect of the left leg associated with a lancinating sensation. On physical examination, the patient had reproducible pain in the lumbar region; cardiac and abdominal etiologies were ruled out.

On her third day of hospitalization, the patient was evaluated by neurosurgery; MRI of the thoracic and lumbosacral spine was performed, which showed evidence of epidural hematoma associated with subarachnoid hemorrhage of L1–4 compressing dural sac of heterogeneous characteristics (Fig. 1). Brain and spine digital subtraction angiography was done on her seventh day of hospitalization, showing abnormal dilatation and dissecting of the posterior radiculomedullary artery on the right side at the level of L2 (Fig. 2) (Video 1), and it was believed that it did not require emergency surgical management. On the ninth day of hospitalization, the case was presented to the neurosurgery and neuroradiology meeting where it was decided that given the low bleeding risk, the patient did not benefit from surgical management and that the lesion could be followed on an outpatient basis.

VIDEO 1. Clip showing spinal arteriography. Click here to view.

On the twelfth day of hospitalization, it was decided to discharge the patient with outpatient analgesic, since the patient presented improvement in pain and symptomatology. Two months later, a postoperative lumbosacral MRI was performed, which showed a decrease in the epidural hematoma and the associated subarachnoid hemorrhage but with signs of posthemorrhagic arachnoiditis (Fig. 3). The next day, control spinal arteriography was performed, which showed complete disappearance of the lesion (Fig. 4) (Video 2). The patient had substantial improvement of her lumbar pain with recovery of her functionality and mobility.

VIDEO 2. Clip showing control spinal arteriography. Click here to view.

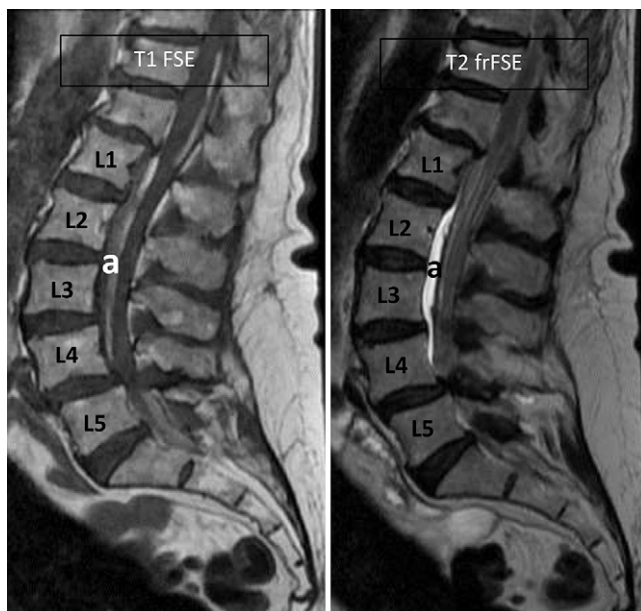


FIG. 1. MRI showing an epidural hematoma (a) associated with subarachnoid hemorrhage of L1–4. frFSE = fast recovery fast spin echo.



FIG. 2. Spinal angiography of the lumbar spine showing dilatation of the posterior radiculomedullary artery on the right side.

Discussion

Observations

Dissection of a radiculomedullary artery is an infrequent etiology of SSEH associated with SAH and low back pain.⁶ The pathophysiology of SSEH and SAH is not very clear, however, it is described that it can originate after the dissection of a radiculomedullary artery due to increased intraabdominal or thoracic pressure as a result of exertion or after spinal trauma.^{8,9}

Knowledge of the perfusion of the intramedullary portion of the spinal cord is important to understand the pathophysiology of the case presented. The perfusion of the structures of the spinal canal is through two arteries, mainly the vertebo-subclavian arteries and the thoraco-abdominal aorta, less frequently through the internal iliac arteries.¹⁰ From these arteries originate the segmental arteries which in turn give rise to the spinal arteries which divide into a ventral, middle and dorsal branch. The middle branch in particular perfuse the dura mater adjacent to the intervertebral foramen and bifurcates to join the

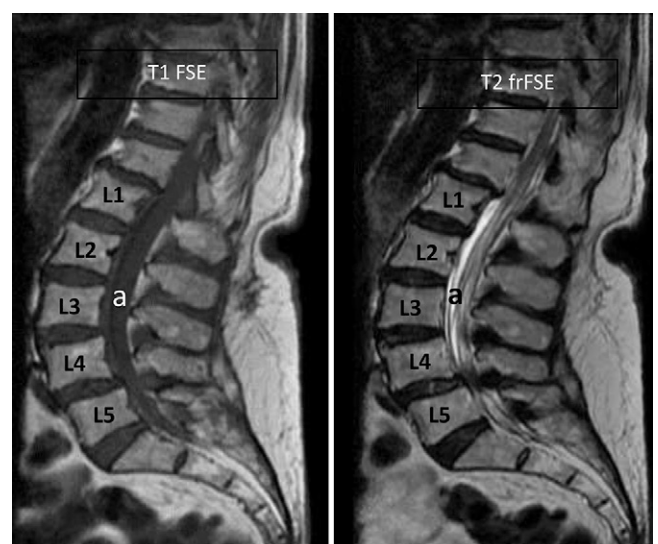


FIG. 3. Control lumbar MRI showing superficial siderosis in the dural sac (a). There are also signs of posthemorrhagic arachnoiditis with sacodural enhancement.

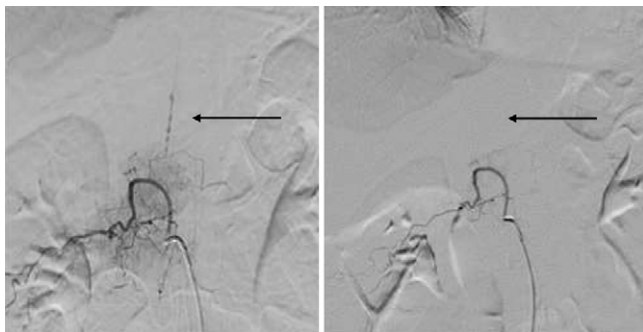


FIG. 4. Comparison of initial spinal arteriography (left) with control spinal arteriography (right). Dilatation of the posterior radiculomedullary artery occurred on the right side.

anterior and posterior nerve roots to generate the radicular, radiculopial or radiculomedullary arteries, the latter respectively follow the path of the anterior or posterior nerve roots to perfuse the intramedullary portion of the spinal cord, and are further subdivided into anterior or posterior radiculomedullary arteries depending on whether they perfuse the anterior or posterior of the intramedullary portion of the spinal cord. It is estimated that the number of anterior radiculomedullary arteries is 6, while the number of posterior radiculomedullary arteries is approximately 11 to 16. In the same sense it is described that the radiculomedullary arteries follow a path through the dura that allows them to subdivide into extradural, intradural, and subarachnoid portions, thus if a dissection is sufficiently extensive it can involve several portions of the radiculomedullary artery as in the present case, where the patient experienced a SSEH and SAH given the involvement of the artery and the extent of bleeding.¹¹

On the other hand, the thoracic and upper lumbar portions are extremely sensitive to ischemia given the scarce perfusion by collateral branches; however, in some cases, the spinal and segmental arteries can provide sufficient collateral supply to perfuse the intramedullary portion of the spinal cord. In the present case, the patient did not experience a spinal stroke given the perfuse provided by the collateral branches provided through the spinal and segmental arteries despite the dissection of the right radiculomedullary artery.¹² MRI is considered the gold standard to locate the hematoma and describe its relationship with the spinal cord,⁴ authors such as Kirsch et al.¹³ classify them according to their imaging characteristics as acute (1–3 days) highlighting isointense hematomas in T1 and mixed in T2, subacute (4–7 days) characterized by a high-intensity image in T1 and T2 and finally in the chronic stages (weeks to months) a high diffuse signal is seen, it is also described that they are generally located in the anterolateral region of the spinal cord and present a compressive pattern.¹⁴ After the identification of the hematoma, some authors suggest performing spinal angiography according to availability, the degree of neurosurgical emergency, and the suspicion of vascular malformation, in this way it is intended to better characterize some lesions such as radicular aneurysms, arteriovenous malformations, and radicular dissections.¹⁵

Surgical or expectant management depends on the neurological and hemodynamic compromise of the patient.² In severe cases, rapid surgical evacuation is recommended through a laminectomy, the opening of the dura, and drainage of the hematoma¹⁶; however, in cases where the neurological compromise is not significant or is moderate and pain is adequately modulated, expectant management may be an option, with the

spontaneous recovery of the hematoma recommend hematoma follow-up in cases in which neurological involvement is not severe.¹⁷

In the present case, the etiology is not clear, so it was considered of spontaneous origin, also the location of SSEH associated with SAH is not grouped within the cases described in the literature which most were at the thoracic level, on the other hand, it is considered that the diagnostic approach of the entity was performed according to the guidelines. In the case of a dissecting of a radiculomedullary artery and especially in the lumbar region, close follow-up is recommended, limiting emergent behaviors that may pose an ischemic risk. In the patient's case, close follow-up was preferred to reduce the risk of bleeding and ischemic lesions.¹⁷

Currently, there is no case described in the literature; however, similar cases are described. Priola et al.¹⁶ described a review of the literature in which they found a total of 11 cases in which patients experienced low back pain associated with SAH or SSEH due to dissection aneurysm of a radiculomedullary artery mainly at the thoracic level. In the same sense, Guédon et al.¹ describe the case of a 22-year-old patient with no significant previous history who presented sudden back pain and paraplegia and underwent a spinal MRI showing SSEH that extended from C1 to L5; after a consensus the authors decided to perform full cerebral and spinal digital subtraction angiography where they found a dissecting aneurysm of T4 for which they opted for an endovascular occlusion and surgical decompression of the level with an adequate postoperative evolution.

Lessons

SSEH associated with SAH secondary to a dissection of a lumbar radiculomedullary artery is an entity of very low frequency, so it is important to diagnose it through a spinal arteriographic study. Its management depends on the neurological symptoms, so expectant management may be eligible for those patients with mild to moderate neurological symptoms, while in severe cases or those that do not spontaneously reabsorb, the surgical approach is preferred.

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Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author Contributions

Conception and design: Garcia Rairan, Gomez, Mejia. Acquisition of data: Garcia Rairan, Mejia. Analysis and interpretation of data: Garcia Rairan, Ramirez-Arquez, Mejia. Drafting the article: Garcia Rairan, Ramirez-Arquez, Mejia. Critically revising the article: all authors. Reviewed submitted version of manuscript: Garcia Rairan, Mejia. Approved the final version of the manuscript on behalf of all authors: Garcia Rairan. Study supervision: Mejia.

Supplemental Information

Videos

Video 1. <https://vimeo.com/776663851>.

Video 2. <https://vimeo.com/776665793>.

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