

## C A S E R E P O R T

# Serial magnetic resonance imaging findings in subarachnoid hemorrhage due to an initially angiographically occult type II spinal aneurysm: case report

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**Summary.** *Background:* Spinal aneurysms are rare causes of spontaneous subarachnoid hemorrhage. *Methods:* We present an unusual, initially occult, case of an upper thoracic intradural extramedullary isolated aneurysm arising from the T2 intercostal-radicular circulation that was initially angiographically occult but was discovered due to unique, albeit nonspecific, magnetic resonance imaging findings of spinal cord T2 hyperintensity and contrast enhancement that were noted to progress with a clinical picture of ictal rehemorrhage. *Results:* Repeat spinal angiography revealed a spinal aneurysm that was treated surgically. *Conclusion:* In cases of sufficient clinical suspicion and nonspecific imaging findings, continued vigilance is advised in seeking an underlying pathoanatomic etiology. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** type II spinal aneurysm; subarachnoid hemorrhage; neuroradiology; angiography

**Abbreviations:** CT, computed tomography; MR, magnetic resonance; SAH, subarachnoid hemorrhage

## Introduction

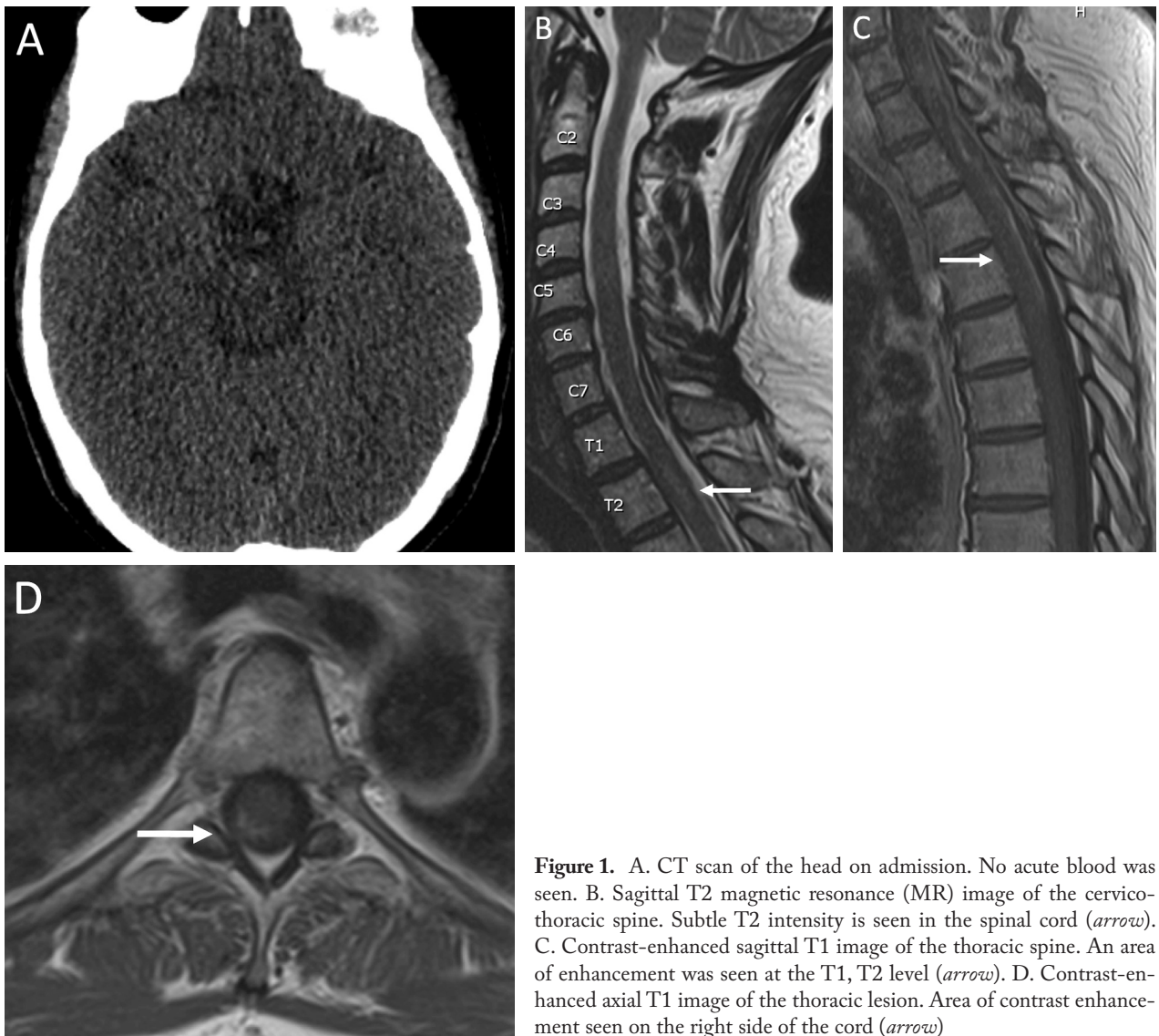
Spinal aneurysms are rare causes of spontaneous subarachnoid hemorrhage (SAH). Some are associated with arteriovenous malformations and fistulae (Type I) (1). Others are isolated (Type II) (1). We here present an unusual case of an upper thoracic intradural extramedullary Type II aneurysm arising from the T2 intercostal/radicular circulation that was initially angiographically occult but was discovered due to unique, albeit nonspecific, magnetic resonance (MR) imaging findings.

## Case Description

A 58-year-old woman presented with a 1-day history of a sudden-onset severe headache, radiating

from her scalp to her neck and upper back with associated photophobia, nausea, vomiting, and double vision. On the initial clinical encounter, her double vision had resolved, and she had only mild nuchal rigidity, with no weakness or signs of myelopathy. No blood was seen on computed tomography (CT) of the head (Figure 1A). A lumbar puncture confirmed subarachnoid hemorrhage (SAH). The patient was treated empirically for aneurysmal SAH according to our institutional protocol, which includes strict blood pressure control, intensive care unit monitoring, nimodipine, continuous magnesium sulfate infusion, and antiepileptic medications.

CT angiography of the aortic arch and all distal vessels and catheter-based cerebral angiography were negative for aneurysms or other vascular anomalies. Neural axis MR imaging showed only an area of subtle T2 hyperintensity in the spinal cord and nonspecific contrast enhancement at the T1 and T2 vertebral levels (Figure 1 B-D). No vascular lesion was seen on

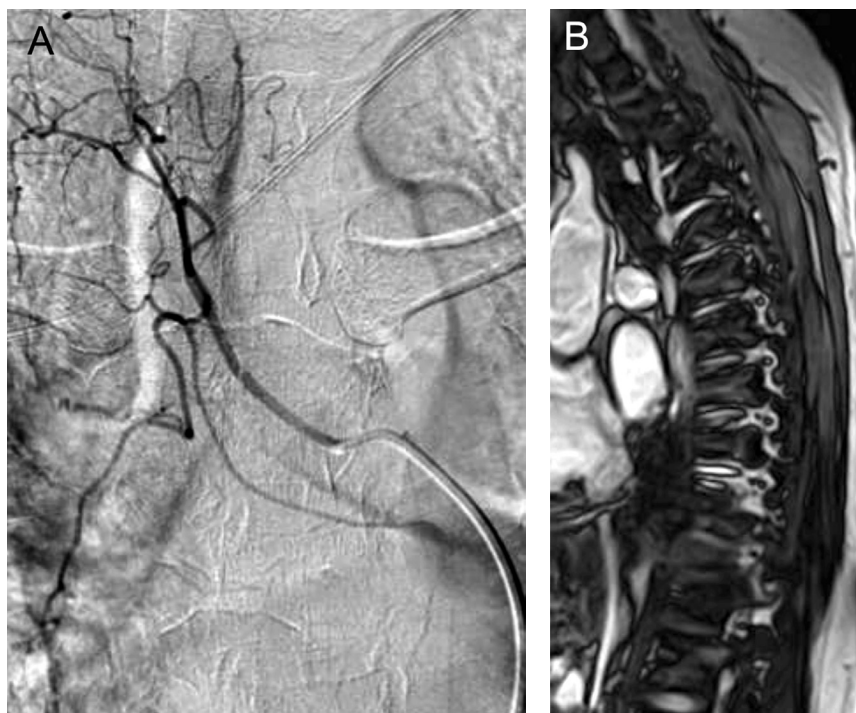


**Figure 1.** A. CT scan of the head on admission. No acute blood was seen. B. Sagittal T2 magnetic resonance (MR) image of the cervico-thoracic spine. Subtle T2 intensity is seen in the spinal cord (*arrow*). C. Contrast-enhanced sagittal T1 image of the thoracic spine. An area of enhancement was seen at the T1, T2 level (*arrow*). D. Contrast-enhanced axial T1 image of the thoracic lesion. Area of contrast enhancement seen on the right side of the cord (*arrow*)

diagnostic spinal angiography, including the right superior intercostal artery (Figure 2A).

An acute episode of progressively worsening headache and nuchal rigidity on hospital day 8 prompted repeat imaging with MR angiography of the cervical and thoracic region (Thoracic: Figure 2B, Cervical: Not shown). MR angiography was conducted on a Toshiba 1.5 tesla MR imaging unit with a standard contrast and noncontrast coronal freeze-frame protocol using .75 mm contiguous slices via a dynamic acquisition protocol (Toshiba America Medical Systems,

Tustin, California, USA). This did not yield a previously unidentified vascular lesion in either the cervical or thoracic regions, yet the contrast-enhanced and T2 signal on the routine MR sequences demonstrated progression of the T2 cord signal hyperintensity with increased enhancement from T1 to T5 in the spinal cord eccentric to the right, with possibly an epidural component (Figure 3A–C). The new imaging findings were thought to be suggestive of a recurrent hemorrhage from a presumed underlying lesion. A second spinal angiogram was performed on hospital day 10. A



**Figure 2.** A. Angiogram of the cervical spine after the initial headache showing the right superior intercostal artery at T5. No obvious vascular abnormality was noted. B. MR angiogram of the thoracic spine after onset of the second headache showing the right-sided radicular arteries. No obvious abnormality was seen.

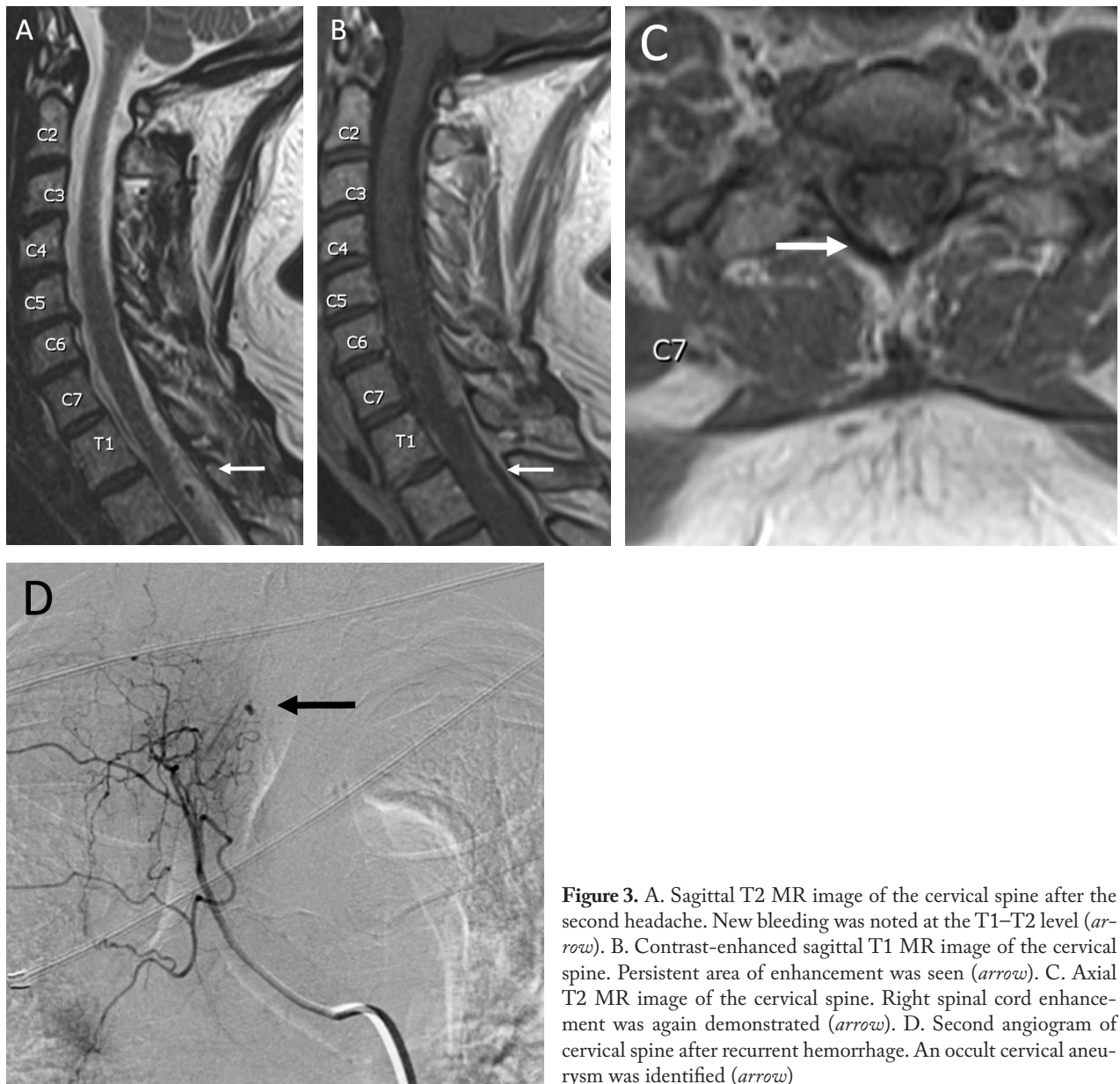
right superior intercostal artery injection at T5 showed good vascular supply to the cord at the T1-T4 levels, with a small aneurysm noted at the right T2 vertebral level arising from the right intercostal artery (Figure 3D).

The patient opted for open exploration and treatment of the aneurysm and was taken for a T1-T3 laminoplasty and surgical ligation for obliteration of the lesion. Upon opening the dura, a hematoma was immediately noted, with an obviously dilated and diseased vessel at the T2 vertebral level. Indocyanine green evaluation of the vasculature showed no early filling or drainage of the lesion, suggesting that the pathology was consistent with a single-level aneurysm without an associated larger underlying arteriovenous fistula. The lesion was then coagulated and excised. The dural defect was repaired, and the laminoplasty was completed. The patient remained neurologically intact postoperatively with resolution of headaches and nuchal rigidity upon discharge from the hospital on day 15 after admission. Repeat spinal angiography 6 months after the operation demonstrated no residual aneurysm.

## Discussion

The incidence and natural history of spinal aneurysms have been well described in a recent review of 112 cases (1). Our case of a Type II spinal aneurysm was consistent with previous reports, where 73% of isolated Type II spinal aneurysms were found in patients older than 38 years, compared to only 7% of type I cases (1). Although the above review discusses a total of 64 known cases of Type II spinal aneurysms, only 3 presented with multiple episodes of SAH (1). However, in general, SAH was a common presenting feature (in 78.6%). Further, only 12% of such aneurysms were reported in the thoracic region. Origin from the anterior spinal artery and the intercostal artery was seen in 23% and 21.9% of cases, respectively. Other associated factors such as aortic coarctation, renal transplant, trauma, stimulant abuse, or pregnancy (1, 2) were not present in our case.

Only 16.1% of type II aneurysms versus 54.2% of type I aneurysms have historically been treated with endovascular methods (1). Anecdotally, Type I aneurysms are thought to be more amenable to catheter-



**Figure 3.** A. Sagittal T2 MR image of the cervical spine after the second headache. New bleeding was noted at the T1–T2 level (*arrow*). B. Contrast-enhanced sagittal T1 MR image of the cervical spine. Persistent area of enhancement was seen (*arrow*). C. Axial T2 MR image of the cervical spine. Right spinal cord enhancement was again demonstrated (*arrow*). D. Second angiogram of cervical spine after recurrent hemorrhage. An occult cervical aneurysm was identified (*arrow*)

based techniques. We report a good outcome after surgical ligation of a type II spinal aneurysm. We present unique MR findings that caused suspicion for an underlying spinal etiology, which prompted the performance of a repeat angiogram, despite an initially negative catheter-based selective spinal angiogram. In the setting of a high index of clinical suspicion, special care should be taken to review imaging for nonspecific evidence of underlying pathology despite lack of an-

eurysm visualization on invasive and noninvasive modalities and consider serial angiography despite the low incidence of the disease process.

In general, spinal angiography has been considered the gold standard for visualizing vascular pathology involving the spinal cord; however, advances in MR imaging technology have yielded results comparable to conventional angiography (3). We believe that the aneurysm was occluded initially due to hemorrhage,



making both methods suboptimal for detection. Our success with simple contrast MR imaging highlights the value of this modality for occult spinal lesions.

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DIRECT, MicroVention CONFIDENCE Study, MicroVention FRED Trial, Penumbra 3D Separator Trial, Penumbra COMPASS Trial, Penumbra INVEST Trial, POSITIVE Trial; *Board Member*: Intersocietal Accreditation Committee.

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