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Case Report

Surgical treatment of spinal arachnoid web: Report of two cases and literature review

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ABSTRACT

Background: Arachnoid webs (AWs) can cause cord compression and syringomyelia in the thoracic spine. Here, we describe two patients who underwent operative treatment for AW and reviewed the literature.

Case Description: Two patients underwent surgical treatment for thoracic AW. Both presented with spastic gait and numbness in the lower extremities. On MR, these lesions exhibited the "scalpel" sign (i.e. due to the accumulation of cerebrospinal fluid on the dorsal aspect of the spinal cord). Operative intervention, consisting of fenestration and web resection, resulted in symptom resolution.

Conclusion: Thoracic AWs are rare lesions that should be considered among the differential diagnosis of spinal compressive syndromes. Surgical fenestration and resection of the AW correct the flow dynamics allowing for full symptoms resolution.

Keywords: Arachnoid web, Scalpel sign, Surgical treatment, Syringomyelia, Thoracic spine

INTRODUCTION

"Spinal arachnoid web (AW)" is defined by a thickening of the arachnoid membrane occurring along the spinal cord under the pial surface. It is believed to originate from a malformed or ruptured arachnoid cyst. These AWs are rare and can cause compressive myelopathy particularly in the thoracic spine.[1,4]

On magnetic resonance (MR) T2-weighted sagittal sequences, these lesions produce the "scalpel sign," due to AW's resultant accumulation of cerebrospinal fluid (CSF) on the dorsal aspect of the spinal cord.[5-7] These are typically surgical lesions requiring both fenestration and resection, following which symptoms/signs typically resolve.[7]

CASE REPORT

Case 1

History and examination

A 36-year-old male presented with a progressive weakness of the left leg greater than the right leg (range of 4– to 4+/5), hyperactive lower extremity reflexes/Babinski responses, a bilateral L1 relatively sensory level, and sphincter dysfunction of 4 month's duration.

Imaging studies

The magnetic resonance imaging (MRI) of the thoracic spine showed the spinal cord compression at the T7 level (enlargement of the spinal cord is the positive "scalpel sign:" focal dorsal indentation secondary to deformity of the cord at the level, because of the resemblance on sagittal MRI images to a scalpel with its blade pointing posteriorly) and inferior syringomyelia [Figure 1].

These findings were consistent with the diagnosis of an AW or anterior spinal cord herniation.

Surgical report

The patient underwent a T6–T7 laminotomy. A midline durotomy was then performed. After the opening the arachnoid, exposing the dorsal cord, there were multiple septate membranes between the dura and the spinal cord that thick fibrotic tissue appeared to strange the cord (i.e. adhesions to the ventral dura, contributed to cord compression) [Figure 2]. At surgery, following careful microdissection of these adhesions from medullary pia mater resulted in decompression and immediate cord reexpansion.

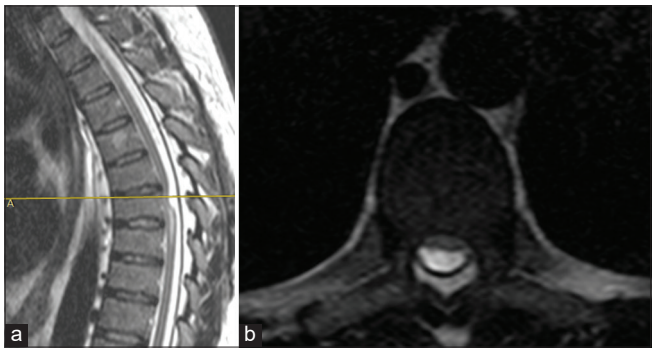

Figure 1: (a) Sagittal T2-weighted magnetic resonance image (MRI) of the thoracic spine showing the spinal cord anteriorly displaced at the level of T7, with enlargement of the dorsal liquor space ("scalpel sign") and narrowing of the spinal cord, associated with the inferior syringomyelia area. (b) Axial T2-weighted MRI of the thoracic spine showing the spinal cord anteriorly displaced by arachnoid web.

Follow-up

There were no postoperative complications, and the patient was discharged days later. The 3 months postoperative MR showed resolution of spinal compression and but residual syringomyelia [Figure 3]. His examination 4 months later had largely normalized [Table 1].

Case 2

History and examination

A 49-year-old female also presented with paraparesis/myelopathy but intact sphincter function. The thoracic MRI of again showed the spinal cord displaced at the T7 level, with a central syrinx [Figure 4]. She too underwent a T6–T7 that showed a thickened AW consistent with an AW, and microdissection released the adhesions resulting in spinal cord reexpansion [Figure 5]. The postoperative MR 1 month later was normal, and the patient at 4 postoperative months regained normal function [Figure 6] [Table 1].

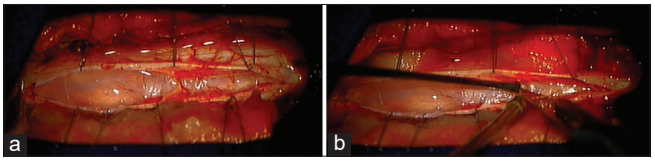

Figure 2: Intraoperative photography obtained in case 1. (a and b) Intraoperative appearance after midline durotomy. Removal of the dura mater, observing the presence of spinal narrowing caused by arachnoid thickening shown by the white arrow. Normal spinal cord is visualized as cranial and rostral.

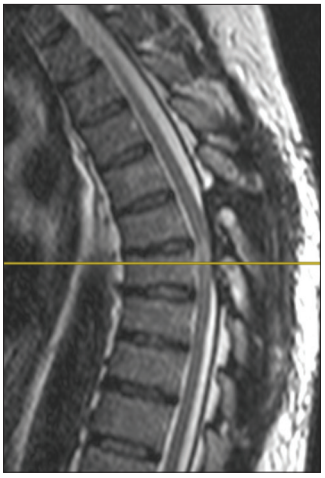

Figure 3: Postoperative magnetic resonance images (MRI) obtained in the patient in Case 1. Sagittal T2-weighted MRI of the thoracic spine showing resolution of the arachnoid web at T7 level and persistence of residual syringomyelia.

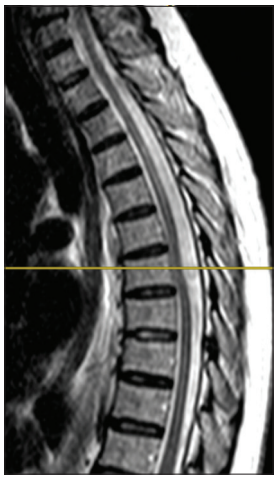

Figure 4: Preoperative magnetic resonance images (MRI) obtained in the patient in Case 2. Sagittal T2-weighted MRI of the thoracic spine showing the spinal cord anteriorly displaced at the level of T7, with enlargement of the spinal cord liquor ("scalpel sign") and narrowing of the spinal cord. Hypersignal indicating segmental myelopathy.

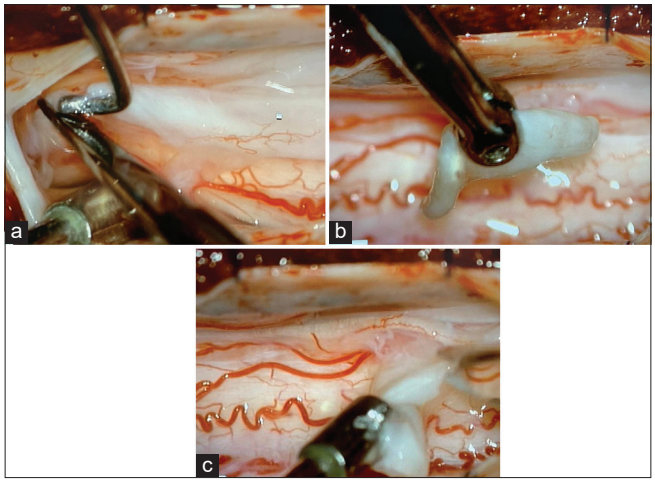

Figure 5: (a-c) Intraoperative photography obtained in case 2 showing the microdissection of the arachnoid web and the removal of arachnoid thickening.

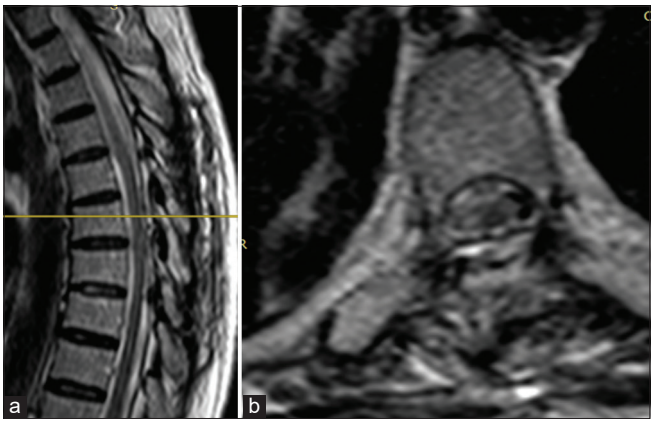

Figure 6: (a) Postoperative magnetic resonance images (MRI) obtained in the patient in Case 2. Sagittal T2-weighted MRI of the thoracic spine showing resolution of the arachnoid web at the T7 level. (b) Axial T2-weighted MRI of the thoracic spine at the T7 level showing improvement of spinal cord displacement.

Table 1: Comparation between the cases

	Case 1	Case 2
Age, gender	36, male	49, female
Localization	T6-7	T6-7
Past medical history	Polytrauma	Tabagism
Gait difficulty	Yes	Yes
Weakness	Yes	Yes
Pain	Yes	Yes
Paresthesia	Yes	Yes
Sensory Loss	Yes	Yes
Incontinence	Yes	No
Scalpel sign	Yes	Yes
Syringomyelia	Yes	Yes
Surgery	Laminotomy and excision	Laminotomy and excision
Complication	No	No
Persistence syringomyelia	Yes	No
Follow-up	Improvement for walking and day to day activities	Improvement for walking and day to day activities

DISCUSSION

Definition and etiology

AWs are rare pathology. They are defined as intradural transverse extramedullary bands of arachnoid tissue connecting the dorsal surface of the spinal cord to the dura. A total of 43 cases have been documented.[1,4,6] Almost all cases were reported dorsally, including both of our cases. Inflammation following trauma, prior surgery, hemorrhage, and spinal infection might have caused the AW in some studies.[4]

Epidemiology

The majority of patients present with thoracic AW; they are typically male, middle aged, and present with paraparesis/myelopathy.[6] A syrinx occurs in 85% of cases.[4]

Diagnosis

MRI is the most accurate test for diagnosing AW.[2,3,6] The T2-weighted sagittal sequence demonstrates the pathognomonic finding of the "Scalpel sign," formed by the accumulation of CSF on the dorsal spinal cord, but with preservation of

the ventral subarachnoid space.[2,4,5] CT myelography may demonstrate indirect AW signs, such as obstruction to CSF flow, although complete obstruction is not common.[7]

Treatment and outcome

Surgical treatment should include fenestration and resection of the web.[2,4,7] Most commonly this involves laminectomy with intradural excision of the AW. Nisson *et al*.[4] recommended surgical lysis/excision. The various surgical techniques include; laminectomy (or hemilaminectomy) at the level of the lesion with the excision of the AW (86%), placement of a shunt or stent (17%), or bypassing the CSF at the level of AW obstruction.[1,3,4] Postoperatively, 91% of patients with AW improve neurologically.[4,6]

CONCLUSION

AWs are rare typically thoracic lesions responsible for a compressive myelopathy that is readily relieved with operative decompression.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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