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Case Report

Pathomorphological description of the shunted portion of a filum terminale arteriovenous fistula

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Abstract

BACKGROUND CONTEXT: The clinical morphology of a filum terminale arteriovenous fistula (f-AVF) is well known; however, pathological details of the fistulized portion are unknown. Herein, we report the pathological findings of the f-AVF.
STUDY DESIGN: Case report and literature review.
PURPOSE: To present a detailed pathological examination of the fistulized portion of the f-AVF.
METHODS: A 71-year-old man presented with gradually worsening bilateral foot paresthesias and anal dysesthesia. T2-weighted magnetic resonance imaging showed flow voids surrounding an edematous conus medullaris and cauda equina with spinal stenosis at L3–L4 and L4–L5. Spinal digital subtraction angiography demonstrated an f-AVF fed by the left T9 intercostal artery.
RESULTS: We performed laminotomies of L3 and L4 to open the dura mater and found a hypertrophic filum terminale. It was resected, leaving a length of 2 cm between the abnormal proximal end and normal distal end. The f-AVF completely disappeared after the surgery. On pathological examination, the filum terminale included two vessels at the proximal end and one at the distal end. At the proximal end, immunostaining showed one vessel that was definitively an artery with both an internal elastic membrane (IEM) and smooth muscle. The other was a vein and lacked an IEM. On the distal side, the collagen fibers gradually increased, the IEM partially disappeared from the arterial wall, and the vein became arterialized with a thin IEM. At the distal end the two vessels joined. Therefore, we speculated that the fistulized portion of the f-AVF was not a fistula point but had some lengths where the artery had characteristics of a vein and there was venous arterialization.
CONCLUSIONS: The filum arteriovenous shunting occurred at the portion where there was venous arterialization and the artery had the characteristics of a vein. Therefore, resecting the filum terminale requires more proximal from the normal distal end.

Keywords: Filum terminale arteriovenous fistula; Shunt; Artery with characteristics of a vein; Arterialization; AVF; Pathology

Introduction

Although some articles have discussed the clinical morphology of AVFs of the filum terminale (f-AVF) [1–4], a detailed pathological examination in the fistula point has not been performed. On histologic examination of the f-AVF, Witiw et al. [5] demonstrated that there were two vascular lumina and the inconsistent vessel wall thickness was suggestive of venous arterialization. However, the specimen

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Fig. 1. (Left) T2-weighted sagittal image showing lumbar spinal stenosis at L3–L4 and L4–L5 and a high-intensity signal at the conus medullaris. (Right) T2-weighted sagittal image showing abnormal flow voids surrounding the spinal cord at the thoracic level.

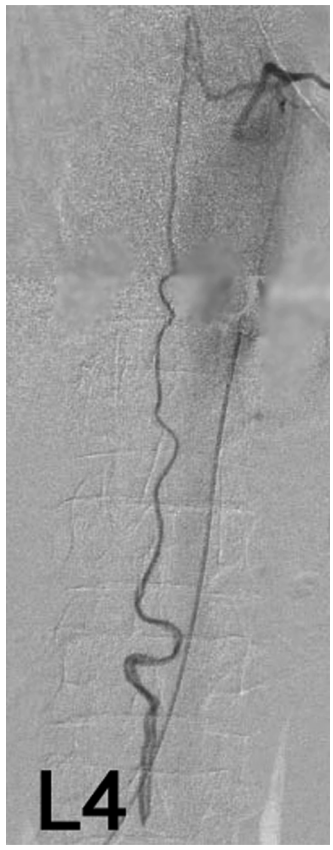

Fig. 2. Spinal angiography showing that the lesion was supplied by the left T9 intercostal artery that was connected to the anterior spinal artery. This artery forms the fistula at the L4 level of the body.

did not include a precise fistula point. We encountered a case of f-AVF and examined the specimen. Herein, we describe a detailed pathological examination of a precise fistula point of the f-AVF.

Clinical summary

A 71-year-old man reported 5 years of gradually worsening bilateral foot paresthesias, intermittent claudication, and anal dysesthesia. The patient was referred to a hospital.

On physical examination, the patient was found to have bilateral pedal paresthesia, anal dysesthesia, and difficulty walking without any radicular symptoms. There were no other clinical or laboratory findings. The patient had no history of trauma or medical treatments. T2-weighted magnetic resonance imaging showed many low-intensity dots, similar in appearance to flow voids, surrounding the conus medullaris and cauda equina and lumbar spinal stenosis at L3–L4 and L4–L5. In addition, a high intramedullary signal was observed from the conus medullaris to the midthoracic spine (Fig. 1, Left and Right). Spinal digital subtraction angiography (DSA) from the left T9 intercostal artery revealed that the anterior spinal artery was connected to the filum artery and formed a shunt at the L4 level (Fig. 2).

We performed laminectomies at L3 and L4 to open the dura mater. The hypertrophic filum terminale and its abnormal vessels were exposed. The author confirmed the abnormal proximal and normal distal ends of the hypertrophic filum terminale. Here, an angiographic catheter was induced into the left T9 intercostal artery, which fed into the lesion in the intraoperative DSA, and intra-arterial dye injection of indigo carmine (Daiichi Sankyo Company Limited, Tokyo, Japan) [6].

Indigo carmine was directly injected into the artery feeding into the lesion at a dilution of 2 mg/mL. We found abnormal vessels and shunt portions with a hypertrophic filum terminale. The abnormal vessels were permanently occluded under close monitoring with transcranial motor evoked potentials, and the filum terminale was resected, leaving 2 cm between the abnormal proximal and normal distal ends (Fig. 3). Finally, the f-AVF completely disappeared by intraoperative DSA.

After the surgery, the patient demonstrated improvement in his symptoms. Magnetic resonance images obtained 3 months postoperatively revealed marked improvement of the high intramedullary signal and complete disappearance of the abnormal flow voids.