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# Transarterial and transvenous embolization of a paraspinal arteriovenous fistula

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**Abstract**

We report a rare case of a paraspinal arteriovenous fistula which was caused by a traumatic compression fracture. A 62-year-old man was admitted because of intermittent claudication, urinary dysfunction, and lumbago. Spinal magnetic resonance imaging and angiography revealed an epidural arteriovenous fistula at the T12 level which had multiple feeding arteries. A combination of transarterial and transvenous embolization achieved stable clinical improvement.



*Keywords:* Paraspinal arteriovenous fistula; Epidural arteriovenous fistula; Transarterial embolization; Transvenous embolization

## 1. Introduction

Spinal vascular malformations can be categorized according to their location: (1) intradural lesions (2) dural lesions, and (3) epidural lesions [1–4]. Except for vertebro-vertebal arteriovenous fistulas (AVF), the last group constitutes a rare vascular anomaly and has been called paraspinal AVF, paravertebral AVF, metameric spinal vascular malformation, and epidural AVF. Herin, we report a rare case of a paraspinal AVF successfully treated with a combination of transarterial and transvenous embolization.

## 2. Case report

A 62-year-old man presented with intermittent claudication, urinary dysfunction, and numbness in both legs. He had a history of a traumatic compression fracture of his T12 vertebral body two years earlier, and his symptoms had gradually progressed since then.

Magnetic Resonance (MR) imaging showed increased signal within the mildly swollen spinal cord, a dilated venous sac within the T12 body, and perimedullary flow voids in the subarachnoid space (Fig. 1A). Spinal angiography using a 5-French Mikaelsson visceral catheter (MIK Clinical Supply) showed multiple feeding arteries arising bilaterally from the T12 and T11 segmental arteries (Fig. 2A–C). Each of the arteries converged into the venous sac and drained into the epidural vein with reflux into the perimedullary veins. In the first procedure, using a Progreat micricatheter (Terumo Tokyo, Japan), multiple feeders were embolized with mixtures *N*-butylcyanoacrylate (NBCA) and lipiodol in rations 25:75–50:50. After the transarterial embolization, the patient's symptoms, the extent of the hyperintense signal area in the cord, and the size of the venous sac were unchanged. Therefore, two weeks after the first procedure, transvenous embolization was attempted via a transfemoral approach. A 5-French Headhunter cerebral balloon catheter (H1, Clinical Supply) was placed into the azygos vein and balloon occluded azygos venogram was obtained (Fig. 3A). A FasTracher 18 microcatheter was then

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Fig. 1. Sagittal T2-weighted MR image shows the increased signal within the swollen cord, perimedullary flow voids in the dorsal surface of the cord, and a dilated venous sac in the fractured T12 vertebra.

advanced through the 5-French catheter into the exit of the venous sac in the epidural venous plexus (Fig. 3B), which was embolized using a 50:50 mixture of NBCA and lipiodol.

After the transvenous embolization, the urinary dysfunction and intermittent claudication of the patient gradually improved. His urinary dysfunction disappeared within six months of follow-up examinations. The numbness of both his legs remained unchanged. MR imaging showed only a small residual venous sac and a decrease in the extent of the hypersignal area in the cord (Fig. 4). These findings stabilized within the 18-month period of follow-up MR imaging studies.

## 3. Discussion

The term 'Paraspinal AVF' indicates that the AVF occurs outside the dura, but drain into the epidural veins [2]. An AVF can be caused by trauma, as in our patient. It also occurs spontaneously and as the result of vascular fragility attributable to fibromuscular dysplasia, Ehlers–Danlos syndrome, or neurofibromatosis [3]. The clinical presentations of paraspinal AVF is variable, and includes subcutaneous pulsating mass, a bruit, heart failure, and progressive neurological symptoms. Progressive neurological symptoms are caused by congestive venous hypertension, direct spinal cord compression by an ectatic venous pouch, or arterial steal on the artery of Adamkiewicz [2,4,5].

Paraspinal AVFs usually have high flow and an endovascular treatment is recommended. However, they remain a challenge because of the rarity of the disease and the paucity of reported cases. According to a review of the literature, which is summarized in Table 1, transarterial embolization alone showed clinical improvement and its stabilization in patients with a single feeding artery [1,2,5–7]. In contrast, in patients with multiple feeding arteries, transarterial embolization

Table 1
Paraspinal arteriovenous fistula: a review of the literature

| Reference | Age/sex | Feeding artery | Endovascular treatment | Initial clinical outcome | Follow-up study |
|---|---|---|---|---|---|
| 1 | 24/F | Single | TAE | Asymptomatic | |
| 1 | 0/F | Single | TAE | Improvement | |
| 2 | 1/M | Single | TAE | Asymptomatic | |
| 5 | 39/M | Single | TAE | Asymptomatic | Stable for one month |
| 6 | 60/M | Single | TAE | Improvement | Stable for six months |
| 7 | 17/F | Single | TAE | Asymptomatic | |
| 2 | 7/M | Multiple | TAE | Asymptomatic | |
| 1 | 38/M | Multiple | TAE (8 times) | Improvement | Multiple spisodes of recurrence |
| 2 | 5/F | Multiple | TAE | Unchanged, removal is needed | Stable for seven months |
| 8 | 57/F | Multiple | TAE(7 times) + TVE | Improvement | Multiple episodes of recurrence after each TAE, stable for one year after TVE |
| 8 | 41/M | Multiple | TAE + TVE | Improvement | Recurrence after TAE, stable for eight months year after TVE |
| 2 | 48/F | Multiple | TAE + TVE | Improvement | Recurrence after TAE, stable for eight months year after TVE |
| 2 | 68/M | Multiple | TAE + TVE | Improvement | Recurrence after TAE, no follow-up after TVE |
| 2 | 17F | Multiple | TAE + TVE | Improvement | Recurrence after TAE, no follow-up after TVE |
| 9 | 48/F | Multiple | TAE + TVE | Asympyomatic | Stable for six months |
| 3 | 50/F | Multiple | TVE | Asymptomatic | Stable for eight months |
| 3 | 21/F | Multiple | TVE | Asymptomatic | Stable for six months |