

Differential Diagnosis of Claudication: Cystic Adventitial Degeneration of the Popliteal Artery – Diagnosis by a Combination of MR Angiography and Anatomical Sequences

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Case report

A 40-year-old female patient presented at the Department of Vascular Surgery with typical claudication during physical activity after a walking distance of maximum 200 meters. She complained of pain in the right calf that relieved after a short rest. At clinical examination the pulses of the lower extremities were unremarkable at both sides, the oscillogram at rest did not show any pathologies. Under stress the oscillogram was restricted in the right leg, the treadmill ergometer examination had to be stopped at 3 km/h and 12% fall after 80 meters. The preliminary diagnosis was peripheral artery disease (PAD) grade IIB, a conservative therapy was initially suggested.

The patient was then transferred to our Department of Radiology for the evaluation of PAD. We performed multi-station bolus-chase magnetic resonance angiography (MRA)

in the arterial phase of the pelvis and the whole lower extremity (3T, MAGNETOM Skyra, Siemens Healthcare, Erlangen, Germany) in 4 steps using a dedicated peripheral vascular coil together with the body-array and spine-array coils and a fast 3D spoiled gradient echo sequence (T1 3D FLASH) in coronal orientation (TR 3.75 ms, TE 1.33 ms, flip angle: 24°, parallel imaging factor: 3, base resolution: 384, number of slices per slab: 72–80, slice thickness: 1.3 mm, FOV: 420) [1]. A bi-phasic continuous injection of the contrast agent (CA) was used (1 ml/sec and 0.6 ml/sec) together with an automatic movement of the table (table advance per stage: 260–300 mm). Planning of the procedure was done by utilizing the Tim Planning Suite with a Set-n-Go protocol. For the timing of the CA the care bolus technique was applied. The MRA showed an occlusion of the popliteal artery in the P1/P2 segment over a distance of 5 cm with mild collateralization (Fig. 1). All the other vessels were

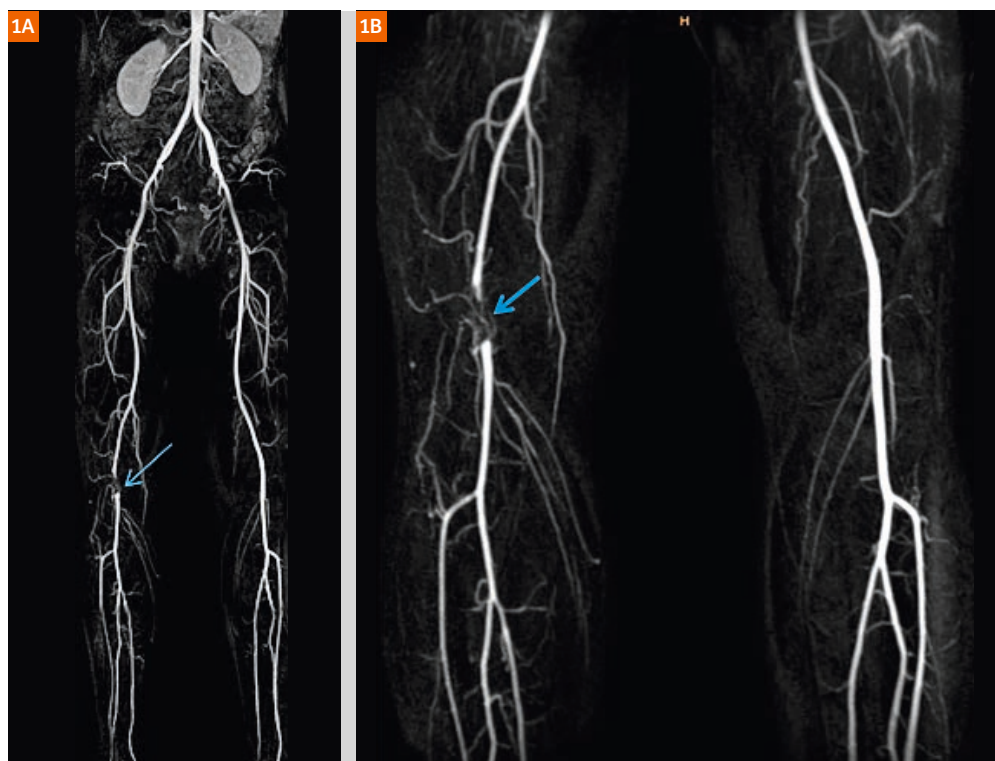


Figure 1: MR-angiography (3T, MAGNETOM Skyra) clearly depicting an occlusion of the popliteal artery in the P1/P2 segment over a distance of 5 cm with mild collateralization (blue arrows).

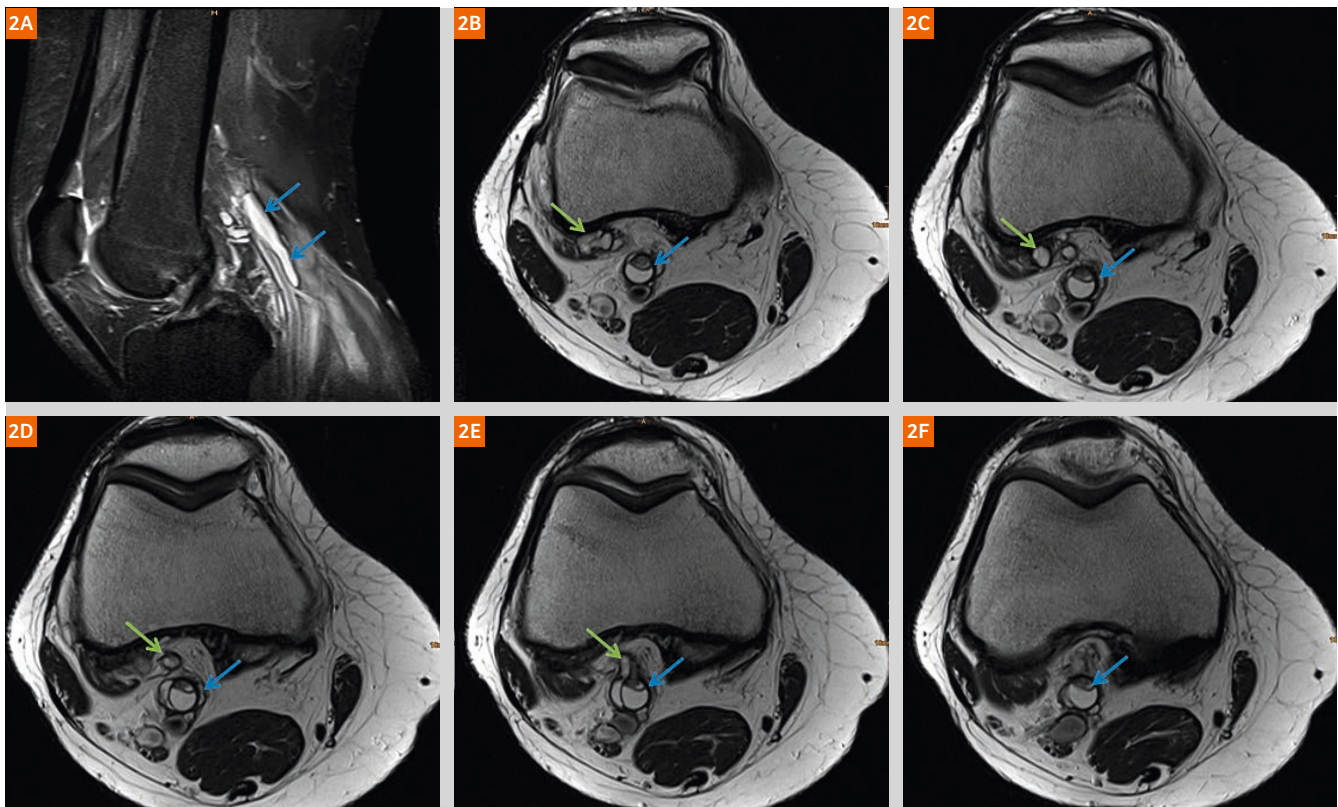


Figure 2: MRI of the knee (1.5T, MAGNETOM Avanto) demonstrating a cystic lesion that is adherent to the popliteal artery (blue arrow). Further we could demonstrate a connection to a ganglion that is adjacent to the knee joint (green arrow). Image 2A is a sagittal TIRM (TE 15 ms, TR 3160 ms, SL 3 mm, matrix 316 x 320) and images 2C–F are axial T2-weighted turbo-spin-echo sequences (TE 79 ms, TR 4680 ms, SL 3 mm, matrix 384 x 384).

unremarkable which is unlikely for a vasosclerotic disease with only one focal manifestation in a young woman. Therefore we decided for a further evaluation by MRI of the knee to rule out other differential diagnosis for the occlusion. We performed knee MRI on a 1.5T scanner (MAGNETOM Avanto, Siemens Healthcare, Erlangen, Germany) with a dedicated knee coil (8-ch high-resolution knee array, Invivo, Gainesville, FL, USA). The protocol consisted of a sagittal TIRM sequence (TE 15 ms, TR 3160 ms, SL 3 mm, matrix 316 x 320) and an axial T2-weighted turbo-spin-echo sequence (TE 79 ms, TR 4680 ms, SL 3 mm, matrix 384 x 384). We found a cystic lesion (hyperintense on TIRM and T2), adherent to the popliteal artery, with an extraluminal appearance (Fig. 2). The diagnosis was cystic adventitial degeneration of the popliteal artery causing a compression of the artery leading to a stenosis.

The patient was again referred to the Department of Vascular Surgery and due to the clinical burden a surgical procedure was performed. The affected part of the popliteal artery was resected and replaced with the vena basilica by an end to end anastomosis. Postoperative MRA showed a regular opacification of the interponate (Fig. 3). The clinical symptoms disappeared after the intervention and the patient at present is free of any symptoms.

Discussion

The cystic adventitial degeneration is a challenging diagnosis. The disease was initially described by Atkins in 1947 [2]. It is a vascular condition characterized by a collection of mucinous material within the adventitia that constricts the vessel from the outside [3–5]. The P2 segment of the popliteal artery is the most common localization. Patients typically present with the same symptoms as patients with classical PAD. The disease predominantly occurs in young males (age < 50 years) presenting with typical symptoms of claudication. The lack of risk factors for arteriosclerosis and the atypical age should alert for other differential diagnosis. Beside cystic adventitial degeneration other differential diagnosis such as chronic exertional compartment or popliteal entrapment syndrome, chronic venous insufficiency, degenerative disk disease, osteoarthritis, spinal stenosis and thrombangiitis obliterans should also be considered [6].

In some cases MRA can be negative and therefore misleading because the cyst of the adventitia leads to a dynamic exercise-dependent flow inhibition. In our case the occlusion could be clearly depicted with MRI and further associated to a cystic lesion by a local MRI of the knee.

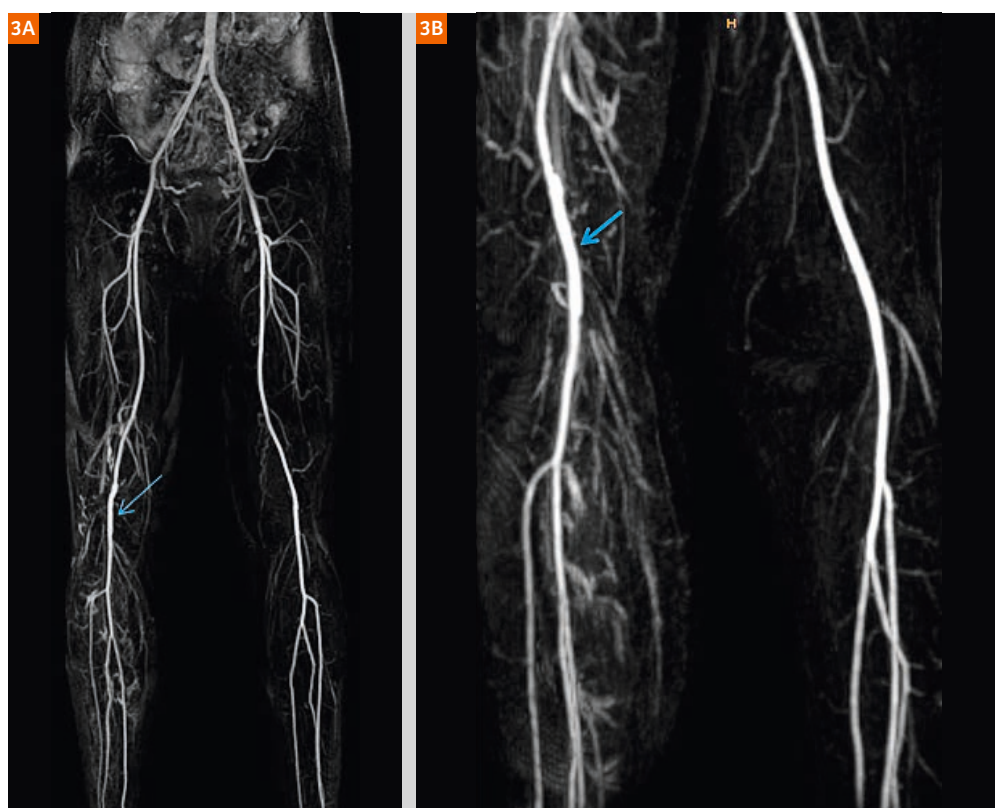


Figure 3: MR-angiography (3T, MAGNETOM Skyra) after resection of the affected popliteal artery and replacement with the vena basilica by an end-to-end anastomosis. Regular opacification of the interponate is shown (blue arrows).

The pathogenesis of cystic adventitial degeneration is still unexplained, but several theories have been advanced:

1. The synovial theory: adventitial cysts are seen as ganglia originating from the adjacent joint space [7];
2. The embryologic theory: inclusion of mucin-secreting cells in the wall of the vessel [8];
3. Microtrauma theory: repeated injuries lead to a progressive degeneration of the arterial adventitia [9, 10].

Our case supports theory 1 because we found a connection between the cyst and ganglia that was adjacent to the knee joint space (Fig. 2).

MRI with a combination of MRA and anatomical sequences are essential tools in the clarification of differential diagnosis in PDA. Further MRI is crucial for surgical planning and also for postoperative control.

References

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