CLINICAL CASE

Popliteal pseudoaneurysm and arteriovenous fistula after acupuncture

Faux anévrysme et fistule artério-veineuse de l’artère poplitée après acupuncture

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KEYWORDS
Popliteal artery; Pseudoaneurysm; Trauma; Arteriovenous fistula; Surgery; Endovascular repair; Acupuncture

Summary Most popliteal arteriovenous fistula and pseudoaneurysm formation are related to trauma. Few cases have previously been reported after acupuncture therapy. Such events are typically observed when the procedure is performed by non-medical acupuncturist. They may present with acute ischemia, recent claudication, distal emboli, or less commonly rupture. Duplex ultrasound should be considered as the 1st method of investigation. Computed tomography scanning is particularly accurate in making the diagnosis. Treatment strategies consist of surgery or endovascular management. The most commonly performed surgical technique for popliteal pseudoaneurysm repair is resection with bypass grafting, whereas popliteal arteriovenous fistula are usually treated surgically with ligation and primary repair. Endovascular procedure using a stent-graft is thought to be a reasonable option for treating popliteal false aneurysm or even arteriovenous fistula. We will describe two cases of an arteriovenous fistula and pseudoaneurysm of the popliteal artery that developed after acupuncture needling in the region of the popliteal artery.

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MOTS CLÉS
Artère poplitée ; Faux anévrisme ; Traumatisme ; Fistule artério-veineuse ; Chirurgie ; Traitement endovasculaire ; Acupuncture

Résumé Les faux anévrismes et les fistules artério-veineuses, faisant suite dans la plupart des cas à un traumatisme, sont des entités cliniques caractérisées par leur caractère insidieux et tardif. Peu de cas ont été rapportés après une procédure d’acupuncture. De tels accidents sont généralement constatés lorsque les acupuncteurs ne sont pas suffisamment formés. Ces lésions sont importantes à diagnostiquer car elles peuvent mettre en jeu le pronostic vital du membre et parfois conduire à l’amputation. L’examen de choix devant une suspicion d’un faux anévrisme ou d’une fistule artério-veineuse poplitée est l’échographie Doppler. L’artériographie est indispensable dans le bilan préopératoire et pour le diagnostic. Le traitement de ces lésions est soit chirurgical, soit endovasculaire. Néanmoins, le traitement de référence reste la chirurgie à ciel ouvert à cause de la localisation particulière de ces lésions. Nous rapportons un cas de faux anévrisme et un cas de fistule artério-veineuse poplitée post-traumatiques après l’implantation d’aiguilles d’acupuncture dans la région poplitée.
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Introduction

Acupuncture is an ancient alternative medical treatment that has commonly been used for pain control. Precautions are observed at acupuncture points to avoid traumatic complications while needling. Vascular lesions are rarely reported following acupuncture, and most that are reported are arterial pseudoaneurysms. Untreated, they may ultimately lead to amputation. Early detection and management are critical in the prevention of such complications. Open surgical intervention has been the primary therapeutic option including resection with either end-to-end anastomosis or interposition grafting, commonly with reverse saphenous vein grafts, or by ligation of the vessel and bypass grafting with a synthetic graft.

We will present two cases of arteriovenous fistula and pseudoaneurysm of the popliteal artery as a sequel of traditional acupuncture.

Case 1

A 38-year-old man presented to our cardiovascular surgery unit at Rabta Hospital with pulsatile mass in the back of his lower left thigh and popliteal space.

About one month earlier, he had undergone a single session of traditional acupuncture for pain associated with lumbosciatica, performed by an unauthorized practitioner. During that procedure, several needles had been inserted around the knee. During the following month, his left thigh began to swell progressively with lower left limb pain and edema.

Upon clinical examination, a pulsatile mass was identified in the left popliteal area. The distal pulses were normal.

A Doppler examination followed by a conventional arteriography revealed a 3-cm-long pseudoaneurysm of the left popliteal artery, and adequate distal runoff.

We performed elective surgery, using a medial approach to the popliteal artery pseudoaneurysm (Fig. 1). After systemic heparinization, the popliteal artery was clamped above and below the false aneurysm.

Figure 1 Operative view of the left popliteal space showing the pseudoaneurysm.
Vue per-opératoire montrant le faux anévrisme poplité

The pseudoaneurysm was opened longitudinally. We tried to perform a direct anastomosis of the two divided ends of the popliteal artery, which turned out to be impossible because of severe adhesion between the popliteal artery and adjacent structures. Thus, we interposed a vein graft between the two ends of the popliteal artery.

The patient made an uncomplicated recovery. At a three-month follow-up, the patient was well and free of any recurrent vascular lesion.

Case 2

A 38-year-old male, having a prior history of traditional acupuncture for osteoarthritis of the right knee achieved by an untrained practitioner, was presented with an increasing buzzing sensation of a length of two months in the right popliteal fossa. Neurological examination revealed intact motor and sensory neural functions of the extremities.

Physical examinations revealed a continuous thrill in the right popliteal space. There was a soft tissue swelling in the right popliteal fossa and a thrill that diminished with
compression. The patient was hemodynamically stable and right distal leg pulses were palpable.

Doppler examination and selective arteriography revealed a popliteal arteriovenous fistula (Fig. 2).

The popliteal artery was explored via a posterior approach. Operative findings confirmed the presence of a fistula and a dilated, tortuous popliteal vein. A 1-cm communication was discovered between the main popliteal vein and artery just below the knee.

Complete popliteal arteriovenous fistula exclusion with lateral venorrhaphy and end-to-end repair of the artery was performed.

The patient’s postoperative course was uneventful and he was discharged from the hospital on the 10th postoperative day without complications.

Discussion

Popliteal pseudoaneurysm and arteriovenous fistula are commonly caused by trauma. They are developed after penetrating injuries rather than blunt trauma [1]. In our patients, the mechanism of injury is caused by a deep insertion with 3–4 cm long acupuncture needles into the popliteal cavities. Presumably, they penetrated the medial wall of the artery or/and the vein, which led to extravasation around the artery.

Adverse effects related to acupuncture have rarely been documented. The most frequent complications included pneumothorax, bacterial and viral infections, central nervous system injury, peripheral nerve injury, cardiac tamponade, and pseudoaneurysm formation [2,3].

Pseudoaneurysms and arteriovenous fistulas resulting from acupuncture are an extremely rare event. They are often caused by malpractice of acupuncturists and may be associated with serious and even life-threatening incidents. There are few reports concerning popliteal vascular complications following acupuncture, and most that are reported are arterial pseudoaneurysms (Table 1) [4–11]. The locations of the pseudoaneurysms were the popliteal artery, the lower abdominal aorta, the renal parenchyma and the costocervical trunk. Five patients underwent surgical repair: resection, patch angioplasty, direct repair, and graft interposition. One patient was treated by coil embolization and another by endovascular repair. Only one case of popliteal arteriovenous fistula has previously been reported and was successfully closed using percutaneous endovascular intervention. All patients made an uncomplicated recovery.

In the early stages, the popliteal artery pseudoaneurysm may be presented as a pulsatile mass in the popliteal fossa or it might remain undetected for a long time [12]. It can be presented in the form of a painful swelling and can cause a flexion deformity [13]. A palpable thrill and an audible bruit will be frequently found on examination of a patient with a post-traumatic popliteal arteriovenous fistula [14].

The main complications of popliteal artery pseudoaneurysm include distal embolization, local compression increasing the risk for popliteal vein thrombosis, and thrombotic obstruction leading to a high risk of limb loss. Rupture is an uncommon complication affecting less than 2% of popliteal aneurysm [15].

For these reasons, we should not ignore asymptomatic aneurysms; early operation is necessary in pseudoaneurysms larger than 20 mm, or where intraluminal thrombus is visible on ultrasound.

The diagnosis of popliteal pseudoaneurysms should be suspected clinically, and Doppler ultrasonography and CT angiography should be used to confirm it [16]. Arteriography supplements the diagnosis and allows better preoperative planning.

Repeated ultrasonography is also valuable in determining whether the false aneurysm is increasing in size. Moreover, smaller pseudoaneurysms, which are associated with small defects in the arterial wall, can be treated with an ultrasound-guided compression repair.

The established treatment for the remainder is pseudoaneurysm exclusion with or without popliteal artery bypass grafting with ligation of the native artery.

Open surgical repair of the vascular lesion is best performed via a medial approach to the popliteal artery. This allows further extension of the incision and greater exposure of the vessel either proximally or distally should the need arise. Otherwise, the popliteal space can be approached posteriorly with direct visualization and resection of the vascular lesion with bypass grafting [17].

Vein, Dacron® or Polytetrafluoroethylene may be used to repair popliteal pseudoaneurysms. An autologous vein should be used when resecting the false aneurysm or performing direct in-lay grafting, as this will not kink or occlude...
Table 1 Patients with vascular complications secondary to acupuncture.

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Author/Year (references)</th>
<th>Cases age (year)/Sex</th>
<th>Indications for acupuncture</th>
<th>Complication</th>
<th>Onset after acupuncture</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fujiwara et al., 1994 [4]</td>
<td>58/F</td>
<td>Shoulder stiffness</td>
<td>Pseudoaneurysm of costocervical trunk</td>
<td>1 month</td>
<td>Resection</td>
</tr>
<tr>
<td>4</td>
<td>Origuchi et al., 2000 [7]</td>
<td>67/M</td>
<td>Back pain</td>
<td>Pseudoaneurysm of the lower abdominal aorta</td>
<td>6–7 months</td>
<td>Graft interposition</td>
</tr>
<tr>
<td>5</td>
<td>Kao et Chang. 2002 [8]</td>
<td>61/F</td>
<td>Knee pain</td>
<td>Pseudoaneurysm of the popliteal artery</td>
<td>6 months</td>
<td>Direct repair</td>
</tr>
<tr>
<td>6</td>
<td>Kim et al., 2002 [9]</td>
<td>54/M</td>
<td>Abdominal pain</td>
<td>Pseudoaneurysm of the abdominal aorta</td>
<td>Immediately</td>
<td>Graft interposition</td>
</tr>
<tr>
<td>7</td>
<td>Nakanishi et al., 2007 [10]</td>
<td>71/M</td>
<td>Intermittent claudication</td>
<td>Pseudoaneurysm of the popliteal artery</td>
<td>Shortly</td>
<td>Endovascular repair</td>
</tr>
<tr>
<td>8</td>
<td>Kuo et al., 2010. [11]</td>
<td>39/F</td>
<td>Knee soreness</td>
<td>Popliteal arteriovenous fistula</td>
<td>Several years</td>
<td>Percutaneous endovascular intervention</td>
</tr>
</tbody>
</table>

As easily when the patient’s knee is bent. For bypass procedures an autologous vein is preferred, although good results have been obtained with both Dacron® and Polytetrafluoroethylene.

Reported complications after open pseudoaneurysm repair include infection, graft occlusion and venous thrombosis.

For the treatment of popliteal arteriovenous fistula, surgical procedures such as partial resection, ligation, and primary reconstruction with end-to-end anastomosis are frequently used options [18]. If primary repair is not feasible without undue tension, a short graft may be fashioned by using reversed autogenous greater saphenous vein.

Endovascular repair with a stent-graft is a minimally invasive alternative approach to that of conventional repair. Covered stent-grafts have been reported to be used in the exclusion of both pseudoaneurysms and arteriovenous fistulas in peripheral arteries [19].

The obvious advantages of the endovascular stent in the femoropopliteal segment are lower morbidity and mortality, a shorter hospital stay and recovery time, and preservation of the saphenous vein for possible future vascular bypass surgery [12].

Drawbacks of this procedure are potential long-term problems, such as stent-graft migration and stent fracture with occlusion.

A major concern when using this technique for the popliteal artery is that a flexion joint is crossed. The great mobility of the popliteal artery, along with the risk of device rotation, twisting, and kinking, remain a problem.

Conclusion

The use of acupuncture technique, both by medical and non-medical therapists may cause various adverse effects such as arteriovenous fistula and pseudoaneurysm. Adequate regulation can even further minimize any risk.

Early repair, before ischemic symptoms, distal thromboembolism, or rupture, yields better results and biomedical knowledge, such as anatomy and microbiology, remains essential for a safe and clean practice of this procedure to avoid major complications.

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