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Postcatheterization femoral artery pseudoaneurysms: Therapeutic options. A case-controlled study

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ABSTRACT

Objectives: Postcatheterization femoral artery pseudoaneurysm is a troublesome complication following percutaneous canulations of the femoral artery. Both diagnostic and therapeutic options in the management of these pseudoaneurysms have changed dramatically, with surgery being required only rarely. We aimed to perform a comprehensive review of our experience, techniques and results in treating postcatheterization femoral artery pseudoaneurysms.

Methods: A retrospective study of all patients presenting with local complications following invasive percutaneous femoral artery canulations over a five-year period was performed. Physical examination with color Doppler ultrasound analysis identified 29 femoral artery pseudoaneurysms. Surgery, duplex-guided compression, and thrombin injection were the main therapeutic options.

Results: Fourteen cases of femoral artery pseudoaneurysms were treated by duplex-guided compression obliteration with a 78.5% success rate. Four patients had spontaneous thrombosis of their pseudoaneurysms. Five patients underwent percutaneous thrombin injection. Six patients had conventional surgery. Three cases failed duplex-guided compression: one closed with thrombin injection, and two were repaired surgically. Follow-up US showed no recurrent pseudoaneurysms for patients who underwent successful duplex-guided compression.

Conclusion: Despite the voluminous data in the literature of treating postcatheterization femoral artery pseudoaneurysms by thrombin guided injection, as a quick and effective method of therapy, with infrequent failures and complications, our study confirms the clinical usefulness of duplex-guided compression in the management of these pseudoaneurysms. The possibility of spontaneous thrombosis of small pseudoaneurysms is emphasized.

1. Introduction

As the number of arteriographies rises exponentially both for diagnostic purposes and as a treatment modality in coronary artery diseases and peripheral vascular diseases, the frequency of iatrogenic arterial injury increases as well.[1–5] Historically, the incidence of a false aneurysm after arterial catheterization was approximately 0.1%.[6,7] However, recent

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studies documented a marked increase in the occurrence of false aneurysms from 0.2% to 9%.[8,9] Femoral artery pseudoaneurysms (FAPs) requiring repair were seen in 1.1% of patients who underwent cardiac catheterization for diagnostic purposes and in 4.7% of patients after cardiac interventional procedures.[10] FAPs occur in 0.1–0.2% of diagnostic angiograms and in 0.8–2.2% of cases following peripheral interventional procedures.[3,6] Postcatheterization complications include bleeding, arterial thrombosis, distal embolization, arteriovenous fistula and false aneurysm formation. Early reports on the natural history of arterial pseudoaneurysms warned of the potential for distal embolization, expansion, or catastrophic rupture,[2,11,12] and recent reports have added persistent pain and compression neuropathy as associated morbidities.[1,13,14]

Clinically suspected FAP can easily be confirmed by color Doppler ultrasonography.[15–17] Surgical repair has been the traditional treatment.[16] We now know with certainty that if such lesions are left alone, spontaneous thrombosis may occur in a significant number, particularly the small ones, and especially in patients not receiving anticoagulant therapy.[5,15,18] Less invasive treatment options such as duplex-guided compression and percutaneous thrombin injection into the lumen of such pseudoaneurysms are currently considered the treatment of choice.[1,3–5,12,13] Endoluminal vascular repair with covered stents was reported as an alternative approach.[15,18]

Herein we report our experience with 29 cases of postcatheterization FAPs, focusing on the use of various closure techniques (duplex-ultrasound-guided compression, thrombin injection, and surgery). We aimed to present a comprehensive review of our experience in the management of FAP, mainly duplex-guided compression despite the current treatment of these lesions with thrombin guided injection.

2. Patients and methods

From June 2001 to September 2006, the hospital records of 8360 patients who had coronary or peripheral angiography and angioplasty were reviewed. All complications related to femoral puncture sites such as a bruit, hematoma, pulsatile hematoma, or marked pain or tenderness were studied. A color Doppler ultrasound analysis evaluated the presence of pseudoaneurysm or other complications, such as arteriovenous fistula. The clinical diagnosis in our cases was based on the presence of groin hematoma, and a pulsating mass. Color Doppler ultrasound confirmed the diagnosis in all our cases. The status of the injured vessel, the pseudoaneurysm, and the connecting tract are displayed in real time as a two-dimensional image. Criteria used to diagnose a pseudoaneurysm included swirling color flow in a mass separate from the underlying artery, color flow signal in a track leading from the artery to the mass consistent with a pseudoaneurysm neck and a to-and-fro Doppler waveform in the pseudoaneurysm neck (a retrograde flow out of the pseudoaneurysm in diastole).[12–14] Twenty-nine patients were found as having FAPs. The pseudoaneurysm vessel of origin was the common femoral artery (CFA) in 21 patients, the superficial femoral artery (SFA) in five patients, and in the remaining three patients the origin could not be determined. Although there was no specific treatment according to the different sites of FAP; the six FAPs which were treated with surgery were 5 related to the CFA and one related to the SFA; the 14 FAPs which were treated with compression therapy were 12 related to the CFA and two related to the SFA; the five FAPs which were treated with thrombin injection, three were related to CFA and two related to the SFA; and in the remaining four FAPs with spontaneous thrombosis, one was related to CFA and in three the origin of the FAP was not determined. We applied the available treatment regardless of the site of origin and the volume of the pseudoaneurysm, and we applied thrombin injection in the last five cases.

At diagnosis, 14 patients received anticoagulation therapy (LMWH) and nine received antiplatelet therapy (clopidogrel), and none of the remaining six patients received anticoagulation or antiplatelet therapy. We resume therapy by using clopidogrel when indicated. Four patients had spontaneous thrombosis of their pseudoaneurysms in the interval between discovery and treatment. These pseudoaneurysms were less than 2 cm in diameter, and neither anticoagulation nor antithrombotics were given in these four cases. Six patients underwent conventional surgery, 14 were referred for duplex-guided compression, and five patients for thrombin injection as the initial and primary therapy. Actually at our hospital, US-guided manual compression or percutaneous injection of thrombin into a non complicated FAP was considered to be the primary therapy. Surgery was considered for FAPs associated with active thigh bleeding from rupture in two patients, local ischemic skin necrosis in one patient, suspicion of infection or groin abscess in two patients, and in one patient with a large FAP with a wide ''neck''.

US-guided manual compression was performed by using the technique of Fellmeth et al.[12] The puncture site was scanned with a variety of transducers ranging from 3.5 to 7.0 MHz. to determine the anatomy of the pseudoaneurysm. The relationship of the flow lumen to the underlying pseudoaneurysm neck and artery was delineated. The soft tissues surrounding the pseudoaneurysm were searched for evidence of an arteriovenous fistula or of multiple interconnecting pseudoaneurysm lobes. After written informed consent was obtained, the transducer was oriented to demonstrate the pseudoaneurysm neck to the best advantage. Manual compression was applied to the neck for 10–20 min periods to completely arrest flow into the pseudoaneurysm. Brief intermittent release between cycles was performed to assess pseudoaneurysm thrombosis, or to reposition the transducer. Compression was continued until the pseudoaneurysm achieved thrombosis or until patient or operator fatigue compelled termination. Conscious sedation was employed by using intravenous injections of 1–2 mg midazolam hydrochloride, and local anesthesia if needed.

US-guided thrombin injection was given by using the technique described by Kang et al.[13] With transducers ranging from a 5.0 to 7.5-MHz linear-array or a curved linear-array transducer, the local anatomy was determined as previously mentioned, with patent artery and vein. The needle was preloaded with human thrombin (500 U/mL); the freeze-dried human thrombin was reconstituted with the calcium chloride solution. The needle was placed into that portion of the flow lumen where the direction of flow was away from the