



Thrombin Injection Vs Conventional Surgical Repair in Treatment of Iatrogenic Post-Cath Femoral Artery Pseudoaneurysm (Ifap)

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Abstract

Background: Femoral pseudo aneurysms may complicate up to 8% of vascular interventional procedures. Small pseudo aneurysms can spontaneously clot, but sometimes treatment is needed. Surgery has traditionally been considered the 'gold standard' treatment, although it is not without risk. Less invasive treatment options such as Duplex ultrasound-guided compression and percutaneous thrombin injection are available alternatives; however, their efficacy was a concern.

Aim of the study: Study the safety and efficiency of the thrombin injection in comparison to the conventional surgery as an alternative treatment of IFAPs.

Patients and Methods: 120 patients were divided into two groups A and B

Group A underwent a surgical repair.

Group B underwent US guided Thrombin injection

Results: Results were studied in terms of Success, Recurrence, Bleeding, Thrombosis, Infection, Secondary Haemorrhage and amputations

For Group A: All procedure were successful, 2 patients had wound infection, one patient had a secondary haemorrhage ended up with AKA

For Group B: 58 out of 60 procedures were successful. Only 2 needed surgical intervention.

Conclusion: Thrombin injection can be considered as a safe and considerably efficient alternative for surgery in management of femoral artery pseudo aneurysm.

Keywords: Iatrogenic complications; Femoral catheterization; Pseudoaneurysm; Surgery; Thrombin injection

Introduction

The number of percutaneous endovascular interventions performed worldwide has been growing rapidly due to important technological advances, improved long-term clinical outcomes, and, also, the lower morbidity associated with these procedures compared with traditional surgical treatment methods. The common femoral artery (CFA) is the most common access site for endovascular procedures [1].

Iatrogenic femoral artery pseudo aneurysms (IFAPs) form when an arterial puncture site fails to seal, allowing arterial blood to jet into the surrounding tissues and form a pulsatile hematoma [2]. This is a recognized and troublesome complication in patients undergoing diagnostic or therapeutic catheterization and its incidence increases when large bore sheaths and post-procedural anticoagulation therapy, and/or antiplatelet therapy are used during the intervention [3]. Complications of pseudoaneurysms include

rupture, distal embolization, pain, femoral vein compression, neuropathy and local skin ischemia. IFAPs have historically been treated with open surgical repair, but this is not without risks especially in patients with severe cardiovascular disease [4]. Less invasive options include compression under continuous sonographic guidance with success rates ranging between 71% and 99% [4]. This technique, however, has disadvantages, including arterial occlusion, inability to treat noncompressible pseudoaneurysms, limited success in patients receiving anticoagulants, patient and operator discomfort during compression, as well as long procedure times with compression time ranging between 30 and 100min [2]. The use of thrombin injection under ultrasound guidance has allowed repair of IFAPs with success rates ranging from 93% to 100% [5], and minimal complications, such as distal embolization or allergic reactions [6]. The aim of this study was to review our experience with percutaneous ultrasound-guided thrombin injection to treat IFAPs and evaluate the success of the technique in comparison to the classic conventional surgery.

Patients and Methods

In the period from March 2004 and till March 2009 we run our study on 120 patients 68 males and 52 females with age ranging from 48 to 84 all were presented with post femoral artery catheterisation pseudo aneurysm

Criteria of exclusion:

- Associated lower limb ischaemia
- Infected aneurysm
- presence of skin necrosis
- Allergy to thrombin (For Group B)

All patients had Arterial duplex scan to confirm the diagnosis.

Patients were then randomly divided into two groups:

Group A: 60 patients 33 males and 27 females underwent open surgical repair for the aneurysm after obtaining a written consent. Surgical repair was in the form of, patch plasty, interposition graft or direct repair The hospital stay of the patients underwent open surgeries varies from 3 to 21 days. All the patients had a follow up appointment with duplex scan after 4 weeks and then every 6 month for 2 years. Patients who had graft interpositions have been further followed afterwards on a year basis.

Group B: 60 patients 35 males and 25 female all underwent US guided thrombin injection under local anaesthesia as an outpatient procedure Human thrombin solution (500 U/mL) was prepared and was loaded into a 5mL syringe attached to a 22-gauge spinal needle. The ultrasound transducer was placed over the pseudo aneurysm and under aseptic technique the needle was introduced with the tip in the centre of the pseudo aneurysm. Using real time sonography, thrombin was injected into the sac until thrombus filled the entire sac or the 1000U limit was reached. Color-Doppler was used to detect successful occlusion of the lumen. If there was

flow still detected in the sac , a further 1000 U was injected.



Figure 1: Duplex Scan of pseudoaneurysm showing the flow within.

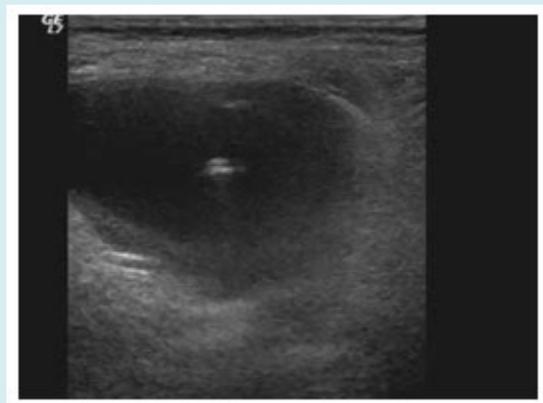


Figure 2: needle inside the aneurysm sac under US guidance

Treated patients remained in bed for 2 h. Distal pulses were checked before and after the procedure. The patients had follow-up duplex ultrasound the day after and at four weeks following the procedure unless there was a clinical indication to perform this sooner.

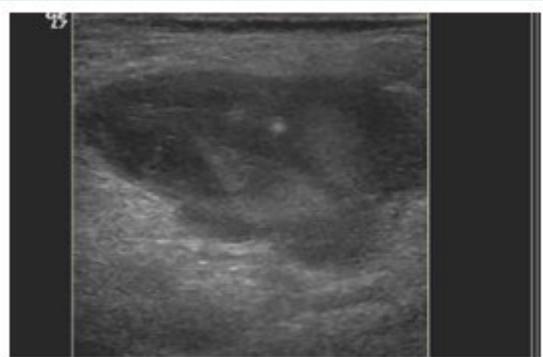


Figure 3: Thrombosis of the aneurysm after thrombin injection

All patients had out-patient clinic follow-up at four weeks. The imaging findings and patient medical records were reviewed. The pseudo aneurysm size, site, thrombin dose injected, success and complication rates were obtained.

Results

74 patients (62.5%) had undergone diagnostic coronary angiograms (with a 6-French sheath). 34 patients (30%) developed IFAP following percutaneous transluminal coronary angioplasty (PTCA) with stent placement in eight (requiring a 8-French sheath), 9 (7.5%) following lower limb angioplasty, 3 (2.5%) after a complication from femoral catheter insertion for hemodialysis.

In 107 patients (90%) pseudo aneurysms arose from the common femoral artery, 9 from the superficial femoral artery (7.5%) and 3 from the *profunda femoris* artery (2.5%). No associated arterio-venous fistulas were noted. The average pseudo aneurysm sac size was 3 cm (range 1.8–5.6 cm).

Group A results

Demographic: 60 patients 33 males and 27 females with age range was between 48 and 79. 48 of aneurysms occurred in the right lower limb (80%) while 12 (20%) were in the left. 52 of aneurysms raised from the CFA (86.6%), 5 from the SFA (8.3%) and only 3 from the profunda (5%).

Procedures

38 of the patients in this group had direct repair (63%), 14 had patch plasty (27%) while 6 had interposition graft repair (10%).

Outcome

All procedures were considered successful in term of aneurysm repair. 4 Patients (6.7%) had wound infections which range from mild cellulitis to superficial dehiscence 2 of the patients had post op thrombosis 3.3% one of them after patch repair and the other after an interposition graft.

Only one patient developed secondary haemorrhage (1.7%). The same patient developed irreversible ischaemic gangrene as a result of ligation of the CFA to stop the secondary bleeding and had an above knee amputation.

Group B

A certain correlation between the diameter and the amount of the thrombin injection and a correlation between the sac diameter and the success rate were definitely noticed. All IFAPs with sac of 2.5 cm or less in maximum diameter required less than 500U (range 200–500 U) of thrombin

in relation to almost 2000 U injected in the large diameter aneurysm (> 5cm). Also the diameter of the aneurysm was predictive to the procedure success rate success rate as the two failed procedures were in a 5.2 and 5.4cm aneurysm respectively.

Demographic

60 patients 35 males and 25 females, with age range between 51 and 84. In 52 patients (86.7%) the aneurysm occurred the right LL and in 8 (13.3%) it was the left. 56 of aneurysms arose from the CFA (93.3%) while 4 arose from the SFA (6.7%).

Outcome

In 58 out of 60 patients the procedure was successful (96.7%), 54 (90%) needed only one session while 4 (6.7%) needed a second session of injection, 2 patients (3.3%) required open repair.

No patient complain of pain or required analgesia for the procedure

No post procedure infection.

No secondary haemorrhage.

No patients developed had embolic event post procedure.

None of the patients had an amputation.

Discussion

Ultrasound-guided thrombin injection has become the treatment of choice for IFAPs, replacing in most centers ultrasound guided compression. Percutaneous injection of thrombin for the treatment of pseudo aneurysms was first described by Cope and Zeit in 1986 p [6], but Walker et al. first used thrombin to treat pseudo aneurysms transluminally through a catheter [7]. The method, however, did not gain popularity until 1997 when Liau et al. successfully treated five femoral artery pseudo aneurysms with intra-vascular injection of thrombin via a catheter under continuous ultrasound guidance [8]. Ultrasound-guided thrombin injection reduces the mortality and morbidity associated with surgical repair of pseudo aneurysms. In Group A, although success rate was 100% in terms of aneurysm repair, however we recorded complications rate of 11.7% and no mortality. In their series, Lumsden, et al. demonstrated complication and mortality rates as high as 21% and 2.1%, respectively, for surgical repair [9]. In our study, Group B recorded success rate in 96.7% compared to 95% in a study by Paraskevi, et al in 2009, however it is important to mention that 2 patients of the success group had further session of injection while in Paraskevi study they didn't try a second injection [10]. None of our patient developed embolic event which again agrees with the studies by Paraskevi, et al. and Kang, et al. [10] (Tables 1 & 2).

Demographic	Group A	Group B
Right limb	48	52
Left Limb	12	8
CFA	52	56
SFA	5	4

Table 1: Demographic results.

Outcome	Group A	Group B
Success	60	58
Failed	0	2
Thrombosis	4	0
Infection	3	0
Amputation	1	0
Mortality	0	0

Table 2: Outcome results.

Conclusion

Ultrasound guided intraluminal thrombin injection is a very efficient and quite safe procedure in treating iatrogenic femoral artery pseudoaneurysm. Provided proper selection of the patients, Thrombin injection should be considered as the first choice line of treatment in iatrogenic femoral artery aneurysm.

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