PRACTICE OBSERVED

Pseudoaneurysm of femoral artery after catheterisation: treatment by a mechanical compression device guided by colour Doppler ultrasound

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Abstract

Background—Femoral artery pseudoaneurysm is a significant complication in patients undergoing diagnostic or therapeutic catheterisation. First choice treatment for pseudoaneurysm is freehand ultrasound guided compression repair, which is time consuming and uncomfortable for the patient and operator.

Aim—To explore a mechanical compression device (FemoStop) as an alternative treatment for iatrogenic femoral artery pseudoaneurysm.

Methods—Fourteen patients with pseudoaneurysm were considered for treatment with FemoStop after a brief freehand ultrasound guided compression repair to confirm the compressibility of the lesion. The FemoStop compression was applied for 20 minutes. The result was controlled with colour Doppler ultrasound, and a second cycle of 20 minutes followed if necessary.

Results—FemoStop compression was successful in 13 of the 14 patients. The mean compression time was 33 minutes (range, 20–60). The mean number of compression periods was 1.6 (range 1–3). FemoStop compression was successful in all 11 patients not taking anticoagulants and in two of three patients receiving anticoagulants. The mean compression time in patients given oral or intravenous anticoagulants was longer (50 v 27 minutes). Colour Doppler ultrasound 12 hours after the procedure indicated no recurrence of pseudoaneurysm in the 13 patients with initial success.

Conclusions—FemoStop compression for iatrogenic pseudoaneurysm is feasible, and as safe and effective as freehand ultrasound guided compression repair. It is more comfortable for the patient and operator, and probably more economical than freehand compression.

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Femoral artery pseudoaneurysm is a significant complication in patients undergoing diagnostic or therapeutic catheterisation. Pseudoaneurysm incidence of 0.6–6% has been reported.^{1,2} Treatment of iatrogenic femoral pseudoaneurysms has traditionally been surgical.³ Non-operative management of pseudoaneurysm with ultrasound guided compression was described by Fellmeth in 1991.¹ Today, first choice treatment for pseudoaneurysm is freehand ultrasound guided compression repair^{2,4,5}; however, this procedure is time consuming and uncomfortable for the patient and operator. This investigation aimed to evaluate a mechanical compression device (FemoStop; Radi Medical Systems AB, Uppsala, Sweden) as an alternative means to treat iatrogenic femoral pseudoaneurysm.

Materials and methods

In 1995, 2351 cardiac catheterisations and 764 peripheral percutaneous transluminal angioplasties were performed at our institution. Patients with a pulsatile mass, a bruit on physical examination, or a painful haematoma at the puncture site after the procedure were referred for colour Doppler ultrasound examination. Scans were performed with a 5 or 7 MHz linear array transducer (Acuson 128; Acuson Corp, Mountain View, California, USA). Pseudoaneurysm was detected in 14 of these patients (0.5%) (10 men, four women). Cardiac catheterisation procedures had been performed in 12 of the 14 patients (four diagnostic studies and eight interventional procedures). The other two patients had undergone peripheral percutaneous transluminal angioplasty. The mean age of the 14 patients was 61 years (range, 42 to 83).

FemoStop compression was performed in all patients within 24 hours of the ultrasound diagnosis. Contraindications to treatment by FemoStop compression were the same as for ultrasound guided compression repair: signs of infection, critical limb ischaemia, coexistent large haematomas with overlying skin necrosis, and injuries proximal to the inguinal ligament. After premedication with 10 mg subcutaneous morphine sulphate and 0.5 mg atropine, and

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Figure 1 (A) The skin is marked with tape indicating the exact location of the track. (B) FemoStop in position exerting continuous pressure.

local anaesthesia with 10 ml subcutaneous lidocaine 1%, the track was localised with the transducer and the skin overlying this point marked with adhesive tape for the FemoStop compression (fig 1). The pulse of the pedal arteries was palpated to make sure that the femoral artery was not totally occluded. Constant pressure with the FemoStop was maintained for 20 minutes. The pressure was then released and the pseudoaneurysm was carefully scanned for flow. If necessary, the

Figure 2 Flow chart of patients and procedures.

pressure with the FemoStop was applied for another 20 minutes. After successful closure, all patients immediately received a pressure dressing and were put on bed rest for 12 hours. A follow up colour Doppler ultrasound examination was performed after removing the pressure dressing.

Results

Mechanical (FemoStop) compression was successful in 13 of the 14 patients. The mean compression time was 33 minutes (range, 20–60). The mean number of compression periods was 1.6 (range, 1–3) (fig 2). FemoStop compression was successful in all 11 patients not given anticoagulants and in two of three patients receiving anticoagulants. The mean compression time in patients given oral or intravenous anticoagulants was longer (50 v 27 minutes). The one patient with unsuccessful FemoStop compression had been given intravenous anticoagulants. After stopping anticoagulation, a freehand ultrasound guided compression repair was successfully done in this patient. Colour Doppler ultrasound examination performed 12 hours after compression indicated no recurrence in any of the patients with initial success. There were no complications.

Discussion

Treatment of pseudoaneurysms has traditionally been surgical.³ In 1991 Fellmeth described the successful non-surgical closure of 35 iatrogenic femoral pseudoaneurysms with ultrasound guided compression repair in patients undergoing catheterisation.¹ Today, ultrasound guided compression repair has become the treatment of choice for iatrogenic pseudoaneurysm with success rates up to 100%.^{1 2 4 5} However, freehand ultrasound guided compression repair is time consuming as well as being uncomfortable for patient and operator. The most painful aspect of freehand ultrasound guided compression repair is related to the adjustments in transducer position and force that must be applied because the probe tends to drift away from the optimal position, especially in obese patients.

Alternative techniques have been sought to overcome these disadvantages. The use of the modified C arm clamp to secure an ultrasound transducer in fixed position over the vascular structures was reported by Fellmeth *et al*.⁶ This was successful in nine of 10 patients. In two other studies the authors used a C arm clamp placed by ultrasound with success in eight of 10 and 10 of 10 patients, respectively.^{7 8} The FemoStop compression device to treat pseudoaneurysm was reported by Trerotolo in six patients.⁹ Water was used to fill the FemoStop cushion rather than air. This offered the possibility to scan directly through the device. The procedure was successful in four of the six patients, without follow up. We studied the effect of the FemoStop device using a similar approach. In contrast to the above reports our method does not require direct ultrasound control but yields comparable results.

After installation of the FemoStop in the ultrasound laboratory the patient is allowed to return to the ward. During compression, the ultrasound machine is free for use on other patients. This method for compression is thus considerably more attractive in terms of personnel and equipment use.

FemoStop compression was successful in 13 of our 14 patients, comparable to the freehand method.^{1 2 4 5} The success rate of ultrasound guided compression repair is lower in patients taking anticoagulants.^{2 4} The number of patients in our study was too small to demonstrate a significant difference between patients taking and not taking anticoagulants, although compression time was much longer in patients taking anticoagulants. Complications with ultrasound guided compression in other studies include femoral artery thrombosis,¹ pseudoaneurysm rupture,¹⁰ and femoral vein thrombosis.⁸ There were no complications in our study patients.

The literature on immediate and follow up results of ultrasound guided compression repair using colour Doppler ultrasound is scarce.^{1 11} Follow up with colour Doppler ultrasound in our study showed no relapse of pseudoaneurysms at 12 hours.

Our study is limited by the small number of patients and absence of randomised comparison with established strategies. Such trials are

necessary to test the clinical and economic superiority of mechanical compression with FemoStop over the freehand method.

- 1 Fellmeth BD, Roberts AC, Bookstein JJ, et al. Postangiographic femoral artery injuries: nonsurgical repair with US-guided compression. *Radiology* 1991;178:671-5.
- 2 Chatterjee T, Do DD, Kaufmann U, et al. Ultrasound-guided compression repair for treatment of femoral artery pseudoaneurysm. Acute and follow-up results: *Cathet Cardiovasc Diagn* 1996;38:335-40.
- 3 Roberts SR, Main D, Pinkerton J. Surgical therapy of femoral artery pseudoaneurysm after angiography. *Am J Surg* 1987;154:676-80.
- 4 Schaub F, Theiss W, Heinz M, et al. New aspects in ultrasound-guided compression-repair of post-catheterization femoral artery injuries. *Circulation* 1994;90:1861-5.
- 5 Chatterjee T, Meier B. Ultrasound-guided compression repair and beyond [editorial]. *Cathet Cardiovasc Diagn* 1996;40:16.
- 6 Fellmeth BD, Buckner NK, Ferreira JA, et al. Postcatheterization femoral artery injuries: repair with color flow US guidance and C-clamp assistance. *Radiology* 1992;182:570-2.
- 7 Hillborn M, Downey D. Deep venous thrombosis complicating sonographically guided compression repair of a pseudoaneurysm of the common femoral artery. *Am J Radiol* 1993;161:1334-5.
- 8 Agarwal R, Agrawal S, Roubin GS, et al. Clinically guided closure of femoral arterial pseudoaneurysms complicating cardiac catheterization and coronary angioplasty. *Cathet Cardiovasc Diagn* 1993;30:96-100.
- 9 Trerotola SO, Savader SJ, Prescott CA, et al. US-guided pseudoaneurysm repair with compression device. *Radiology* 1993;189:285-6.
- 10 Dol JA, Reekers JA, Kromhout JG. Rupture of pseudoaneurysm during attempted US-guided compression repair. *Radiology* 1992;185:284.
- 11 Hajarizadeh H, LaRosa CR, Cardula P, et al. Ultrasound-guided compression of iatrogenic femoral pseudoaneurysm failure, recurrence, and long-term results. *J Vasc Surg* 1995;22:425-33.