

ENDOVASCULAR AND SURGICAL TECHNIQUES

Percutaneous Duplex-guided Thrombin Injection for Treatment of Iatrogenic Femoral Artery Pseudoaneurysms

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Objectives: to evaluate the feasibility of treatment of post-catheterisation pseudoaneurysms with duplex-guided thrombin injection.

Technique: the technique of duplex-guided injection of thrombin in post-catheterisation pseudoaneurysms of the femoral artery is described and illustrated.

Results: between December 1998 and October 1999, eight post-catheterisation pseudoaneurysms of the femoral artery were successfully thrombosed with thrombin injection. One patient developed a new pseudoaneurysm within 6 hours and this was also successfully treated with thrombin. Follow-up duplex-scanning at 3 months revealed no recurrences. No other adverse events occurred.

Conclusions: this initial experience suggests that duplex-guided thrombin injection in the treatment of post-catheterisation pseudo-aneurysms is feasible and safe.

Key Words: False aneurysm; Pseudo-aneurysm; Thrombin; Cardiac catheterisation; Complication.

Introduction

The incidence of iatrogenic pseudoaneurysms after femoral artery catheterisation is reported to be approximately 1%.¹ The growing number and complexity of intravascular interventional procedures, as well as the necessity to use larger catheters, may have resulted in a higher incidence of iatrogenic femoral pseudoaneurysm over the recent years. Duplex-guided compression is limited by pain, the requirement for prolonged compression time (≥ 30 min) and a failure rate of up to 30% in patients receiving anticoagulants.²⁻⁴ More recently, duplex-guided thrombin injection has been reported to be effective in the treatment of post-catheterisation pseudoaneurysms.^{5,6} We describe the technique and our early experience of this method.

Technique

If a post-catheterisation pseudoaneurysm of the femoral artery was suspected on clinical grounds, duplex

imaging of the femoral artery was performed. The length, depth and width of the pseudo-aneurysms, together with the width of the aneurysmal neck were measured and recorded. Distal pulses were palpated and the ankle-brachial index determined. Patients with evidence of local infection and/or skin necrosis were excluded.

Thrombin (500 U/ml) was prepared by defrosting the 2 ml syringe of Tissucol® Duo 500 (Immuno AG, Vienna, Austria). A 0.8 × 40 mm needle was attached. After repositioning the duplex transducer directly over the pseudoaneurysm, the aneurysmal neck was identified. The skin adjacent to the transducer was disinfected and the needle inserted into the aneurysm as far away as possible from the neck. After confirming that the needle-tip was in the right position, the colour-mode was activated and thrombin was injected slowly into the aneurysm until flow disappeared and the aneurysm had been thrombosed completely (Figs 1 and 2). The needle was then removed, distal pulses palpated and ankle-brachial index measurement repeated.

Patients were kept in bed for 12 h without external compression. Duplex scan was repeated after 24 h and 3 months.

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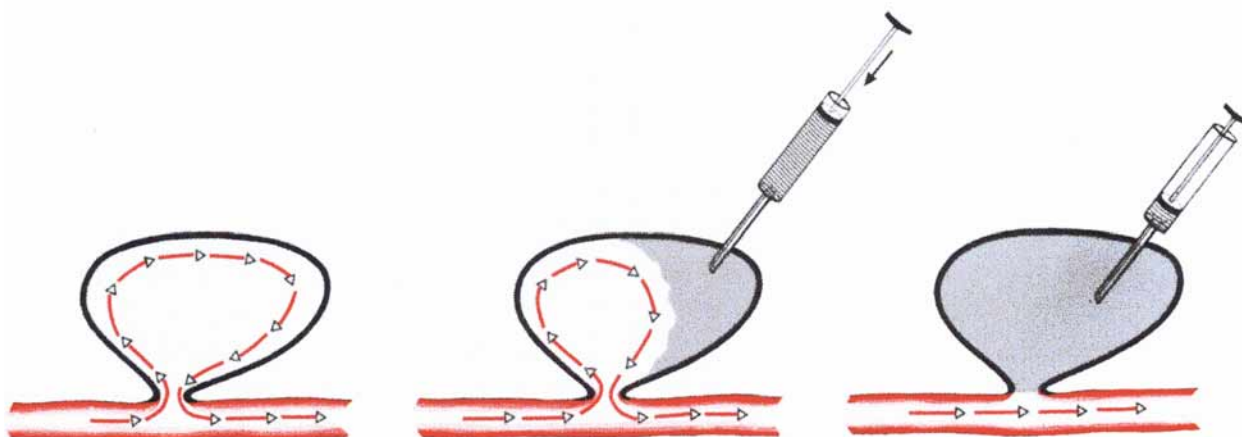


Fig. 1. Procedure (schematic). Under continuous duplex-scanning (left) the syringe with thrombin is positioned in the pseudoaneurysm away from the neck. Slowly, thrombin is injected to form thrombus (middle). If necessary, the needle is repositioned to thrombose the pseudoaneurysm completely (right). The needle is then removed.

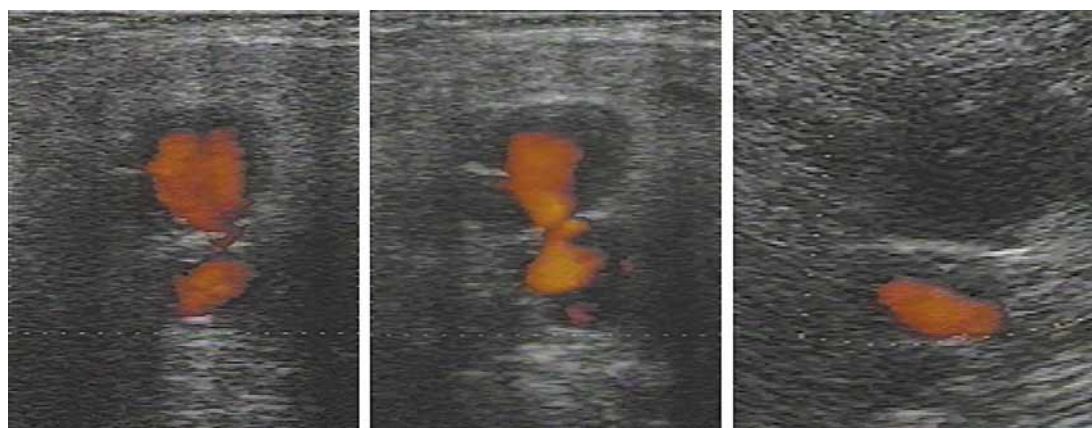


Fig. 2. Duplex scanning of thrombin injection into pseudoaneurysm. Duplex ultrasound of a pseudoaneurysm of the common femoral artery before (left), during (middle) and after (right) thrombin injection. The colour-flow in the pseudoaneurysm before (left) has disappeared after thrombin injection (right) as evidence of thrombosis.

Results

Between December 1998 and October 1999, eight post-catheterisation pseudoaneurysms (median size 3 cm, range 2–6) were successfully treated by duplex-guided thrombin injection (median 250 units, range 100–300). The median age of the patients was 77 years (range 68–83) and catheterisation was performed a median of 6 (range 2–14) days prior to treatment. Six pseudoaneurysms thrombosed within 15 s, and two within 3 min. These last two pseudoaneurysms had the largest dimensions and the thrombus was built up slowly from the periphery of the aneurysm towards the neck. Oral anticoagulant medication (all patients) and antiplatelet therapy (three patients) was continued throughout treatment.

During coughing, one patient noticed a new painful

swelling in the treated groin, 6 h after treatment. Duplex scanning showed a new pseudoaneurysm, lateral from the first (still thrombosed) pseudoaneurysm. This second pseudo-aneurysm was also successfully treated with thrombin injection.

No patient required sedation or analgesia during the procedure and no systemic complications were seen related to thrombin. Resting ankle-brachial indices before and after the procedure were identical. After 24 h all pseudoaneurysms remained thrombosed with duplex scanning. After 3 months all thrombosed pseudoaneurysms had disappeared.

Discussion

Although this series is small, it demonstrates the ease, effectiveness and safety of treatment of percutaneous

thrombin injection. Duplex-guided compression is usually painful and has to be maintained for at least 10 min, but compression times of more than 30 min are not exceptions.⁷ In contrast, thrombin injection requires no compression and treatment often takes less than 5 min and certainly does not exceed 15 min.

Thrombin injection into a pseudoaneurysm results in a high local concentration of thrombin which directly initiates fibrinogen to form fibrin. All factors in the coagulation sequence, which are affected by warfarin and/or heparin treatment, are thereby effectively bypassed. Theoretically therefore, thrombin has the potential to thrombose pseudoaneurysms independent of anticoagulant therapy, a major factor in the failure rate of pseudoaneurysm treatment with ultrasound guided compression.^{3,8-10}

Although complications such as acute thrombosis of the brachial or femoral arteries⁵ have been described, they occur infrequently and can be treated by thrombolysis. To avoid this complication, thrombin is injected as far away from the neck as possible so that the fibrin clot builds up from the periphery of the pseudoaneurysm towards the neck under continuous duplex-guidance. The use of small volumes (0.1–0.6 ml (100–300 units) should also reduce or eliminate peripheral arterial circulatory problems.

We conclude that duplex-guided thrombin injection into post-catheterisation pseudoaneurysms of the femoral artery seems a safe and effective method for thrombosing these aneurysms, even when anticoagulant therapy is continued.

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