

Percutaneous Management of PTFE Dialysis -Graft Pseudoaneurysm by Ultrasound- Guided Thrombin Injection

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Section: Interventional radiology

Imaging Technique: Ultrasound-Colour Doppler

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Case Type: Clinical Cases

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Patient: 31 years, female

Clinical History:

A 31year old female diabetic presenting with recurrent pulsatile swellings related to a PTFE dialysis loop-graft of the upper thigh -for definitive mangement.

Imaging Findings:

A 31 year old Somali female with end stage chronic renal failure presented with two enlarging pulsatile swellings related to a PTFE dialysis loop-graft of the right thigh. The loop graft had been created in the right thigh due to suboptimal upper limb vasculature. A pulsatile swelling relating to the graft developed in December 1999 which ruptured acutely in January 2000, necessitating surgical salvage of the graft by interposition PTFE. In March 2000, two further enlarging pulsatile swellings were noted, ultrasound appearances were consistent with graft-related pseudoaneurysms and the larger (2.7cm in maximal diameter) was treated by ultrasound guided compression (USGC). Of the two subsequent enlarging swellings diagnosed in July 2000, one was thought to be the pseudoaneurysm previously treated by USGC. Both had a narrow neck. The larger measured 4.5cm x 3.0cm x 3.0cm at the graft apex (Figure 1), the other measured 3cm in maximum anteroposterior diameter and was sited more proximally. Materials & Methods Under aseptic conditions the graft-related pseudoaneurysms were identified using a linear 7-12MHz (variable frequency) ultrasound probe covered with a sterile probe- sheath (Ultra Cover 40mm x 300mm Casmed, Banstead, Surrey, UK, and Aesculap B-Braun, Thorncliffe Industrial Estate, Sheffield, UK). 5000 units of bovine thrombin were mixed with normal saline (sodium chloride 0.9%) to a volume of 5mls, giving a concentration of 1000units/ml. 1.5mls was drawn up into a 3ml syringe with a 23 (blue) gauge needle and approximately and 1ml of thrombin (1000 units) injected under ultrasound guidance into each pseudoaneurysm. The expulsion of a little thrombin out of the needle tip prior to injection rendered it more echogenic. Stable thrombus formation was rapid following thrombin injection, appearing instantaneous on real-time ultrasound (Figure 2). Following thrombin injection, the pseudoaneurysm was visualised using colour Doppler for at least one minute to ensure that there was complete thrombosis of the sac, and no compromise of graft flow (Figure 3). The status of the peripheral circulation was assessed by palpation of the peripheral pulses. The patient suffered a hypotensive bradycardic event and possible seizure at the end of the second injection, which was thought to be vasovagal. She was resuscitated without the use of any medication. The patient returned after 24 hours and the original sites of the

lesions again imaged with colour Doppler to confirm complete pseudoaneurysm exclusion

Discussion:

The incidence of iatrogenic pseudoaneurysm of the femoral artery is rising, with a reported current incidence of 7% if patients are investigated by ultrasound (1). Treatment in the femoral arterial segment has evolved over the last decade from operative repair, through USGC and more recently to thrombin injection. Surgical intervention for femoral pseudoaneurysm has been recommended in patients of increasing age, peripheral vascular disease and raised plasma liver enzymes on admission, all of which are significant independent predictive variables for pseudoaneurysm rupture. Surgical repair, however, may be associated with a lengthy procedure and significant morbidity (2). Conversely, conservative management may result in spontaneous thrombosis and may be advocated if the aneurysm is <2cm and the patient is not anticoagulated (1). USGC was first described in 1991, is cheap and simple and avoids ionising radiation. It is however, time consuming, may be painful and may be ineffectual in anticoagulated patients. A series comparing USGC and thrombin injection gave a 63% primary technical success for USGC versus 93% for thrombin injection. Thrombosis occurred within seconds of thrombin injection (requiring a mean of 300 units), while mean time to thrombosis in the USGC group was 37 minutes. A cost analysis showed that thrombin treatment results in considerable savings in vascular resource use but not in overall hospital expenditures (2). Percutaneous injection of thrombin may be unprotected or protected by placement of an occlusion (or angioplasty) balloon across the neck of the pseudoaneurysm. This may prevent propagation of thrombus into the parent vessel, with in-situ thrombosis or distal embolisation. Although an effective method, balloon protection may be unnecessarily invasive. Subsequent series reporting unprotected thrombin injection have shown high technical success and low complication rates (1). The safety of unprotected thrombin injection depends on the speed of formation of stable thrombus at the desired site and the dimensions of the pseudoaneurysm neck. The communicating hole between pseudoaneurysm and parent vessel, being most commonly produced by a needle, is small, between 2-3mm (1). Native vessel occlusion during unprotected thrombin injection has been reported, but occurred in the situation of a wide neck (1). If no aneurysm neck is visible, or the neck is wider than a point source, USGC may be attempted, followed by balloon protected thrombin injection if compression fails. The status of the run-off is assessed clinically at completion by palpation of distal pulses and may be augmented by ankle pressures. Since reports of its use in femoral pseudoaneurysm, percutaneous thrombin injection has been used in several peripheral arterial sites and for treatment of pseudoaneurysm of the pancreatic head. To date, various treatment modalities have been proposed for graft-related pseudoaneurysm. Detachable balloons have been used to exclude pseudoaneurysm related to an upper extremity dialysis graft but this has not been shown to be a durable treatment. There has been some enthusiasm for covered-stent placement for graft related pseudoaneurysm. There have been mixed results. Two patients treated with PTFE-covered Palmaz stents had successful pseudoaneurysm exclusion and functioning grafts in the intermediate term (6 months) (3). Other reports of covered-stent placement have had less favourable outcomes. Two of 3 patients in whom placement of a Cragg Endo-Pro stent graft resulted in satisfactory pseudoaneurysm exclusion, developed recurrence in the intermediate term due to repeated stent-graft puncture during dialysis (4). Thrombin dosage is titrated against effect- commonly up to 1500 units may be injected per pseudoaneurysm at any one time. The origin of the thrombin should be considered. The commercially available forms are bovine and human, the latter usually released on a named-patient basis. There have been reports of antibody formation to bovine thrombin (1). Bovine thrombin may be used to promote haemostasis during vascular surgery, including dialysis-access. Patients may mount an antibody response to this and some may develop antiphospholipid antibodies. It may be argued that bovine thrombin should have been avoided in this case. Surgeons at our centre do not routinely use bovine thrombin during vascular access and human thrombin was unavailable. The bradycardiac event at completion of the procedure was thought to be vasovagal; the clinical manifestations and time frame were inconsistent with allergic reaction.

Differential Diagnosis List: Recurrent pseudoaneurysm of PTFE dialysis graft treated by US-guided thrombin injection

Final Diagnosis: Recurrent pseudoaneurysm of PTFE dialysis graft treated by US-guided thrombin injection

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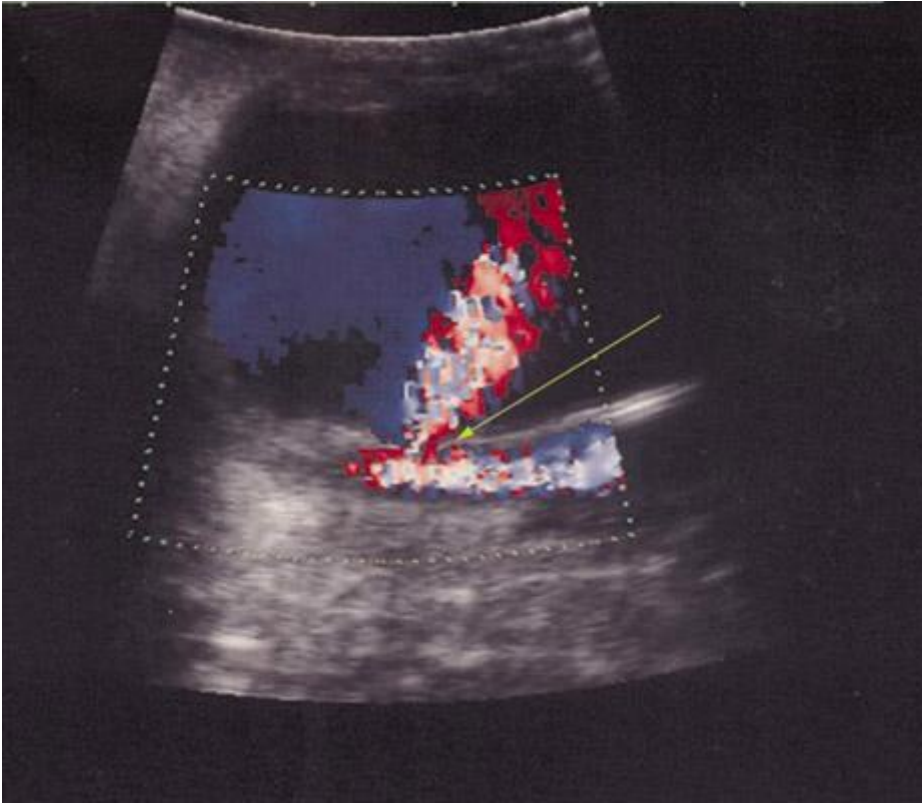
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Figure 1

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Description: Colour Doppler demonstrating a 43.5cm x 3.0cm x 3.0cm pseudoaneurysm at the graft apex with a narrow neck (arrow). **Origin:**

Figure 2

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Description: Stable thrombus formation occurring almost instantaneously on injection of thrombin during real time ultrasound (left-hand arrow) with simultaneous reduction of colour flow (right-hand arrow). **Origin:**

Figure 3

a



Description: Exclusion of pseudoaneurysm, thrombus in the sac (long arrow) and preservation of flow within the graft (short arrow). **Origin:**