Ultrasound-guided Thrombin Injection of Iatrogenic Pseudoaneurysm at a Community Hospital

Deowall Chattar-Cora, MD, Edwin Pucci, DO, Nirman Tulsiyan, MD, Ernest Cudjoe, MD, Kevin V. James, MD, and Michael Resnikoff, MD, Morristown, New Jersey

The purpose of this study was to report the success rate of treating pseudoaneurysm using ultrasound-guided thrombin injection at a community hospital. Over 16-month period, 42 patients with femoral artery pseudoaneurysms were treated using ultrasound-guided thrombin injection. Our results showed that ultrasound-guided thrombin injection has a high success rate, and can be safely performed at a community hospital.

INTRODUCTION

With improvements in modern endovascular technology, the use of minimally invasive diagnostic and therapeutic interventions with the femoral artery has increased. Physicians treating vascular diseases have begun using devices with larger diameters; furthermore, interventional cardiologists, interventional radiologists, and vascular surgeons are now deploying devices that require post-procedure anticoagulation therapy. With the increased use of the femoral artery, increasing size of the catheter sheaths, and increased use of anticoagulation, there has been a concurrent increase in the incidence of femoral artery pseudoaneurysms noted. Until the early 1990s the gold standard for the treatment of this complication was surgery. In an effort to find an alternative to surgery and its associated costs and complications, ultrasound-guided compression was developed in 1991 and found to be an effective therapeutic modality. Compression has a success rate that varies from 47% to 100%.

However, the success rate drops to 38% when the patient requires anticoagulation therapy. Additionally, compression is lengthy, lasting from 10 to 110 min, it can be uncomfortable and frequently requires intravenous sedation or analgesia. When ultrasound-guided compression is unsuccessful, surgery is required. A minimally invasive alternative to ultrasound-guided compression is needed that can be successfully used in patients requiring anticoagulation. Ultrasound-guided thrombin injection may prove to be this alternative.

We report our experience with thrombin injection of iatrogenic pseudoaneurysms at a community hospital.

PATIENTS AND METHODS

From March 1999 to June 2000, our vascular lab diagnosed 42 patients with pseudoaneurysms, using a duplex examination. The charts of these patients were reviewed. Patient data including gender, age, site of arterial injury, the causative factor, size of the catheter sheath causing the injury, and use of anticoagulation agents were collected. All patients consented to having thrombin injection of their pseudoaneurysms. The only
contraindication to thrombin injection was a history of a negative reaction to bovine products.

The diagnosis of a femoral artery pseudoaneurysm was confirmed with a duplex scan using either an ATL HDI 3000 scanner (Advanced Technology Laboratories, Bothell, WA) or an Acuson 128XP scanner (Acuson, Mountain View, CA). The largest diameter of the aneurysm was measured in the anterio-posterior, transverse, and longitudinal planes. The volume of the aneurysm was subsequently calculated.

A solution containing 5000 units of bovine thrombin (GenTrac Inc., Middletown, WI) with 5 cc normal saline was mixed to create a final concentration of 1000 units thrombin per cc. It was then drawn into a 1-cc tuberculin syringe with a 22-gauge spinal needle. To enhance echogenicity, the needle was roughened up with a scalpel.

Before proceeding with thrombin injection, lower extremity vascular exams were performed, consisting of examination of the pulses, capillary refill, and color of the foot, as well as a continuous Doppler examination of the pedal arteries. The affected groin was then prepped, draped sterilely, and infiltrated with 1% lidocaine. Lidocaine was used only during 1999, after which local anesthesia was no longer employed. The transducer was equipped with a biopsy needle guide, and was then placed over the pseudoaneurysm (the guide facilitated accurate needle placement). The syringe containing the thrombin solution and spinal needle were then introduced into the pseudoaneurysm under ultrasound guidance. The duplex color flow was then turned on, and the tip of the needle was directed into the pseudoaneurysm but away from the source of the flow (pseudoaneurysm neck). Injection was discontinued when flow was no longer detected within the pseudoaneurysm. If thrombosis did not occur, additional syringes were used at the discretion of the treating surgeon. Once thrombosis occurred, the vascular exams were repeated. All patients during 1999 were inpatients, and were thus sent back to their rooms for 24 hr of bed rest. Starting in January 2000 we began performing this procedure on an outpatient basis, and the activities of all patients were no longer restricted. All patients had duplex studies repeated 24 hr post-procedure.

Intravenous sedation or analgesia was not administered to any patients.

RESULTS

Of the 42 patients who presented to our vascular laboratory there were 16 women and 26 men. The overall mean age of the patients was 73.3 years, the mean age for the women was 75.3 years, and the mean age for men was 72.2 years. All of the aneurysms were of the common femoral artery. The etiology of 41 pseudoaneurysms was secondary to cardiac catheterization. The other pseudoaneurysm was secondary to an intraaortic balloon pump.

The sizes of the catheter sheaths were as follows: 8 size 6 French, 13 size 7 French, and 11 size 8 French. Ten patients did not have any documentation of the diameter of the sheath. The latter group of patients had their diagnostic and or interventional procedure done at an outside institution and were referred to our hospital for further treatment. The average diameter and volume of the pseudoaneurysms was 2.6 cm (range 1.9 cm), and 44.6 cm³ (range 1.73-762 cm³), respectively. Twenty-two patients were receiving anticoagulation therapy.

We were able to successfully thrombose 92.9% (39/42) of the pseudoaneurysms using thrombin. Nearly 91% (20/22) of the patients receiving anticoagulation had successful percutaneous thrombin therapy. The average amount of thrombin injected to achieve successful thrombosis in all patients was 550 units (200-3000 units). Three patients required additional syringes of thrombin. Two patients required one additional syringe, while the third patient required two additional syringes.

Of the three patients who could not be percutaneously thrombosed, one achieved complete thrombosis on the 24-hr follow-up duplex. On the day of injection this patient had partial thrombosis of a multilobed pseudoaneurysm. This patient was receiving anticoagulation. The other two patients were successfully treated with surgery; one of these patients was on anticoagulation therapy at the time of thrombin injection. All three of these patients had multilobed pseudoaneurysms, and all underwent attempted ultrasound-guided compression of the pseudoaneurysm.

The post-thrombin vascular exams in all patients were unchanged. None of the patients experienced any discomfort or required intravenous sedation or analgesia. There were no complications in any of the patients treated. Of the patients that were successfully treated with thrombin, none have returned with any recurrences.

DISCUSSION

As more vascular conditions become amenable to treatment with minimally invasive endovascular techniques and the use of anticoagulation and antiplatelet agents increases, it seems intuitive that the incidence of femoral arterial pseudoaneurysms