Successful direct thrombin injection of a femoral artery pseudoaneurysm in an anticoagulated patient with a mechanical mitral valve

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Femoral pseudoaneurysm is a complication of cardiac catheterization and may be related to the use of anticoagulants, antiplatelet agents, larger diameter sheaths and prolonged duration of sheath insertion. The treatment ranges from direct compression with or without direct thrombin injection to surgical repair. The present report describes a unique

scenario of postcardiac catheterization femoral artery pseudoaneurysm in a patient with a pre-existing mechanical mitral valve requiring anticoagulation. The potential systemic effects of thrombin made the patient reluctant to undergo treatment and made thrombin administration a challenging proposition. The present report suggests that thrombin injection for treating femoral pseudoaneurysm in patients with mechanical heart valves on chronic anticoagulation can be performed safely.

Key Words: Cardiac catheterization; Femoral pseudoaneurysm; Mechanical mitral valve; Thrombin injection

Iatrogenic femoral pseudoaneurysm is one of the most common complications of cardiac catheterization, with an incidence of less than 1% to 7.7% (1). The risk of developing a pseudoaneurysm is related to a multitude of factors. Previous use of antiplatelet and anticoagulation agents, sheath diameter and the amount of time the sheath remains in the vessel can all contribute to a higher rate of pseudoaneurysm formation (2).

Treatment modalities for pseudoaneurysms have evolved considerably over the past decade. While surgical repair remains a viable option, techniques involving ultrasound-guided direct compression with or without direct thrombin injection have become the standard of care. The success rate with direct compression has been shown to be as high as 90%; however, it considerably drops to 62% to 73% when anticoagulation therapy is initiated before cardiac intervention (3). Addition of direct thrombin injection raises the success rate to approximately 100% when ultrasound guidance is used (4,5). Complications with the use of thrombin injections are rare but can be significant (1,2,5) and include arterial thrombosis, embolization and anaphylaxis.

While the above complications occur in less than 4% of interventions, those that do occur manifest themselves within several hours of injection. To date, very little is known about the systemic effects of thrombin injection and how it impacts downstream vessels. In patients with prosthetic mechanical heart valves, maintaining adequate anticoagulation is paramount in preventing adverse outcomes. We report the first documented case of thrombin injection in a male patient with a mechanical mitral valve who underwent cardiac catheterization and developed a femoral pseudoaneurysm.

CASE PRESENTATION

The patient was a 73-year-old man with a history of atrial fibrillation, congestive heart failure, chronic obstructive pulmonary

disease, sick sinus syndrome and mitral valve regurgitation. He had a history of pacemaker placement and mechanical mitral valve replacement, and was admitted for treatment of a congestive heart failure exacerbation. Nine years before admission, he had undergone cardiac catheterization/coronary angiography, which showed no significant coronary atherosclerosis. Five months before admission, the patient underwent a myocardial perfusion stress study that showed a small reversible perfusion defect in the inferior apex and distal inferior wall and increased lung tracer uptake. As a result, it was decided that the patient should be evaluated for progression of coronary artery disease.

The patient was treated with intravenous and then oral furosemide. His warfarin was held and anticoagulation for his mitral valve was maintained with a heparin drip. He underwent left and right cardiac catheterization on the fourth day of admission, with access through the right femoral artery and vein. The patient was found to have nonobstructive coronary artery disease, a left ventricular ejection fraction of 35%, and mild to moderate aortic stenosis with an aortic valve area of 1.2 cm² and a mean gradient of 15 mmHg. Manual pressure was applied after the completion of the procedure and when the venous and arterial sheaths were pulled, a Femostop device (St Jude Medical Inc, USA) was applied to the patient's groin. His heparin infusion was restarted without bolus after the completion of the catheterization, and he was kept on bed rest.

On the sixth day of admission, the patient complained of right groin ecchymosis and edema at the site of the catheterization access. He reported that he had difficulty getting out of bed during the night and then began to notice a 'knot in his groin'. On examination, the patient was found to have a groin hematoma and a femoral artery bruit. The patient's heparin drip was stopped and a Doppler ultrasound was ordered, which showed a 2.5 cm × 1.2 cm pseudoaneurysm,

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Figure 1 **A** Colour Doppler ultrasound of the right (RT) femoral artery pseudoaneurysm (Pseudo) in a patient with a mechanical mitral valve showing communication between artery and aneurysm. **B** After thrombin injection, the pseudoaneurysm is filled with thrombus, which appears as echogenic material

with a neck measuring 0.5 cm (Figure 1A). After a diagnosis was made, manual pressure was applied at the site of the pseudoaneurysm without successful occlusion. The patient was brought back to his room and remained on bed rest, with a compression dressing in place over the site of the pseudoaneurysm. The presence of the pseudoaneurysm in the patient's groin complicated his clinical course because of his need for anticoagulation in the presence of a mechanical mitral valve. He was restarted on heparin infusion and the vascular surgery team was consulted.

On the seventh day of admission, another attempt at compression was made under ultrasound guidance. This attempt was unsuccessful and the vascular surgery team recommended that the patient undergo direct thrombin injection under ultrasound guidance at the site of the pseudoaneurysm. The patient was very concerned about the thrombin injection because of his mechanical mitral valve. A literature search showed no published data on this specific situation, although a report of injection in a patient with an aortic prosthetic valve was found (6) (unfortunately, the patient described developed a complication). After a discussion of both the risks and benefits of the

procedure, the patient decided to undergo the direct thrombin injection under ultrasound guidance on the eighth day of admission. There was immediate occlusion of the pseudoaneurysm after the thrombin injection, and the patient was returned to his telemetry bed, where he was monitored for 48 h with no events. A Doppler ultrasound of the right groin after 48 h showed thrombosis of the pseudoaneurysm (Figure 1B).

The patient was discharged home with close cardiology follow-up, and had a transthoracic echocardiogram one week after thrombin injection. The echocardiogram showed a mobile mechanical mitral valve with no evidence of thrombus. Overall, there was no change from the transthoracic echocardiogram performed one month before his admission.

DISCUSSION

Arterial pseudoaneurysm is a well-described complication following cardiac catheterization. Treatment methods of pseudoaneurysms are numerous and carry a relatively high success rate (1). Local injection of thrombin under ultrasound guidance has a high success rate; however, known complications such as local and distal clot formation with ischemia have been reported (6). In patients with mechanical mitral valves in whom anticoagulation therapy is paramount, thrombin injection carries with it the potential for severe adverse complications, but the literature is sparse on thrombin injection in patients needing chronic anticoagulation. The only study (7) that examined the systemic effects of thrombin injection found only relatively minor changes of unclear clinical significance. However, the number of subjects included in the study was small. Because of this uncertainty, the risks and benefits of the procedure must be carefully weighed, particularly in the subset of patients whose life depends on anticoagulation. Further studies are needed to truly ascertain the safety profile of thrombin injection in patients with mechanical valves. To date, this present case report represents the first documented case of thrombin injection for pseudoaneurysm in a patient with a mechanical mitral valve.

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