Case report - Vascular thoracic

Post-sternotomy intercostal artery pseudoaneurysm. Sonographic diagnosis and thrombosis by ultrasound-guided percutaneous thrombin injection

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Abstract

Intercostal artery pseudoaneurysms are extremely rare. We present a case of an intercostal artery pseudoaneurysm after median sternotomy that was treated by ultrasound-guided percutaneous thrombin injection. They are a potential source of complications, especially haemothorax, and treatment is mandatory. Different methods may be used for the confirmatory diagnosis of false aneurysms. Doppler ultrasound (DUS) and CT are the two most commonly used methods, but pseudoaneurysms have also been diagnosed by means of arteriography (AR), which enables endovascular treatment of the pseudoaneurysm in a single procedure. We used Doppler sonography alone, because this technique yielded a definitive diagnosis without the need for other complementary imaging modalities to treat the lesion. There are various possible treatments for lesions of this kind. Endovascular embolization is the commonly used treatment for intercostal pseudoaneurysm but also stent grafting has been described. Surgical aneurysmectomy with proximal ligation of the intercostal artery is an option described for the treatment of the pseudoaneurysm. To date only seven cases have been published in the literature. Our case is the only published instance of treatment of an intercostal artery pseudoaneurysm by direct percutaneous thrombin injection under sonographic guidance.

Keywords: False aneurysm; Intercostal pseudoaneurysm; Latrogenic pseudoaneurysm

1. Introduction

Intercostal artery pseudoaneurysms are extremely rare. To date, only seven cases have been described in the literature. All the published cases have been caused by therapeutic procedures or by trauma. We present a case of an intercostal artery pseudoaneurysm after median sternotomy that was treated by ultrasound-guided percutaneous thrombin injection.

2. Clinical case

A 71-year-old man with a history of hypertension, dyslipidemia, smoking, and chronic renal insufficiency on haemodialysis. These patient underwent scheduled surgery to replace the aortic valve. Cardiogenic shock caused by pericardial effusion in the immediate postoperative period required a second sternotomy by the Cardiac Surgery Unit for drainage. Four days after the second procedure the patient was referred to the Vascular Surgery Unit with a pulsatile mass at the level of the second left intercostal space.

Doppler ultrasound (DUS) was performed and revealed a hypoechoic lesion 21 mm in diameter in the second left intercostal space, with arterial Doppler flow inside connected to the second left intercostal artery by a neck ~2 cm long (Fig. 1a).

An intercostal artery pseudoaneurysm was diagnosed and treated by ultrasound-guided percutaneous thrombin injection.

The method of ultrasound-guided thrombin injection (USGTI) is a simple one. We used a 20 G Abbocath® catheter whose tip was advanced to the pseudoaneurysm via percutaneous puncture under grey-scale ultrasound guidance. When the tip reached the pseudoaneurysm the needle was withdrawn, and pulsatile blood outflow was observed. Next, using a syringe preloaded with the thrombin component from Tissucol® duo 2.0 (Baxter Hyland Immuno, Vienna, Austria), thrombin was slowly injected into the pseudoaneurysm. Colour-flow DUS confirmed flow reduction and pseudoaneurysm thrombosis within a few seconds. There was no subsequent compression of the pseudoaneurysm.

Doppler sonography performed two days after the procedure revealed partial reperfusion of the pseudoaneurysm, and it was therefore decided to carry out another ultrasound-guided percutaneous thrombin injection. Injection of
250 IU of thrombin achieved complete thrombosis of the pseudoaneurysm. Further Doppler sonograms performed 48 h, 1 week, and 14 days after the second injection confirmed complete thrombosis of the pseudoaneurysm and a patent intercostal artery (Fig. 1b).

3. Discussion

Intercostal artery pseudoaneurysms are extremely rare. To date only seven cases have been published in the literature (Table 1). Aetiology of the cases described was iatrogenic in five patients and traumatic in two [1]. Median sternotomy for heart surgery was the cause of only one of the intercostal artery pseudoaneurysms reported [2].

In our case the lesion is due to the closure of sternotomy. With the approximation suture of sternum the intercostal artery was damaged, this lesion of the artery produced the pseudoaneurysm formation.

In five cases diagnosis was subsequent to haemothorax following rupture of the pseudoaneurysm [1, 3–6]. In one case, rupture of the pseudoaneurysm after laparoscopic nephrectomy led to recurrent retroperitoneal bleeding [7]. Aside from the case reported here, in only one other case was the initial diagnosis made on the basis of a pulsatile mass without any signs of active bleeding [2].

Different methods may be used for the confirmatory diagnosis of false aneurysms. DUS and CT are the two most commonly used methods, but pseudoaneurysms have also been diagnosed by means of arteriography (AR), which enables endovascular treatment of the pseudoaneurysm in a single procedure. We used Doppler sonography alone, because this technique yielded a definitive diagnosis without the need for other complementary imaging modalities to treat the lesion.

There are various possible treatments for lesions of this kind. Endovascular embolization has been reported in four cases. In three of these cases, embolization of the pseudoaneurysm was carried out by selectively catheterizing the damaged intercostal artery [1, 3, 4]. In the case reported by Callaway et al. [2], with the absence of any signs of bleeding, a covered stent was implanted.

In contrast, after embolization failed to bring about thrombosis of the pseudoaneurysm, Aoki et al. elected surgical aneurysmectomy with proximal ligation of the intercostal artery [5]. Conservative treatment of the pseudoaneurysm without complications has been described in two cases [6, 7].

To date, our case is the only published instance of treatment of an intercostal artery pseudoaneurysm by direct percutaneous thrombin injection under sonographic guidance.

Doppler USGTI is a widely accepted method of treatment for false aneurysms. The method has yielded excellent results for femoral pseudoaneurysms and can be carried out without the need of anaesthesia equipment or an operating theatre.

A recent study of 240 false aneurysms treated by means of thrombin injection reported a success rate of nearly 99%. Forty-five percent of the patients were on anticoagulant therapy when the procedure was performed, and thrombosis of the pseudoaneurysm was achieved in over 90% without suspending therapy [8].

Complications have been described for this procedure in exceptional cases. These are usually caused by overinjection of thrombin or involve false aneurysms with a wide, short neck [9]. Specific treatment for acute arterial thrombosis resulting from intra-arterial thrombin injection is controversial. Krueger et al. described just two cases of thrombin-induced arterial occlusion. Both cases resolved satisfactorily without treatment [8]. However, there are published cases in which this complication required surgical revascularization [9]. Loss of an affected limb subsequent to distal embolization produced by the thrombin is uncommon, but cases have been reported [10].

Table 1

Summary of published cases of intercostal artery pseudoaneurysm

<table>
<thead>
<tr>
<th>Report</th>
<th>Signs</th>
<th>Cause</th>
<th>Diagnosis</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casas et al.</td>
<td>Haemothorax</td>
<td>Percutaneous biliary procedure</td>
<td>CT + AR</td>
<td>Embolization</td>
</tr>
<tr>
<td>Atherton and Morgan</td>
<td>Haemothorax</td>
<td>Thoracoscopic sympathectomy</td>
<td>AR</td>
<td>Embolization</td>
</tr>
<tr>
<td>Yamakado et al.</td>
<td>Haemothorax</td>
<td>Percutaneous microwave coagulation therapy for hepatocellular carcinoma</td>
<td>DUS + AR</td>
<td>Stent grafting</td>
</tr>
<tr>
<td>Callaway et al.</td>
<td>Pulsatile mass</td>
<td>Sternotomy</td>
<td>DUS + CT + DUS</td>
<td>Conservative</td>
</tr>
<tr>
<td>Bluebond-Langner et al.</td>
<td>Retropertoneal haematoma</td>
<td>Laparoscopic nephrectomy</td>
<td>CT</td>
<td>Open surgery after failed embolization</td>
</tr>
<tr>
<td>Aoki et al.</td>
<td>Haemothorax</td>
<td>Traumatism</td>
<td>DUS + CT + AR</td>
<td>Embolization</td>
</tr>
<tr>
<td>Sekino et al.</td>
<td>Haemothorax</td>
<td>Traumatism</td>
<td>DUS + CT + AR</td>
<td>USGTI</td>
</tr>
<tr>
<td>Present case</td>
<td>Pulsatile mass</td>
<td>Sternotomy</td>
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<td></td>
</tr>
</tbody>
</table>

CT, CT-scan; AR, arteriography; DUS, Doppler ultrasound; USGTI, ultrasound-guided thrombin injection.
4. Conclusions

Intercostal pseudoaneurysm are a potential source of complications, especially haemothorax, and treatment is mandatory. This is the first reported case of intercostal artery pseudoaneurysm treated by Doppler ultrasound-guided percutaneous thrombin injection. The method allows efficacious, rapid treatment of the lesion with few complications.

References


eComment: It could be an iatrogenic arteriovenous fistula

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In this article, Fernandez Alonso et al. describe a very interesting case of poststernotomy pseudoaneurysm formation and an easy diagnosis and treatment using ultrasound-guided percutaneous thrombin injection [1]. However, some questions must be addressed:

The authors did not use CT-scan or arteriography diagnosis, however an iatrogenic mammary or intercostal arteriovenous fistula must have been ruled out. Two possible causes of poststernotomy fistulas [2–5] have been suggested. One cause is trauma produced by the sternal wire, which generates a fistulous communication between the artery and the vein and a hematoma, which causes the pseudoaneurysm. In some cases the hematoma could extend subcutaneously along the passage of the sternal wire. The other cause postulated is trauma in the region caused by retraction or electrocautery during operation. At what level of the second intercostal space did the pseudoaneurysm appear? Was it subcutaneous or intrathoracic?

There is a risk of fistula recurrence if there is only pseudoaneurysm occlusion or anterograde artery embolization due to retrograde flow via epigastric artery. In such cases, as we reported some years ago, we recommend embolization of the anterograde and retrograde pedicles [5].

References


