CASE REPORT

Ruptured intercostal artery pseudoaneurysm in a patient with blunt thoracic trauma: diagnosis and management

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SUMMARY

Intercostal artery pseudoaneurysm is an extremely unusual condition, with less than 10 reported cases to our knowledge. Most of them have been associated with surgical interventions or blunt thoracic trauma. The bleeding risk in this kind of lesions is considerable, the majority of them presenting as haemothorax. We present a case of an intercostal artery pseudoaneurysm detected after a blunt thoracic trauma in a patient with signs of acute bleeding. The identification of a small artery pseudoaneurysm as the cause of haemothorax requires knowledge of this possible aetiology as well as detailed attention to the CT technique. Embolisation is considered to be the first therapeutic method in the management of a ruptured pseudoaneurysm. To reduce the risk of failure, the anatomic features and adjacent vessels providing collateral branches must be studied and embolised if needed, with important attention to collateral blood supply arising from the musculophrenic and anterior intercostal arteries.

BACKGROUND

Intercostal artery pseudoaneurysm is an extremely unusual condition, with less than 10 reported cases to our knowledge.¹ Most of them have been associated with surgical interventions or blunt thoracic trauma.² The bleeding risk in this kind of lesions is considerable, the majority of them presenting as haemothorax. We report a case of an intercostal artery pseudoaneurysm detected 3 days after a blunt thoracic trauma in a patient presenting with signs of altered mental status and acute bleeding.

CASE PRESENTATION

A 66-year-old woman with a complex medical history including mechanical aortic and mitral valve replacements, two myocardial infarctions, heart failure, sustained auricular fibrillation on anticoagulant therapy and pertrochanteric femoral fracture was referred to our institution because of two falling episodes not associated with any consciousness loss. During hospital admission a digitalis intoxication was diagnosed. On the third day the patient presented haemodynamic instability given by a decrease in BP (80/50 mm Hg), elevated heart rate (110 bpm) and signs of peripheral hypoperfusion requiring the use of vasoactive drugs. A rapid decrease in the haematocrit level from 36% to 24% was found right after, requiring the transfusion of 4 U of packed red blood cells and the stop of anticoagulation therapy.

INVESTIGATIONS

An abdominal ultrasound (US) was performed, reporting a small right side pleural effusion being the rest of the exploration unremarkable.

Owing to a progressive decline in the patient's haemodynamic status with persistence of low BP and peripheral hypoperfusion signs despite medical management for the heart failure, a contrast-enhanced CT was performed after the US.

The CT scan showed a right-sided haemothorax, with a small nodular-enhancing lesion in the 10th intercostal space related to a costal fracture (figure 1). A chest tube was placed draining 250 cc of haematic fluid in 30 min.

The patient underwent an immediate angiography, which confirmed the intercostal artery pseudoaneurysm (figure 2).

TREATMENT

Embolisation with particles and microcoils was performed with postembolisation angiogram showing successful occlusion of the pseudoaneurysm and absence of collateral arterial feeders. Anticoagulation therapy was resumed with low-molecular-weight heparin. Over the next 24 h the patient re-presented haemodynamic instability and three-point decrease in the haematocrit level. Subsequent CT scan showed signs of active bleeding to the right pleural space at the posterior costophrenic angle, once again with enhancement of the pseudoaneurysm (figure 3). A second angiography was performed. Persistence of the pseudoaneurysm with arterial feeders arising from the ninth intercostal artery was identified and successfully embolised (figure 4).

OUTCOME AND FOLLOW-UP

Progressive recovery of the haemodynamic state was achieved after the second embolisation. The haematocrit levels remain stable and the chest tube was retired after 5 days. Oral anticoagulation therapy along with the usual medication of the patient was reintroduced without any other bleeding episode. On the 11th day the patient was discharged.

DISCUSSION

Pseudoaneurysm formation is due to the disruption of one or more layers of the arterial wall, being the leaked blood contained in a perfused sac. Intercostal artery pseudoaneurysms are extremely rare with only a few cases reported in the English

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Figure 1 Coronal reformatted image of the contrast-enhanced CT scan in arterial (A) and late (B) phase. There is a small nodular-enhancing lesion (arrow) located above the diaphragm, with wash out but no extravasation of contrast in the late phase compatible with a pseudoaneurysm arising from the right 10th intercostal artery. Right-sided hyperdense pleural effusion compatible with haemothorax. No other abnormalities are noted.

Figure 2 Selective digital subtraction angiogram of the right 10th intercostal artery showing a pseudoaneurysm of the vessel (arrow in A) without active extravasation. Selective angiogram showing successful occlusion of the lesion by means of particles and microcoils (arrow in B).

Figure 3 Axial contrast-enhanced CT scan (A) and coronal reformatted image (B) acquired in late phase. Persistent enhancement of the pseudoaneurysm is seen (arrow), associated with active extravasation of contrast material to the pleural space (arrowhead in A). Bilateral pleural effusion and right side atelectasis is also seen.

Figure 4 Selective digital subtraction angiogram of the right ninth intercostal artery showing persistence of the pseudoaneurysm (arrow in A) with arterial feeders arising from the ninth intercostal artery (arrowhead in A). Selective angiogram showing successful occlusion of the lesion by means of particles and microcoils (arrow in B).

literature. Causes for their formation include surgical procedures,^{3 4} penetrating and blunt trauma^{2 5} and other miscellaneous aetiologies such as percutaneous fine-needle aspiration biopsies, thoracentesis and spinal metastases chemoembolisation.⁶ Recognition is important because of the bleeding risk they pose which can quickly lead to hypovolemic shock and death. Haemothorax is the most common presentation, but extrapleural hematomas have also been reported.⁷ The aetiology of the pseudoaneurysm in our patient is related to the blunt thoracic trauma suffered 3 days before admission, with the rib fractures injuring the 10th intercostal artery.

Although CT serves as the primary diagnostic modality in traumatic patients, it was not performed on admission, given the low-energy traumatic mechanism and haemodynamic stability. Once the patient presented signs of haemodynamic instability and a decrease in haematocrit levels, imaging studies were performed. The identification of a small artery pseudoaneurysm as the cause of the haemothorax requires knowledge of this possible aetiology as well as detailed attention to the CT technique, and even so is not always demonstrated.

Embolisation is considered the first therapeutic option in the management of a ruptured pseudoaneurysm, with a few case reports using surgical approaches. When embolising small arteries with collateral supply as is the case of intercostal arteries, the use of particles in conjunction with proximal microcoils achieves a distal and proximal occlusion, with the aim to completely exclude the pseudoaneurysm from circulation. Even though this approach was used in our patient and an immediate angiographic control was successful, the subsequent CT scan showed persistence of the lesion, this time with active bleeding in the pleural space. This kind of treatment failures have often been encountered and may be due to additional small feeding vessels that are too small or invisible at the initial angiography and may be identified in subsequent angiographic studies; in our case, the additional feeders to the pseudoaneurysm were branches of the adjacent intercostal artery.

To reduce the risk of failure, knowledge of the anatomic features is required and adjacent vessels providing collateral branches must be studied and embolised if needed, with important attention to collateral blood supply arising from the musculophrenic and anterior intercostal arteries (in the case of sixth to ninth intercostal spaces).²

Intercostal artery pseudoaneurysm is a rare complication of blunt thoracic trauma, but must be considered in patients presenting with traumatic haemothorax. Successful identification in

CT studies when achieved is useful in guiding the endovascular treatment, which should include the exploration of all possible collateral blood supply.

Learning points

- Pseudoaneurysm formation is due to the disruption of one or more layers of the arterial wall, being the leaked blood contained in a perfused sac.
- Intercostal artery pseudoaneurysms are extremely rare, most of them related to penetrating and blunt trauma.
- Haemothorax is the most common presentation, but extrapleural hematomas may be seen.
- CT serves as the primary diagnostic modality in traumatic patients.
- Embolisation is the first therapeutic option in the management of a ruptured pseudoaneurysm.

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