

Received: 2010.09.27
Accepted: 2011.01.07

CT imaging of aortic intramural hematoma: Report of two cases, and review of literature

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Summary

Aortic intramural hematoma (IMH) is a relatively rare, but potentially fatal pathology, which is most commonly diagnosed under emergency conditions with computed tomography angiography (CTA). We present two cases of IMH examined with different CTA protocols, which resulted in diverse diagnoses.

In the first patient, contrast-enhanced CTA revealed dilatation of thoracic aorta and polymorphic wall thickening. It was misdiagnosed as being a mural thrombus and was complicated by acute dissection. In the second patient, non-enhanced CT revealed hyperdense aortic wall thickening. The patient was diagnosed as having type B IMH but he died due to aortic rupture.

In our opinion, CT examination of the aorta in emergency cases should always include non-enhanced scanning. Any delay in proper diagnosis and treatment of IMH may result in serious complications.

Key words: computed tomography angiography • thoracic aorta • aortic intramural hematoma

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Background

Intramural hematoma (IMH) is a relatively rare but potentially fatal pathology, and one of the entities included into a group of acute aortic syndromes (AAS) [1]. IMH develops in the external layer of the media, due to a spontaneous rupture of the vasa vasorum [2]. However, in rare cases, IMH may also be caused by a penetrating ulcer or an intimal tear [3]. As the most common symptom of the hematoma is an acute chest pain, the condition is most commonly diagnosed under emergency conditions with computed tomography angiography (CTA).

We present two cases of IMH, which were examined with CTA. The examinations were performed using different protocols, which resulted in diverse radiological diagnoses.

Case Reports

Case 1

A 52-year-old female patient was referred from a primary hospital for diagnostics of an atypical chest pain.

Trans-esophageal echocardiography suggested an extensive mural hematoma in the ascending and descending aorta. CTA was performed in a protocol of a non-gated helical acquisition of the entire thoracic aorta, with a collimation of 64×0.6 mm at 120 kVp and a tube current modulation, using 100 mL of 370 mg-I/mL non-ionic contrast media injected at the rate of 4 mL/s. CT revealed an extensive hypodense thickening of the aortic wall (Figure 1A). The ascending aorta was dilated to a diameter of 45 mm, and presented a 6-mm concentric wall thickening. The descending aorta had a diameter of 40–43 mm, with a 15-mm crescent-shaped wall thickening. The lesion extended to the level of the diaphragm. There was also seen a minor area of atelectasis in the lung parenchyma adjacent to the descending aorta, and a small amount of fluid in the left pleural cavity.

Due to its concentric shape, its extent, the existence of aortic dilatation, and incorrect measurements of CT density, the lesion was misdiagnosed as being a mural thrombus. The patient was treated conservatively. The treatment led to a rapid release of pain. However, after 7 days, the patient experienced a relapse of symptoms. The second CTA revealed an aortic dissection and a slight increase of

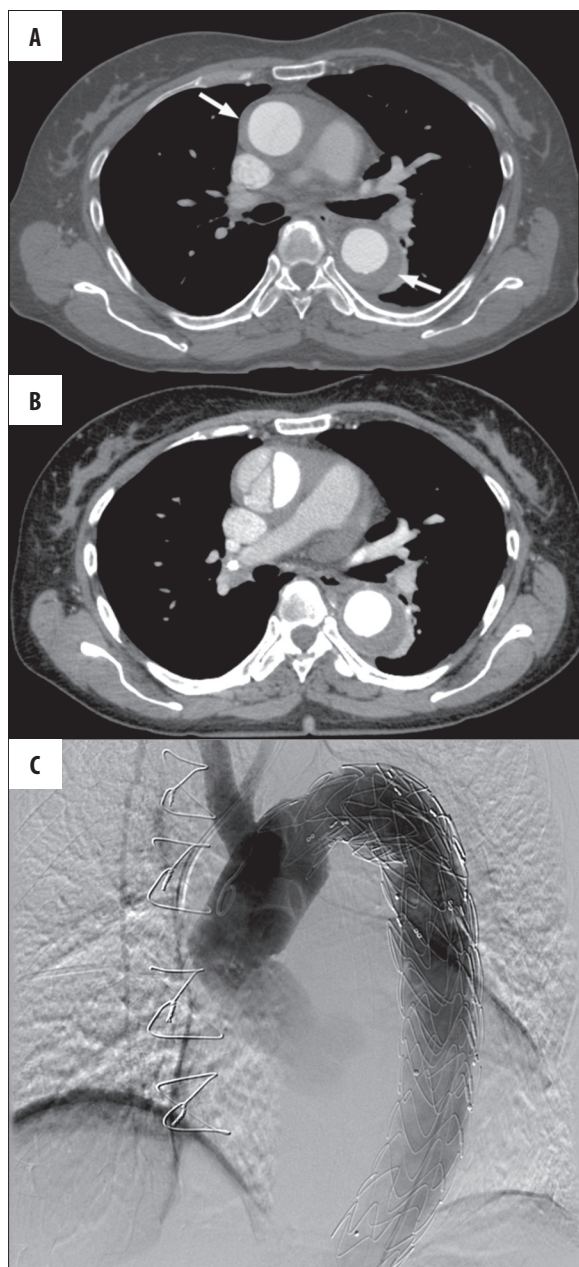


Figure 1. Case 1. (A) CTA at the time of admission, presenting a dilatation of the thoracic aorta with hypodense wall thickening (arrows). Note the small area of atelectasis adjacent to the descending aorta, and the fluid in the left pleural cavity. (B) CTA performed seven days later, revealing an acute dissection of the ascending aorta. (C) Angiography image taken after the stent-graft implantation.

the primary lesion size, which appeared to be a type A IMH (Figure 1B). The patient was successfully treated by a combined surgical-endovascular method: ascending aorta grafting followed by a stent-graft implantation into the descending aorta, which gave a positive clinical outcome (Figure 1C).

Case 2

A 63-year-old male patient in a good clinical condition with a moderate atypical chest pain, referred for CTA. The

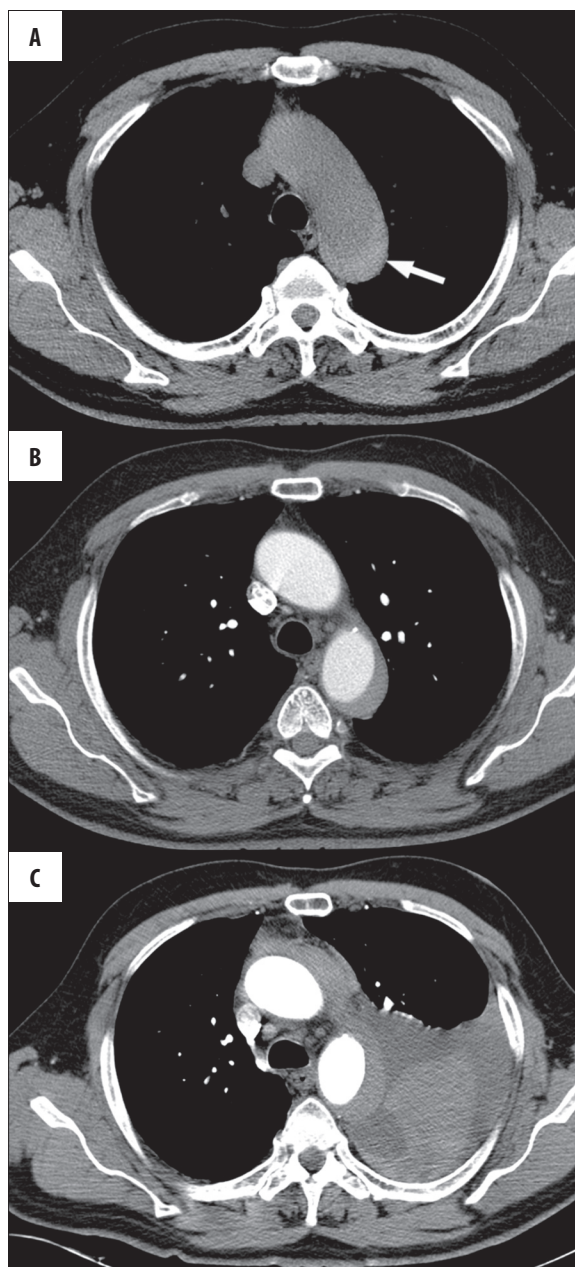


Figure 2. Case 2. (A) Non-enhanced scan at the time of admission, presenting a hyperdense lesion in the lumen of the descending aorta (arrow). (B) Contrast-enhanced CTA confirms well-defined crescent wall thickening of the descending aorta. (C) CTA performed 6 hours later showed a hemorrhage into the left pleural cavity.

examination was performed in a protocol of non-enhanced and contrast-enhanced non-gated helical scan of the thoracic aorta. Both acquisitions were obtained with a collimation of 64×0.6 mm at 120 kVp and a tube current modulation. Contrast agent was given at a dose of 120 mL with injection rate of 4 mL/s. Contrast-enhanced scans revealed a 11-mm hypodense crescent-shaped wall thickening of the descending aorta, which was hyperdense before contrast administration (Figure 2A, B). The patient was diagnosed as having type B IMH, and subjected to an emergent surgery. However, during preoperative period, the hematoma

ruptured, resulting in a fatal massive hemorrhage into the left pleural cavity (Figure 2C).

Discussion

IMH consists of 13–29% of AAS cases [1], which also includes two other pathologies: acute aortic dissection (AAD), and penetrating aortic ulcer (PAU). All of the three entities have a similar clinical presentation but a different natural history, and should be therefore differentiated during diagnostic imaging.

The rate of spontaneous regressions of IMH is estimated at 34% [4]. However, the mortality in IMH reaches 21%, and results mostly from aortic wall rupture [5]. In unruptured cases, the most common complications are true or false aneurysms and dissections. In a series by Evangelista et al. [5], patients with IMH described a more severe initial pain than patients with AAD, but were less likely to have lower limb ischemia, pulse deficits, or aortic valve insufficiency. Moreover, they required a longer time to diagnosis and a higher number of the diagnostic tests.

Diagnosis of IMH is usually made with the use of transesophageal echosonography, CTA, or magnetic resonance angiography (MRA), with insignificant differences in sensitivity and specificity between the techniques [1]. Of these methods, CTA seems to be of the greatest importance due to its availability and comprehensiveness in emergency conditions. On non-enhanced CT images, IMH is characterized by a hyperdense (50–70 HU) thickening of the aortic wall. A typical hematoma has a smooth surface, crescent shape, thickness of at least 7 mm, and length of 3–20 mm, and is located in the descending aorta [1]. The lesion does not enhance after contrast administration, which enables its differentiation from AAD, PAU and other aortic wall pathologies.

Differential diagnosis in cases of aortic wall thickening should include AAD, atherosclerotic plaque, mural thrombus, aortitis, and lymphoma. A typical AAD case is easy to differentiate from IMH on contrast-enhanced images, because of an intimal flap seen in the vessel lumen. In rare cases of false lumen thrombosis, visualization of the site of the intimal tear and spiral progression may help to confirm AAD. Atherosclerotic plaque usually has an irregular internal shape and includes calcifications. Mural thrombus is characterized by hypodensity, circumferential shape, and irregular luminal surface. It commonly coexists with aneurysms. Aortitis causes discontinuous concentric wall

thickening, with normal and involved segments within the aorta. Active inflammation of the aortic wall is associated with contrast enhancement, while the typical perivascular fibrosis in chronic aortitis can be better demonstrated with MRA. Similarly, lymphoma can be differentiated from IMH by contrast enhancement and MRA, and presents as an irregular periaortic mass, usually involving other organs.

The first of our cases was misdiagnosed due to two main reasons. Firstly, the examination did not include non-enhanced CT images, and therefore the hyperdensity of the aortic wall thickening was missed. Moreover, a measurement of CT attenuation of such small structures adjacent to the contrast-filled aorta lumen has a limited value owing to partial volume averaging. Secondly, the hematoma had non-specific features in this patient, i.e. circumferential shape, involvement of the entire thoracic aorta, and simultaneous aortic dilatation. The delay in the correct diagnosis led to a serious complication – aortic dissection. Our second case revealed typical features of IMH and was diagnosed properly. However, the patient developed an aortic rupture, the most serious complication of IMH.

Unexpectedly, with contemporary development in CT technology, the diagnostic work-up of IMH seems to be problematical in the setting of emergency radiology. With an introduction of the 64–320-row multislice CT scanners, imaging of coronary arteries in patients suffering from acute chest pain became feasible and is of great interest [6]. Moreover, to increase the cost-effectiveness of CT, triple-rule-out protocols were introduced. This enabled imaging of coronaries, pulmonary arteries, and aortic lumen in single ECG-gated examinations [7]. The most apparent advantage of such protocols is their high negative predictive value in the diagnostics of coronary artery stenosis, acute pulmonary embolism, and AAD [8]. However, being tailored towards those three pathologies, they do not include non-enhanced scans [6–8] in order to speed up the diagnostic process and to limit the radiation dose, which is essential for IMH demonstration.

Conclusions

In our opinion, omitting non-enhanced CT examinations in patients admitted for chest CTA due to acute chest pain will possibly lead to misdiagnoses in a significant number of non-typical IMH cases. The presented cases suggest that any delay in proper diagnosis and treatment may result in further serious complications, including fatal aortic rupture.

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