Emerg Radiol (2011) 18:271–274
DOI 10.1007/s10140-010-0925-4

CASE REPORT

Myocardial infarction after blunt chest trauma: usefulness of cardiac ECG-gated CT and MRI for positive and aetiologic diagnosis

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Received: 29 September 2010 / Accepted: 24 November 2010 / Published online: 14 January 2011

Abstract Myocardial infarction after blunt chest trauma has been reported in only few cases, and mechanisms of this complication have rarely been described. We report two cases of coronary artery lesions, one parietal hematoma of right coronary artery and one dissection of the left main coronary artery, which resulted in acute myocardial infarction following a blunt chest trauma. In these two cases, cardiac CT and MRI were useful to noninvasively explore these lesions.

Keywords Myocardial infarction · Blunt chest trauma · Gated CT scan · Cardiac MRI

Introduction

Myocardial infarction is a very uncommon complication following blunt chest trauma, and is probably underdiagnosed among the other causes of posttraumatic chest pain. The early recognition of this complication is the mainstay of an appropriate patient management. CT enables a comprehensive assessment of thoracic lesions [1]; however, when symptoms and electrocardiographic findings are compatible with acute myocardial infarction, the use of ECG-gated CT acquisitions may be useful, even completed by a cardiac MR examination.

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We report two cases of young men who experienced acute myocardial infarction following blunt chest trauma, which was confirmed by ECG-gated CT and cardiac MR imaging.

Case report 1

A 38-year-old man was admitted in the emergency suite after a car crash accident. He presented a complex shoulder fracture, and chest pain, attributed to rib lesions. The troponine raised to 34 ng/ml 6 h after admission. ECG was considered as normal. CT was performed in order to rule out aortic or coronary traumatic involvement.

ECG-gated CT showed a severe proximal stenosis of right coronary artery, due to a parietal hematoma. The left coronary artery was normal, without any atherosclerotic lesion (Fig. 1a).

Cardiac MRI showed inferior wall edema on T2-weighted images, (Fig. 1b) and myocardial infarction on late enhancement images in the right coronary artery area, involving about 25% to 50% of myocardial thickness (Fig. 1c). The firstpass perfusion sequence showed delayed subendocardial enhancement in the same area (Fig. 1d), whereas 3D steady state free precession (SSFP) coronary MRA showed a hypersignal around the ostium of right coronary artery, due to the hematoma (Fig. 1e).

A medical treatment was instituted and the patient was discharged from the hospital 10 days later.

Case report 2

A 38-year-old man was admitted after a motorcycle crash accident. Three days after his admission, he still experienced

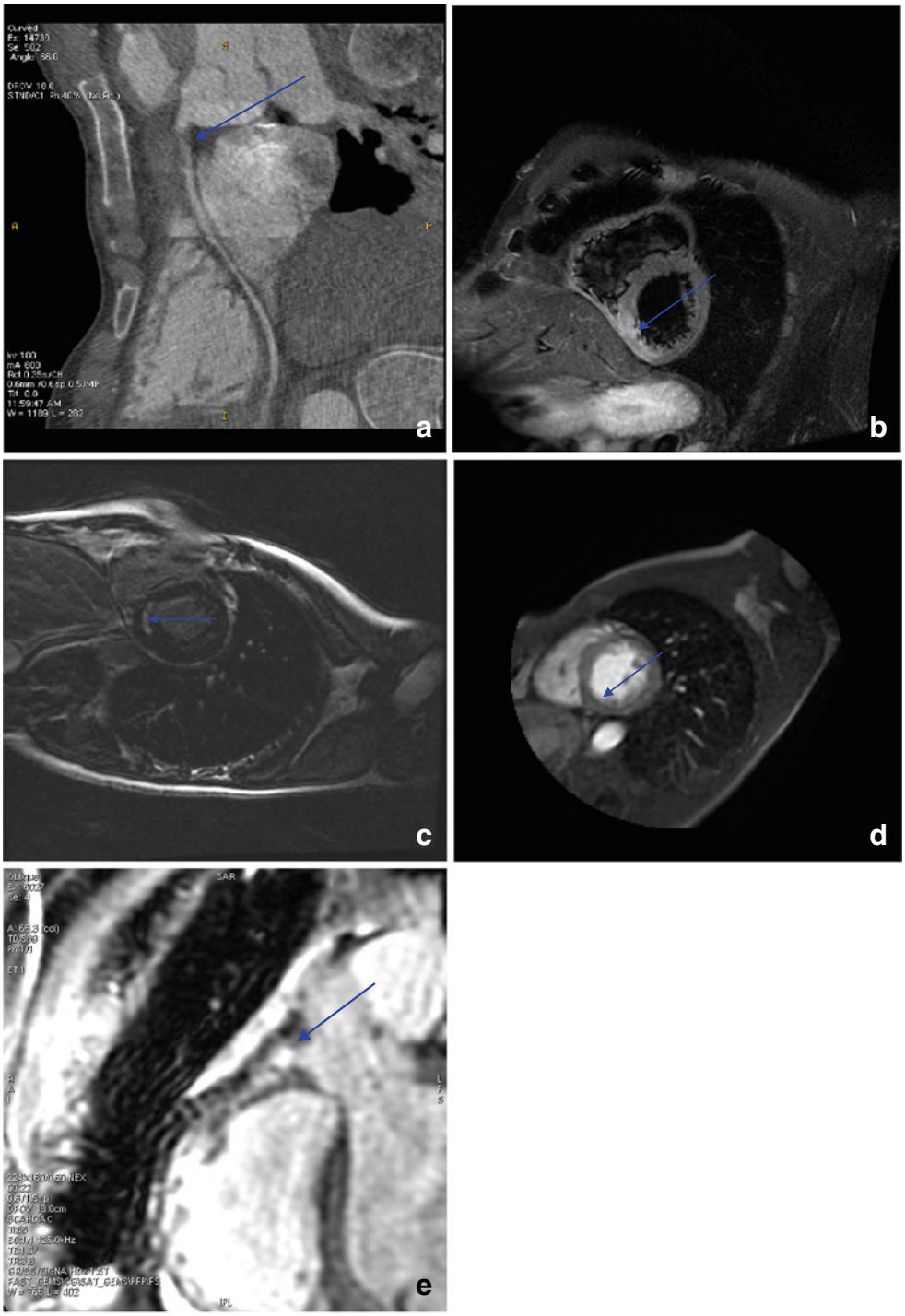

Fig. 1 **a**. MIP reformation from ECG-gated CT acquisition, showing the presence of an hematoma of the right coronary artery ostium (*arrow*). **b**. Cardiac T2-weighted MRI shows inferior wall edema at the site myocardial infarction (*arrow*). **c**. Cardiac MR late enhancement sequence shows myocardial infarction in the right coronary artery area, involving about 25% to 50% of myocardial thickness (*arrow*). **d**. Firstpass perfusion MR sequence shows a subendocardial enhancement defect in the same area (*arrow*). **e**. 3D SSFP coronary MRA shows a hypersignal around the ostium of right coronary artery, due to hematoma (*arrow*)

chest pain. On biological exam, troponine was increased to 250 ng/ml. Transthoracic echocardiography (TTE) displayed anterior wall hypokinesia. ECG-gated CT was performed to noninvasively evaluate coronary arteries, since the patient had no cardiovascular risk factors. CT examination showed a loss of parallelism of the proximal LAD wall (Fig. 2a). On multiplanar (MPR) reconstructions, a flap inside the proximal segment of left main artery was present (Fig. 2b); additional signs included thinning of the anterior LV wall.

Discussion

These two observations highlight the usefulness of ECG-gated CT in patients with chest pain following blunt chest trauma. This underlines the role of this technique after traumatic injury, as well as in the classical medical recognized indications in chest pain [2]. MR imaging is a useful complementary approach to precise the mechanism of the lesions.

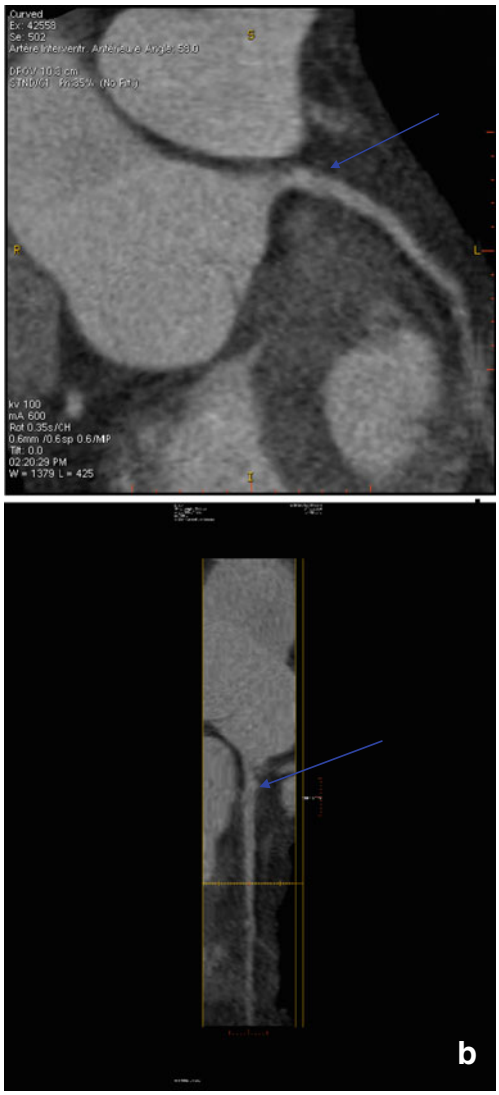

Fig. 2 **a** ECG-gated CT shows a loss of parallelism of the proximal LAD wall (*arrow*). **b**. On MPR reformation image, a flap inside the proximal segment of left main artery is shown (*arrow*)

Nearly one half of blunt chest traumas result in troponine elevation, according to Mori [3]. In this study, only patients with levels above 1 ng/ml had impaired kinetics on TTE.

The diagnosis of post traumatic infarction is difficult because of multiple aetiologies and difficulties to specify the lesions. Myocardial contusion is overdiagnosed. Moreover, car crash most often affects men with cardiac risk factors. Chest pain, associated with the initial trauma in the context of polytraumatism, is often secondarily treated. There could be a problem of timing: did myocardial infarction occur before or after trauma? Other differential diagnoses must also been taken into account, such as aortic dissection or hemopneumothorax.

The proportion of coronary lesions has been reported in a previous autopsy study [4]: Parmley reported that over 546 autopsies in patients with cardiac trauma, there were only nine cases of rupture and only one case of coronary dissection, none had signs of atherosclerotic coronary obstruction.

Coronary artery dissection seems to be a rare cause, found in about 15.8% of heart attacks following a blunt chest trauma, according to Christensen [5].

Dissection mainly affects the left anterior descending artery (LAD), due to its most anterior position behind the thoracic cage, but also less frequently can affect the right coronary artery [6, 7].

ECG seems to be the most non-invasive examination, showing signs of cardiac involvement in nearly 63% of patients with blunt chest trauma, but in only 2% with signs of ongoing myocardial infarction [8]. The assays can be of some help but cannot differentiate the truely coronary obstruction from myocardial infarction secondary to contusions.

TTE and transesophageal echocardiography (TEE) were found to be feasible and acceptable in some studies but suffered from a relatively low sensitivity and specificity for the diagnosis between MI and contusion [9]. The role of these examinations such as ECG, TTE, or TEE is especially helpful to select patients for relatively invasive coronary angiography.

A few cases (less than ten) reported the use of MRI or CT in this situation [10–13].

The CT findings of coronary artery dissection have been reported in the literature but without the reported visualization of intra-coronary flap, to our knowledge [14].

Even if late MR enhancement in the literature has been reported, this sequence can make the distinction between myocardial infarction and contusion; moreover, coronary wall hematoma can also been displayed with this technique.

Conclusion

Diagnosis of post traumatic myocardial infarction is difficult. The cause of coronary lesions is usually unknown. Further studies and routine use of these techniques could determine their place in this situation.

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