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Emergency coronary angiography with gadolinium in a patient with thyrotoxicosis, pulmonary embolism and persistent right atrial thrombi

Sirs: Coronary angiography using iodinated contrast media (CM) is one of the most frequent medical procedures. However, the application of iodinated CM is limited in patients with significant renal impairment, thyroid disease and previous allergic reactions. For these conditions, the use of gadolinium-based MRI CM has been suggested during recent years [1]. In the field of X-ray examinations, the major drawback of the commercially available gadolinium-containing CM is the lower attenuation of X-rays and consequently poorer imaging quality compared to iodinated CM.

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While gadolinium-based CM were studied in different case series of peripheral angiographies [2, 3], data regarding the use of gadolinium-based CM for coronary angiography or interventions are rare. In the present case, we report about the use of these CM for pre-operative coronary angiography in the emergency situation of a floating right atrial tumor, pulmonary hypertension and thyrotoxicosis.

Case report

A 64-year old woman was admitted to the hospital because of progressive right heart failure. The patient complained of coughing and shortness of breath for three months. There was no history of any cardiac disease or deep vein thrombosis. Arterial hypertension was known for four years. Physical examination showed slight peripheral edema and arrhythmia. The ECG documented atrial fibrillation.

The major echocardiography findings were biatrial dilatation, moderate regurgitation of the tricuspid and mitral valves, normal left ventricular function and pulmonary hypertension. Calculated right ventricular pressure was approximately 45 mmHg. Furthermore, a floating tumor in the right atrium was found. This finding was confirmed by transesophageal echocardiography describing a mobile mass with a total length of 6 cm attached to the lateral wall of the right atrium (Fig. 1). Abnormal laboratory findings were slightly increased γ-globulin and leucocyte counts, suppressed thyroid-stimulating hormone, as well as elevated triiodothyronine and L-thyroxine. TSH receptor antibodies were not detectable. Thoracic computer tomography without contrast injection found no abnormalities beside an enlarged and cystic thyroid gland. Sonography of the lower limbs showed no signs of previous venous thrombosis.

Fig. 1 Transesophageal echocardiographic finding of multiple right atrial tumors (marked by arrows)

Urgent thrombectomy was recommended to the patient for prevention of further pulmonary embolization. Antithyroid therapy was initiated using thiamazole. Gadolinium-based contrast medium (Gadovist®, Schering GmbH, Berlin, Germany) was used for the pre-operative coronary angiography to avoid further worsening of thyroid function by iodine-containing CM. The imaging quality of the coronary angiography was good (Fig. 2). Coronary artery disease could be excluded. We performed no ventriculography because of echocardiographic normal left ventricular function. We used undiluted gadolinium (0.41 mmol/kg body weight) to perform the coronary angiography, and we observed no change of renal function (creatinine level before angiography 59 mmol/ml; one day after investigation 70 mmol/ml; after three days 57 mmol/ml).

Thereafter, surgical thrombectomy was performed. Four mobile tumors were removed from the right atrium (Fig. 3). Histological examination described encapsulated older thrombi with cystic structures being partially calcified. They were fixed with the wall of the right atrium. The postoperative course was uncomplicated and the patient reported having less dyspnea. Euthyroidism was induced by means of anti-thyroid drugs and before discharge, right ventricular pressure was 30–35 mmHg in the echocardiography.

Discussion

In the present case, we report about two unusual clinical findings. First, this case was highlighted by the occurrence of encapsulated persistent thrombi in the right atrium. The incidence of right heart thrombi in pulmonary embolism was approximately 5% in two recent studies [4, 5]. Torbicki et al. found right heart thrombi in 3.9% of the patients in the International Cooperative Pulmonary Embolism Registry [4]. Overall, patients with this finding were characterized by higher mortality, lower hemodynamic stability, higher frequency of right heart hypokinesis and repeated pulmonary embolism compared to the other patients with pulmonary embolism. A large study including 23791 autopsies of the Malmö city population reported right heart thrombosis in 6.5% [5]. Right heart thrombi were the only detectable source for emboli in 4%. Normally, these right heart thromboemboli represent embolized deep venous thromboses which are only temporarily lodged in the right atrium or ventricle ("emboli in transit") [6]. In our case, however, these thromboemboli persisted more than three months after the first clinical event.

Generally, free floating right heart thrombi are an emergency condition. Chartier et al. found an in-hospital mortality in 45% of 38 patients with this finding [7]. They recommended urgent surgery or thrombolysis. In our case, an embolizing right atrial myxoma or any other kind of tumor was also possible. Therefore, urgent surgical embolectomy was mandatory. Embolectomy was carried out by means of cardiopulmonary bypass and median sternotomy in this case with unknown malignancy of the tumor and possible infiltration of the atrial wall. In patients with known right atrial thrombi, the risk of surgery can be minimized by antero-lateral mini-thoracotomy without cardiopulmonary bypass [8].

Unexpected thyrotoxicosis was the second challenging problem of this case. Pre-operative coronarography was necessary because of the age and the ath-

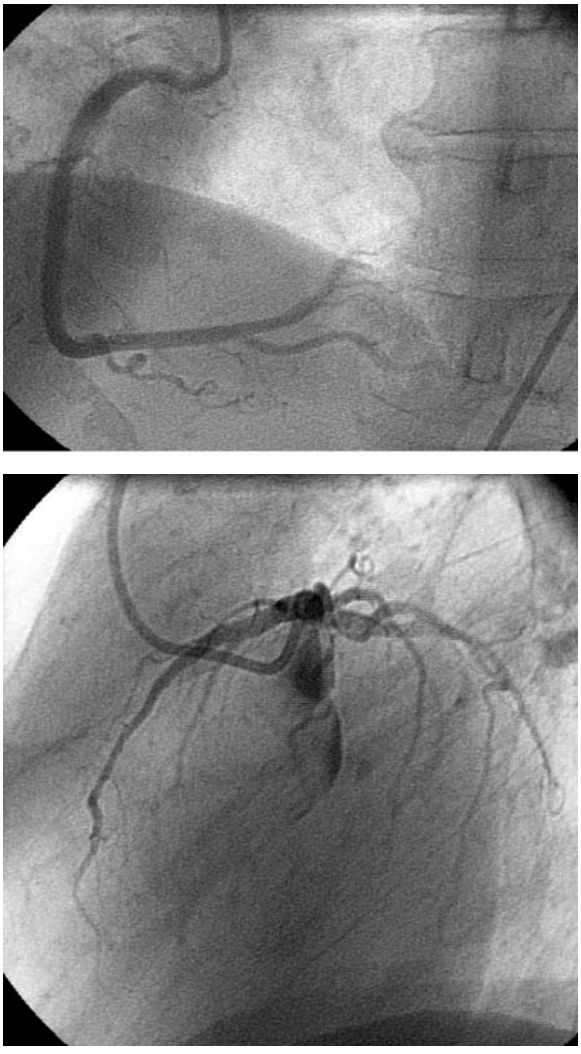

Fig. 2 Gadolinium-based coronary angiography (**a** 30° LAO view of the right coronary artery; **b** 90° LAO view of the left coronary artery)

Fig. 3 Encapsulated right atrial thrombi (**a** in situ; **b** after thrombectomy)

erosclerotic risk factors. The thyrotoxicosis prohibited the use of iodinated contrast agents. Therefore, we performed the coronary angiography with gadolinium, which is established for magnetic resonance coronary angiography [9]. The first report of a gadolinium-based invasive coronary angiography was published in 2001 [10]. In 2003, the first coronary intervention with this CM was described [11]. In these cases, the indications for gadolinium-based coronarography were renal failure and severe allergy against iodinated CM. To the best of our knowledge, gadolinium-based coronarography was never been reported in a patient with thyrotoxicosis. However, Zeller et al. demonstrated in a series of four patients with thyrotoxicosis that thyroid function (i.e. basal thyroid-stimulating hormone, triiodothyronine, L-thyroxine) remained unchanged after peripheral or renal angiography with gadodiamide [3]. Furthermore, they investigated 12 patients with renal failure and observed no deterioration of renal function after the use of gadodiamide. The general limitation of gadolinium-based coronarography is the lower radioopacification in non-nephrotoxic doses compared to iodinated contrast media [12]. However, different reports assessed the angiographic visibility as sufficient even in patients with impaired renal function without further renal deterioration after coronary angiography [10, 11]. Furthermore, gadolinium-based contrast media are generally well tolerated with a low adverse reaction-rate of 2–3% [13, 14]. Thus, gadolinium-based contrast media could be an alternative option in patients with thyrotoxicosis requesting emergency coronarography.

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