CASE REPORT

Right atrial mass in a patient with breast cancer: percutaneous transcatheter biopsy under intracardiac echocardiography guidance

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SUMMARY

Precise diagnosis of intracardiac masses is fundamental to their treatment. However, the findings of non-invasive imaging techniques are frequently inconclusive. In this setting, percutaneous transcatheter biopsy might represent a valid alternative to surgical biopsy. Intracardiac echocardiography (ICE)-guided biopsy offers high-quality imaging, is a relatively quick and easy interventional procedure to perform and does not require patient intubation or the assistance of an echocardiographer. We describe the case of a 47-year-old woman undergoing chemotherapy for breast cancer, who presented with a right atrial mass. Non-invasive imaging was inconclusive. Since no changes in the aspect or size of the mass were noticed after 2-week treatment with heparin, ICE-guided biopsy was performed, which confirmed the thrombotic nature of the mass. The patient underwent surgical resection of the thrombus and curative treatment of her breast cancer was pursued.

BACKGROUND

Definitive diagnosis of intracardiac masses have traditionally been performed after surgical excision or at autopsy. The introduction of advanced imaging techniques (cardiac magnetic resonance (MR) and computed tomography (CT)) represents progress in the field, since they allow precise tissue characterisation in a non-invasive fashion.¹ However, in some cases, a definitive diagnosis cannot be made on imaging grounds alone (eg, in case of image artefacts due to intracardiac foreign objects, or in case of contraindications to cardiac MR and CT), and pathology specimen analysis is needed. Surgical biopsy and resection of the mass remains the standard of care. In some cases, transthoracic cardiac biopsy had been performed.^{2 3} However, these techniques are associated with significant risk of damaging cardiac and non-cardiac structures. An alternative approach consists of echocardiography-guided percutaneous transcatheter biopsy. In particular, intracardiac echocardiography (ICE) is a reasonable alternative to transoesophageal echocardiography (TOE), as it offers excellent imaging quality of intracardiac structures, and is a relatively quick and easy interventional procedure.

CASE PRESENTATION

A 47-year-old woman undergoing neoadjuvant chemotherapy for ductal invasive carcinoma breast cancer (T2N1Mx) presented with a right atrial

mass discovered on routine transthoracic echocardiography. Further testing with TOE ([figure 1A, B](#)) confirmed the presence of a heterogeneous mass, measuring approximately 23×12 mm, firmly attached to the posterior wall of the right atrium and in proximity to (but not in contact with) a chronically indwelling central venous catheter (Port-a-Cath, Smiths Medical, St Paul, Minnesota, USA) implanted 5 months prior to the discovery of the mass, when neoadjuvant chemotherapy had been started.

INVESTIGATIONS

Lower and upper limb ultrasound ruled out thrombi at these locations. There were neither symptoms nor signs of infective endocarditis, and blood cultures were negative. A CT scan of the chest, abdomen and pelvis excluded the presence of metastatic disease in other organs and pulmonary embolism. However, CT imaging could not provide a definitive diagnosis of the tissue characteristics of the mass, partly due to artefacts owing to the presence of the Port-a-Cath in close proximity to the mass ([figure 1C](#)). A 2-week treatment course with intravenous heparin was started. Neither the size nor aspect of the mass demonstrated changes on follow-up TOE. Chemotherapy was suspended, given the suspicion of metastatic heart disease at that point. A definitive diagnosis was required to determine the best treatment strategy for the patient (curative vs palliative). Therefore, percutaneous transvenous biopsy of the lesion was performed.

DIFFERENTIAL DIAGNOSIS

Differential diagnosis included cardiac metastasis, primary cardiac tumour, infective endocarditis and thrombus.

TREATMENT

In order to adopt a minimally invasive approach, ICE was preferred to traditional TOE guidance. Bilateral femoral vein access was secured with a 9-French sheath to perform the biopsy and a 10-French sheath for ICE (ViewFlex Xtra, St Jude Medical, Minneapolis, Minnesota, USA). A 9-French Judkins Right 4 guiding catheter was advanced into the right atrium, and a biptome was inserted through the guiding catheter to take four samples of the mass ([figure 1D, E](#), [video 1](#)) under ICE guidance. No contrast was used. Procedure time was 38 min. Radiation dose was

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Figure 1 Transoesophageal echocardiography (A and B) and CT (C) show a heterogeneous and hypodense mass (asterisk, 23×12 mm) attached to the right atrial wall, in proximity to a Port-a-Cath system (arrow). Catheterisation was performed through the left and right femoral veins. A Judkins Right 4 (JR 4) guiding catheter and an intracardiac echocardiography (ICE) probe were advanced into the right atrium (D and E). Under ICE guidance (D), a biopptome (arrowhead) was advanced through the Judkins catheter and four samples of the mass (asterisk) were taken. (F) Histology revealed that the mass consisted of fibrinoid material, scant inflammatory cells and small calcifications, a finding compatible with a degenerated thrombus. (G) Aspect of the mass after surgical resection.

2927 cGy cm², and fluoroscopy time was 14.4 min. Histology revealed that the mass consisted of fibrinoid material, scant inflammatory cells and small calcifications, findings compatible with an old degenerated thrombus (figure 1F), which was surgically resected (figure 1G).

OUTCOME AND FOLLOW-UP

Given the absence of metastatic disease, the decision was made to pursue curative treatment and the patient was scheduled for curative breast surgery.

DISCUSSION

Intracardiac thrombi related to indwelling central venous catheters are a frequent finding. Gilon *et al*⁴ reported an incidence of 12.5% of early thrombus formation after placement of a central venous catheter, which was highly associated with the catheter tip position within the right atrium as compared with their positioning in the superior vena cava. Such risk might also be increased in patients with a procoagulant state due to active oncological disease. However, differential diagnosis of an intracardiac mass in such patients might be challenging. In this case, intracardiac thrombus related to central venous catheter was

immediately considered as highly probable, but the absence of regression of the mass despite antithrombotic therapy made us reconsider other possible diagnoses. Cardiac metastases are 100 times more frequent than primary cardiac tumours.⁵ The majority of primary cardiac tumours are benign intracavitary masses, as opposed to secondary tumours, which are usually small and multiple, causing diffuse infiltration of the pericardium, myocardium or endocardium.⁶ The most frequent malignancies associated with secondary cardiac tumours (including metastasis and local extension) are pleural mesothelioma, melanoma, and lung and breast carcinoma.⁷

As clinical presentation of patients with cardiac masses tends to be similar (eg, symptoms related to embolisation, obstruction or incidental finding), histological confirmation is required in most cases.⁸ In such cases, percutaneous biopsy might represent a valid alternative to surgical biopsy. In this setting, TOE-guided biopsy has been reported to be safe and effective.^{9 10} However, this technique requires the presence of a dedicated operator; it is sometimes not well tolerated by the patient; and, although infrequently, it is potentially associated with specific and serious complications (in particular, oesophageal perforation and anaesthesia-related complications). For these reasons, alternative approaches have been sought.

ICE offers high-quality real-time imaging of intracardiac structures. It does not require patient intubation nor does it need the assistance of an echocardiographer, since it is performed by the interventional cardiologist. ICE has been traditionally used to guide trans-septal puncture and structural heart disease interventions (eg, atrial septal defect and patent foramen ovale closure, and pulmonic valve interventions),^{11 12} and anecdotally to guide endomyocardial biopsies of cardiac tumours.¹³ Compared with TOE guidance, ICE offers similar image quality and yields comparable measurements of relevant anatomy. However, TOE is superior to ICE for the visualisation of left-sided structures (mitral valve, left atrial appendage and aortic valve). In one study, ICE was less sensitive than TOE for the detection of left atrial appendage thrombi.¹⁴ Additionally, unlike TOE, ICE is solely capable of single-plane imaging.

Video 1 Intracardiac echocardiography-guided right atrial mass biopsy.

Despite these limitations, ICE guidance is feasible in a large variety of percutaneous cardiac procedures, especially right-sided interventions, as in the case described here. It might represent a valid alternative to TOE when a minimally invasive approach is preferable (eg, due to comorbidities), or when TOE is not feasible (eg, lack of an echocardiographer and/or anaesthesiologist) or contraindicated (eg, risk of oesophageal perforation).

In conclusion, despite advances in non-invasive cardiac imaging techniques, definite diagnosis of intracardiac masses usually requires histological confirmation. In this regard, percutaneous transcatheter ICE-guided biopsy of right-sided intracardiac masses is feasible and safe to perform. In the case presented here, ICE-guided transcatheter biopsy allowed precise diagnosis of the nature of the right atrial mass, which in turn led to a

change in clinical management: the patient restarted chemotherapy and was scheduled for curative surgical treatment of her cancer.

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Competing interests None declared.

Patient consent Obtained.

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Learning points

- Differential diagnosis of intracardiac masses in patients with active oncological disease is challenging, as it includes primary and secondary cardiac tumours, infective endocarditis and thrombus.
- Intracardiac thrombi associated with central venous catheters are frequently observed, especially when the tip of the catheter is located within the right atrium.
- Secondary cardiac tumours (including metastases and local extension) are much more frequent than primary cardiac tumours.
- Despite advances in non-invasive cardiac imaging techniques, definite diagnosis of intracardiac masses usually requires histological confirmation.
- Percutaneous transcatheter transvenous ICE-guided biopsy of intracardiac masses represents a reasonable mini-invasive alternative to surgical biopsy.

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