Original Article

Mesothelial/monocytic incidental cardiac excrescences (cardiac MICE) associated with acute aortic dissection: a study of two cases

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Abstract: Acute aortic dissection is a life-threatening condition mainly caused by hypertension, atherosclerotic disease and other degenerative diseases of the connective tissue of the aortic wall. Mesothelial/monocytic incidental cardiac excrescences (cardiac MICE) is a rare benign reactive tumor-like lesion composed of admixture of histiocytes, mesothelial cells, and inflammatory cells set within a fibrinous meshwork without a vascular network or supporting stroma. Cardiac MICE occurring in association with aortic dissection is exceptionally rare (only one such case reported to date). We herein report on the surgical repair of two Stanford type A aortic dissections caused by idiopathic giant cell aortitis in a 66-year-old-woman and by atherosclerotic disease in a 58-year-old-man, respectively. In both cases, the dissections could be visualized via computed tomography. Histopathology showed cardiac incidental MICE within the external aortic wall near the pericardial surface which was confirmed by immunohistochemistry.

Keywords: Mesothelial/monocytic incidental cardiac excrescences, MICE, aortitis, aortic dissection, cardiac surgery

Introduction

Mesothelial/monocytic incidental cardiac excrescences (cardiac MICE) is a rare benign probable reactive tumor-like cardiac lesion composed of admixture of mesothelial and monocytic (histiocytic) cells with variable numbers of other inflammatory cells embedded within a fibrinous meshwork, which can lead to pathological misdiagnosis. To date, about 50 cases have been reported in the literature [1, 2]. The most frequent locations are the cardiac chambers, on the cardiac valves, especially the aortic and mitral valve, or free floating in the pericardium [3, 4]. Therefore, the common associated clinical features were aortic or mitral valve failure, often requiring aortic or mitral valve replacement [5, 6]. Furthermore, there are few cases in the literature where cardiac MICE occurred in association with tuberculous aortitis [7], and antiphospholipid syndrome [8]. To our knowledge, this is the second report of cardiac MICE associated with an acute aortic dissection.

To date, the exact etiology of cardiac MICE remains unclear. Two hypotheses have been proposed, the so-called “reactive” theory and the so-called “artifact” theory [9, 10]. The reactive theory stated mechanical irritation, inflammation, or neoplasm as possible triggers for the formation of the lesion. This was supported by many studies reporting a history of prior catheterization in the majority of patients [11]. The artifact theory postulated that MICE are artifactual [12], formed by the manipulation (compaction), where tissue fragments are collected in suction catheter tips and transferred to the intravascular space during open-heart surgery [9, 10]. Regardless of their exact pathogenesis, cardiac MICE are of potential clinical interest because they may be misdiagnosed as neoplasms or metastatic adenocarcinoma or be associated with severe clinical presentation as acute aortic dissection. In this paper, we report on the second cases of cardiac MICE contained within the resection specimen of acute dissection of the ascending aorta.
Case presentations

Case 1: A 66-year old Caucasian woman with a history of recurrent fever since 5 weeks, abnormal exhaustion, fatigue and weight loss was referred to the rheumatological and hematological department of our hospital for further diagnostic evaluation. She noted progressive episodes of gnawing pain in her left leg, neck and both shoulders. The patient's history included hypothyroidism, gastritis, reflux oesophagitis and borreliosis two years ago.

At admission to the hospital, laboratory examination revealed mildly increased inflammation parameters and blood serum levels. The electrocardiogram (ECG) showed normal frequent sinus rhythm without any ST-increases or decreases. Transthoracic (TTE) and transesophageal (TEE) echocardiography showed normal right and left ventricular function, well-functioning heart valves without any vegetation, no paravalvular leakage and no pericardial effusion. On the next day, the patient developed neurological symptoms with left-sided hemiplegia, whereupon a computed tomography (CT) was performed. The CT scan revealed a large aortic dissection, starting above the aortic cusps within a large aneurysmatic ascending aorta over the aortic arch up to descending thoracic aorta (Figure 1A and 1B).

The patient was taken to the operating theater urgently, where a median sternotomy was performed and cardiopulmonary bypass was installed through brachiocephalic trunk–right atrium cannulation. Intraoperatively, there were approximately 500 ml of hemopericardium, and the ascending aorta appeared dilated and partially hemorrhagic. The longitudinal aortotomy demonstrated that the semi-circular dissection started just in the dehiscent aortic annulus. Therefore, the aortic valve was insufficient and couldn't repair. Afterward, the aortic valve as well as the ascending aorta were excised and replaced by a 25 mm aortic valve and
Dacron aortic prosthesis replacing the ascending aorta. Subsequently, the patient was weaned from cardiopulmonary bypass without any signs of cardiac failure. She was extubated on the operating day and transferred back to the regular care on postoperative day 4. Before leaving the hospital on day 13 after surgery, TTE showed normal left and right ventricular function with an ejection fraction of 60%, a well-functioning aortic valve prosthesis with normal gradients and no pericardial effusion.

Case 2: A 58-year-old Caucasian man with an acute stroke of unknown origin was referred to our hospital for further diagnostic evaluation. The CT depicted a giant circular aortic dissection. The intimal flap was floating through the complete ascending aorta, starting in the aortic cusps, via the aortic arch and the descending thoracic aorta up to the Arteria mesenterica superior. All three supraaortic vessels (truncus brachiocephalicus, carotid artery, subclavian artery) were involved in the dissection. The patient was taken to the operating room immediately, where almost the same procedure was performed like in case 1, but additionally the supraaortic vessels were re-implanted into the aortic arch. Intraoperatively, it was impossible to wean the patient from cardiopulmonary bypass. Therefore, the man was placed on veno-arterial extracorporeal membrane oxygenation (ECMO). Nevertheless, the patient’s cardiopulmonary status progressively deteriorated over the next hours. Postoperatively, all surgical and intensive care procedures failed. The patient passed away of multiple organ failure 26 hours post-operation.

Pathological findings

Histological examination of the resected tissue in case 1 revealed aortic dissection associated with prominent lymphoplasmacytic inflammation surrounding the dissection plane with extensive giant cell formation consistent with giant cell aortitis (Figure 2A, 2B). IgG4 immunostaining revealed no significantly increased IgG4-positive plasma cells. Within the subserosal aortic wall surrounding the dissection and the associated chronic inflammatory infiltrate, a 2 mm lesion was seen surrounded by a cleft-like space and containing a few lymphoid follicles superficially mimicking a lymph node (Figure 3A).

At higher magnification, the lesion was composed of histiocytoid (epithelioid) cells with distinctive cell borders and rounded to oval occasionally grooved central nuclei (Figure 3B). Scattered inflammatory cells and fibrinoid material were seen in the background but a prominent thrombus-like component was not seen. The lesional cells stained partially strongly positive with pancytokeratin (Figure 3C) and calretinin with the two markers also highlighting the cells lining the cleft-like space surrounding the lesion suggesting invaginated surface mesothelium. In addition, the vast majority of cells stained strongly for CD68 (Figure 3D).

Histological examination of case 2 showed atherosclerotic changes in the aortic wall with dissection of the media. In the subserosal fatty tissue a cellular blue nodule was seen (Figure 4A). At higher magnification this nodule showed

Figure 2. Histopathology of aorta (Case 1). A: Aortic dissection associated with prominent lymphoplasmacytic intramural inflammation surrounding the dissection plane. B: Prominent multinucleated Giant cells are seen at higher magnification.
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A similar histomorphology to case 1 (Figure 4B-D). In addition, the monocytic/histiocytic marker CD163 revealed strong positivity in almost all histiocytoid cells (similar to CD68 as depicted in Figure 3D).

Discussion

The first description of cardiac MICE was published by Rosai et al 1997 in a review of lesions in the spectrum of so-called histiocytoid hemangiomas [13]. Subsequently, Luthringer et al reported the first series of 14 cases including the original case from the Rosai’s previous paper and suggested a mesothelial origin of the lesion [11]. The currently widely used term “mesothelial/monocytic incidental cardiac excrescences (cardiac MICE)” was coined by Veinot et al in 1994 who collected four cases from the Mayo Clinic over a period of 13 years [14]. Cardiac MICE is a rare benign tumor-like lesion that is usually encountered as incidental histological finding. The importance of this lesion lies in the potential confusion with neoplasia, either primary or metastatic, or it may be misdiagnosed as a thrombus or other vascular lesions. The clinical manifestations and symptoms of MICE depend on its location either in the cardiac chambers, on the valves or the great thoracic vessels [15], and may include valvular dysfunction, especially the aortic and mitral valve [16], embolic events [17] or like in our presentation aortic dissection.

Since its first description, no more than 50 cases have been reported. Males and females appear to be equally affected with an age range of 5 to 80 years (mean age 61.5 years) [10], with most of the patients above 60 years of age [17].

Figure 3. Histopathology and immunohistochemistry of cardiac MICE (Case 1). A: A circumscribed nodular lesion is seen within sub-adventitial aortic wall. Note follicle-like lymphoid aggregates within the lesion and peripheral clefts surrounding the lesion. B: At higher magnification, histiocytoid (epithelioid) cells with distinctive cell borders and rounded to oval central nuclei are seen. Note papillary-like aggregates floating within clefts. C: Pancytokeratin highlighted a mesothelial-like flat layer lining the clefts around the lesion as well as several lesional cells. D: The majority of cells stained strongly for CD68.
Although the exact pathogenesis of cardiac MICE is still unclear, these lesions have been interpreted as reactive or even artificial [12, 18]. However, neither the “reactive” nor the “artificial” theory could explain the occurrence of cardiac MICE in patients without a history of prior cardiac catheterization or any surgical or invasive manipulation [3, 19].

Transesophageal echocardiography and computed tomography are the standard diagnostic tools to clarify acute diseases of the ascending aorta. In patients with an inflammatory aneurysm without dissection, both methods are often unsuitable to lead to the correct diagnosis. In such cases uncharacteristic symptoms such as recidivated fever, progressive dyspnea, fatigue and dizziness are present. The healthy aortic wall does not contain any inflammatory cells, thus the presence of inflammatory cells in the aortic wall is indicative of aortitis [20]. In the present case report, the inflammation was characterized by disruption of the media and bleeding into the adjacent layers of the aortic wall and the pericardium.

Histopathologically, cardiac MICE is composed of aggregates of mesothelial cells forming tubules, micropapillary structures and cords, admixed with monocytes/histiocytes, other inflammatory cells, sparse adipocytes, and fibrin meshwork without a vascular network or supporting stroma [19]. Cardiac MICE likely forms a spectrum with the nodular histiocytic/mesothelial hyperplasia (NHMH), a lesion that is very similar to cardiac MICE, that can occur in the pericardium, pleura, peritoneum and pelvis [21-23].
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Awareness of this lesion by clinicians and pathologists will help to avoid misdiagnosis and will obviate unnecessary invasive procedures [1, 10]. Particular notice has been emphasized due to its confusion with metastatic adenocarcinoma, because both lesions are frequently positive for cytokeratin [3].

In conclusion, we report two rare cases of cardiac MICE associated with acute aortic dissection. The importance of his lesion comes from the potential of misinterpreting them as metastatic carcinomas or other neoplasms.

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Disclosure of conflict of interest

None.

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