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Case Report

Calcification of tricuspid valve chordae tendineae on echocardiography and computed tomography

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ABSTRACT

We present the appearance of chordae tendineae calcification on transthoracic echocardiography and ECG-gated cardiac computed tomography in a 75 year-old woman. While the etiology is unclear, the abnormality can be clearly delineated on a properly performed CT study. We also discuss modification of the cardiac CT protocol to optimize visualization of the tricuspid valve apparatus.

Introduction

Calcification of the tricuspid valve and its associated apparatus is extremely rare. To the best of our knowledge the imaging appearance of chordae tendineae calcification of the tricuspid valve has not been previously reported. We present a case in which transthoracic echocardiography demonstrated an echogenic focus along the tricuspid valve apparatus in a 75-year-old woman. Further evaluation using an ECG-gated cardiac CT protocol optimized for evaluation of the tricuspid valve revealed calcification of the tricuspid valve chordae tendineae.

Case report

A 75-year-old woman with a prior history of a left hip joint replacement presented to our institution after a fall with a left periprosthetic femur fracture. Prior to left hip revision hemiarthroplasty, a preoperative cardiac evaluation with transthoracic echocardiogram was performed which detected a linear echogenic focus on the ventricular side of the tricuspid valve apparatus (Fig. 1). The tricuspid valve leaflets were mildly thickened without evidence of tricuspid valve stenosis. There was mild TV regurgitation with a velocity of 2.89 m/s (normal <2.90 m/s), with an assumed right atrial pressure of 3

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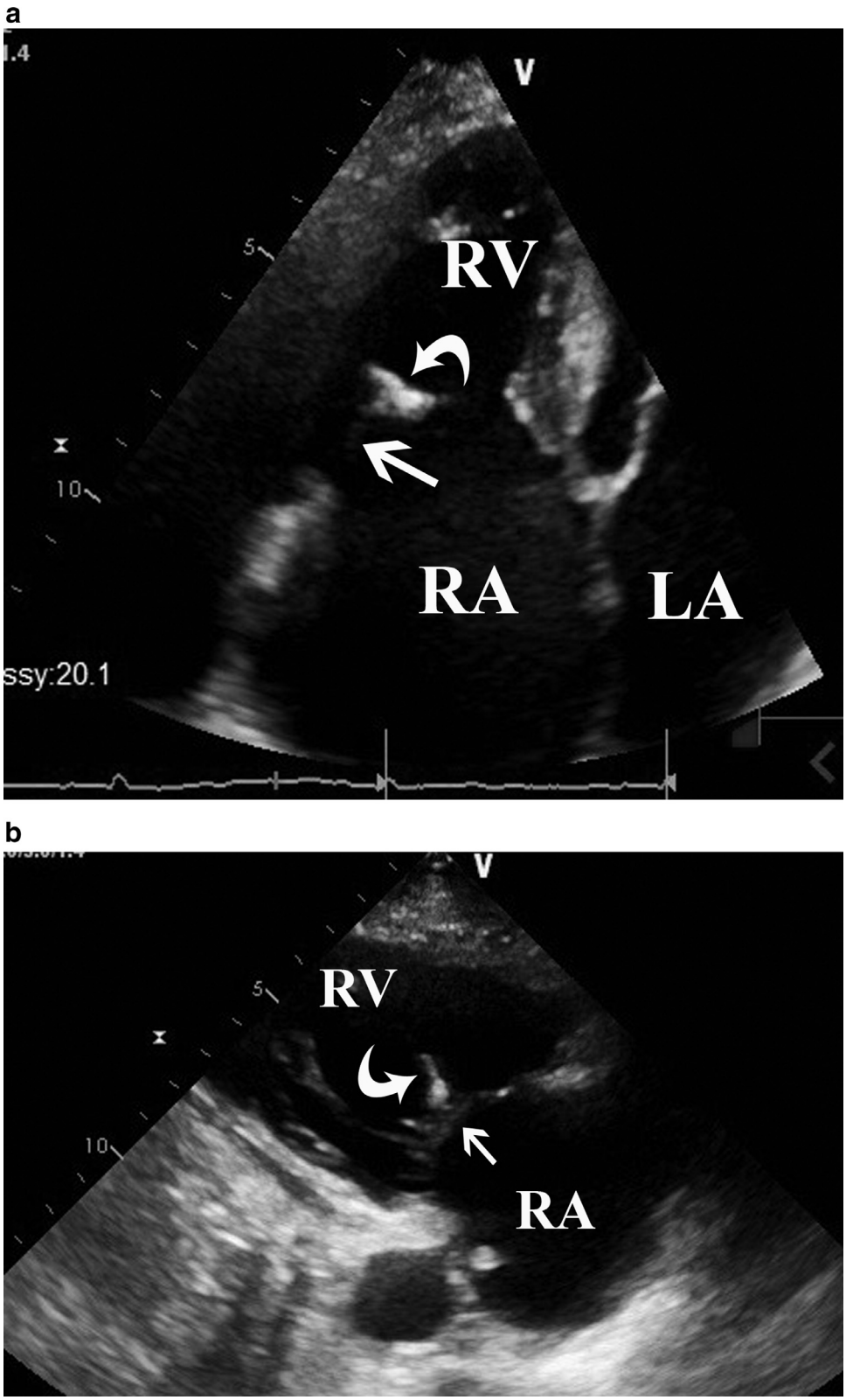

Fig. 1 – Images from transthoracic echocardiography in a 75-year-old woman with calcification of tricuspid valve chordae tendinea. 4-chamber view (a) and 2-chamber view (b) show an echogenic focus (curved arrow) attached to the ventricular side of the tricuspid valve (straight arrow). RA = right atrium; RV = right ventricle; LA = left atrium.

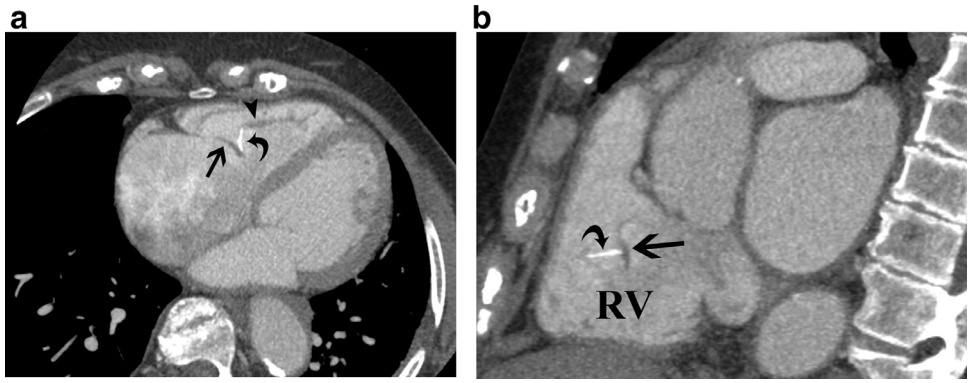

Fig. 2 – Reformatted images from ECG-gated cardiac CT scan in 4-chamber view (a) and short-axis view (b) show calcification of a chordal attachment (curved arrow) to the anterior leaflet of the tricuspid valve (straight arrow). Arrowhead = anterior papillary muscle. RV = right ventricle.

mmHg and estimated pulmonary artery systolic pressure of 36 mmHg. The right atrium and right ventricle were normal in size. Moderate mitral and aortic valve sclerosis was present without significant stenosis or regurgitation. There were no regional wall motion abnormalities and the ejection fraction was normal (66%).

At this point, differential diagnosis included a tumor of the tricuspid valve and endocarditis (although there were no clinical signs or symptoms of endocarditis in this patient). As it was deemed necessary to exclude endocarditis prior to hip surgery, further evaluation of the abnormality was required. Transesophageal ultrasound was considered but the patient was not considered a suitable candidate due to a history of cancer of the glottis treated with radiation therapy 8 years prior to the current presentation. Therefore, a retrospective ECG-gated cardiac CT scan was performed on a 64-slice multidetector scanner using a contrast administration protocol optimized for visualization of the tricuspid valve (see discussion for description of protocol). The cardiac CT scan clearly delineated the abnormality as calcification of a single chordal attachment to the anterior leaflet of the tricuspid valve (Fig. 2). There was no evidence of vegetation or neoplasm. No other significant abnormalities were identified on the cardiac CT study. As the finding of tricuspid valve chordal calcification in this patient was incidental, no specific modifications were made to her management regimen. The patient was eventually discharged to a rehabilitation facility after recovery from her hip surgery.

Discussion

In contrast to the mitral valve, calcification involving the tricuspid valve is rare. Isolated cases of tricuspid valve calcification have been reported associated with rheumatic heart disease, bacterial endocarditis, ventricular septal defect, and congenital malformations of the tricuspid valve [1,2]. However, to our knowledge, there are no prior reports of the appearance of calcification of tricuspid valve chordae tendineae on echocardiography or CT.

Previous reports of chordae calcification have been limited to the mitral valve, often with associated papillary muscle calcification in connection to a diverse array of pathologic situations, including endocarditis, rheumatic and ischemic heart disease, and mitral valve prolapse. In a study of 17 patients with calcification of mitral valve chordae and papillary muscles, 1 patient had rheumatic heart disease and 3 had history of prior myocardial infarction but in the remaining 14 cases the cause of calcification remained idiopathic [3]. In the case we describe there was no evidence of rheumatic heart disease or endocarditis. The patient also did not have hypercalcemia or renal failure, conditions which can result in calcifications in unusual locations. Hence the etiology of the chordae calcification in our case also remains elusive.

While echocardiography remains the first line imaging modality for assessment of cardiac valves, ECG-gated CT angiography is a valuable complementary modality for detailed anatomic evaluation of valvular pathology [4]. Although the mitral valve can be readily evaluated using routine CT angiography protocols, optimal evaluation of right-sided cardiac structures can be challenging. Successful imaging of this region necessitates homogenous enhancement around the tricuspid valve annulus, which is otherwise compromised by artifacts arising from the mixture of high-attenuation contrast from the superior vena cava and unenhanced blood from the inferior vena cava. Therefore, dilute contrast must be used for optimal visualization of right-sided cardiac structures on CT [5]. At our institution we usually use iohexol at a concentration of 350 mgI/mL for our cardiac CT studies. However, for this case we used iohexol at a concentration of 300 mgI/mL further diluted with saline in a dual phase contrast protocol injected at a rate of 4 cc/s. For the first phase we used 80 cc of a mixture consisting of 60% contrast and 40% normal saline followed by a second phase of a 50 cc mixture of 25% contrast and 75% normal saline. We performed bolus tracking over the pulmonary artery to time the CT acquisition for peak enhancement of the right-sided cardiac structures. This particular protocol has been found to be beneficial for CT evaluation of right-sided cardiac structures (personal communication from Prashant Nagpal, MBBS, University of Iowa Hospitals and Clinics).

When properly performed, cardiac CT can well demonstrate the extent of calcifications at the right atrioventricular junction. Previous reports of calcification in this region have largely been limited to the tricuspid valve annulus, generally secondary to diffuse cardiac calcinosis in patients on long-term dialysis or in patients with certain inflammatory processes such as rheumatic heart disease [5]. However, calcification of the tricuspid valve chordae tendineae on CT has not been previously reported. Hopefully, an awareness of this entity and future reports will elucidate the etiology for this curious finding.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.radcr.2019.11.014.

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