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Images in cardiology

Right ventricular crypts in a myocardial bridge: Relevance to surgical relief

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ABSTRACT

Crypts are very thin walled invaginations from the cavity of the left ventricle into the compact myocardium. With the advent and increased application of multimodality imaging, crypts are being increasingly identified in both normal individuals and patients, with various conditions including HCM, before and after the development of LV hypertrophy, LV non-compaction and hypertensive heart disease to date crypts have not been described in the right ventricle. We here describe for the first time, RV crypts which were extending into a myocardial bridge, in a patient with HCM and dynamic obstruction of the LAD coronary artery. We also document and discuss the serious complications which can arise from crypts, and highlight the importance of preoperative identification of crypts. Further studies are required to determine the fetal origin of crypts and their clinical significance.

Keywords: HCM, Myocardial bridges, Crypts, RV, Myocardial bands, Myocardial crevices, Hypertensive heart disease, LV muscle bands

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INTRODUCTION

The presence of thin walled extensions of the cavity of the left ventricle (crypts) into the compact myocardium were first described by Donald Teare in the first pathological description of hypertrophic cardiomyopathy (HCM)[1]. With the advent of modern multimodality imaging including echocardiography, magnetic resonance imaging (MRI) and computed tomography (CT) combined with image processing[2–5], the presence, location, frequency of crypts, in HCM and normal individuals has been described[6–9] (Figure 1). However the origins, significance, prognostic and diagnostic implications of crypts are still being hotly debated[10–12]. Furthermore, the presence of right ventricular (RV) crypts and their significance has not been previously reported. We here describe, for the first time, the presence of crypts in the RV and importantly in a myocardial bridge and discuss their clinical implications.

PATIENT AND METHODS

A 35-year-old male presenting with angina and shortness of breath due to HCM with significant left ventricular outflow tract obstruction (LVOTO) (Figure 2). Coronary angiography showed LAD compression by a muscle bridge (Figure 3), with evidence of ischemia and reduced diastolic FFR. During surgical unroofing of LAD bridge, severe bleeding occurred from the right ventricle due to extremely thin walled extensions from the right ventricular cavity, which proved to be crypts, on reconstructing the CT angiograms. The bleeding was controlled by packing for 48 hours.

CT ANGIOGRAM AND SEGMENTATION

Preoperative images of the right and left ventricle were obtained using 128-dual head multi-detector CT (Siemens, Erlangen, Germany), then the images were used for 3D segmentation using Materialise Mimics software (Materialise, Leuven, Belgium).

IMAGING OF THE CRYPTS AND THE MYOCARDIAL BRIDGE

CT angiogram in the sagittal plane showed soft tissue of the muscle bridge compressing the LAD, with two contrast filled crypts in close proximity to the coronary artery (Figure 4).

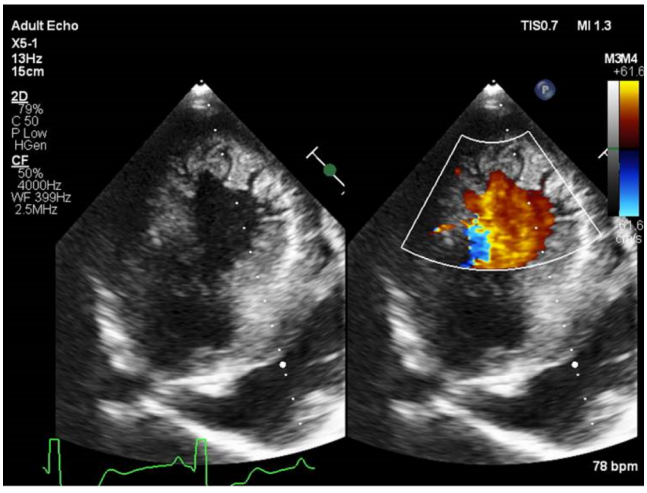

Figure 1. Transthoracic echocardiogram of a patient with severe LV hypertrophy secondary to aortic stenosis showing multiple deep crypts in the LV wall.

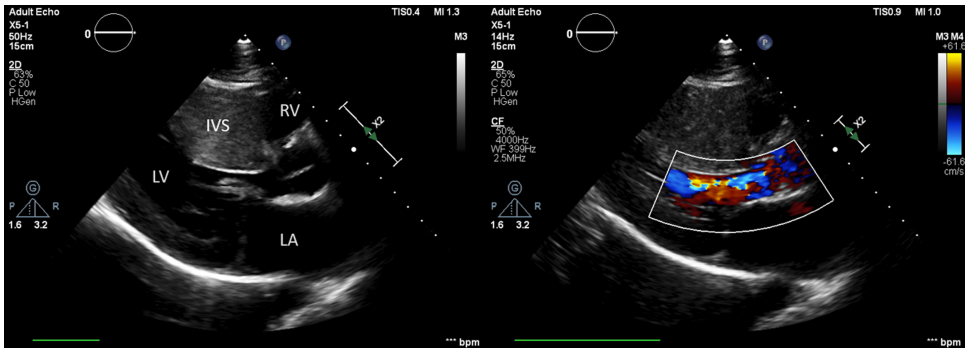

Figure 2. Transthoracic echocardiogram showing systolic anterior motion of mitral valve and left ventricular outflow tract obstruction (peak gradient across outflow tract was 52 mmHg).

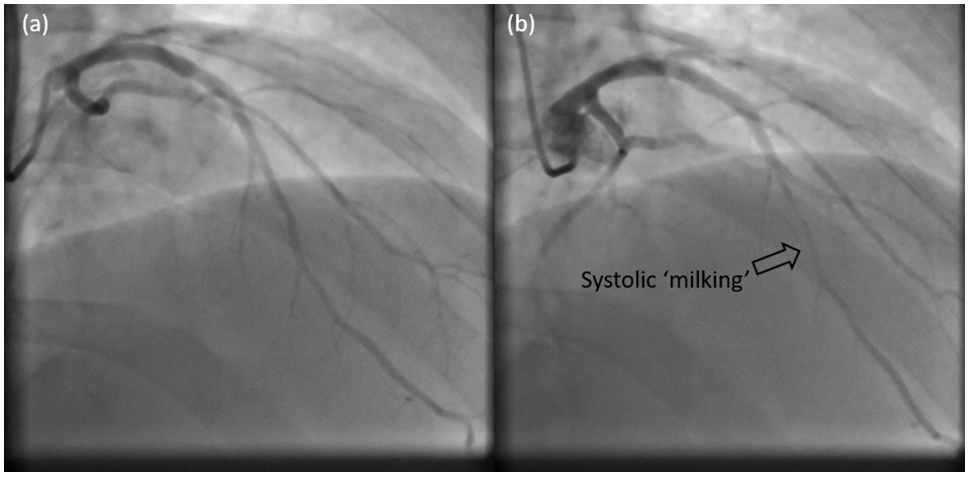

Figure 3. Coronary angiogram showing diastolic (A) and systolic (B) frames with evident systolic obliteration of LAD artery.

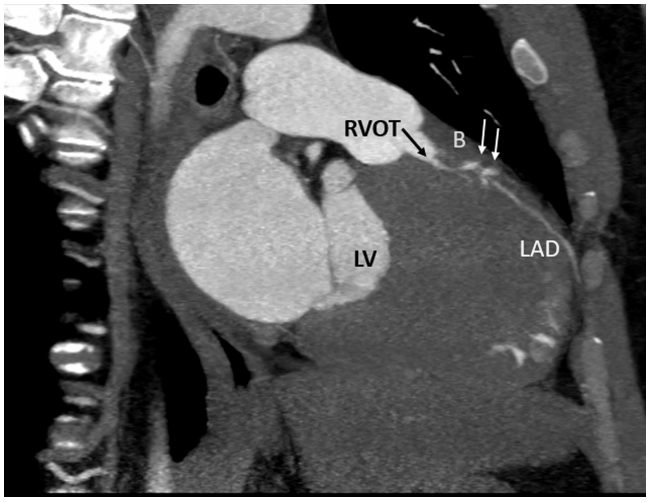

Figure 4. CT image showing RV crypts present in the soft tissue of the myocardial bridge compressing the LAD.

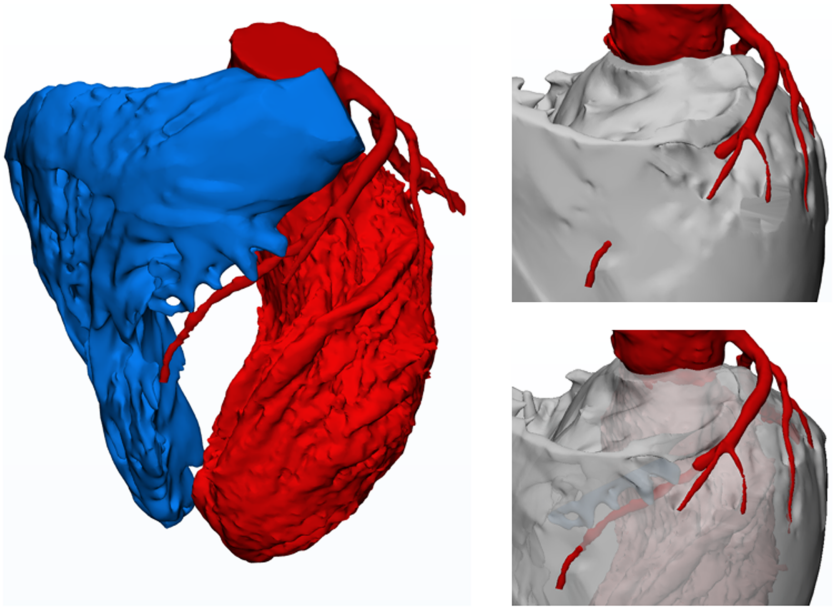

Figure 5. 3D segmentation showing the myocardial bridge and RV crypts.

3D segmentation clearly showed the origin of the multiple crypts from the RV and their close relationship to the muscle bridge and the LAD (Figure 5).

COMMENT AND LESSONS LEARNED

Although left ventricular crypts have been very well documented[6–9], RV crypts have not been described before. Knowledge of their existence is important to avoid complications as described in this report and those described during grafting an intramural coronary [13]. The embryology of the crypts and their relation to HCM and ventricular non compaction requires further study.

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