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Atrial Tachycardia Successfully Ablated from the Left Coronary Sinus Cusp of the Aorta: An Unusual Site of Origin

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Abstract

It has been recognized in the last decade that atrial and ventricular tachycardias may arise from the myocardium around the aorta. These tachycardias can be ablated from the coronary sinus cusps of the aorta (ASCs) . In some of those tachycardias, the site of origin may be epicardial and thus can be ablated only through the thin structure of the ASCs. It is important to know how to make a diagnosis, map and ablate tachycardias arising from this region.

Introduction

It has been recognized in the last decade that atrial and ventricular tachycardias may arise from the myocardium around the aorta. These tachycardias can be ablated from the coronary sinus cusps of the aorta (ASCs).¹⁻⁴ In some of those tachycardias, the site of origin may be epicardial and thus can be ablated only through the thin structure of the ASCs. It is important to know how to make a diagnosis, map and ablate tachycardias arising from this region.

Shehata et al. illustrated 2 rare cases with atrial tachycardias (ATs) successfully ablated from the left coronary cusp (LCC).⁵ This recently published paper was reviewed in this article. This is an important contribution to the literature on the anatomical background of tachycardias arising from the myocardium around the aorta. They nicely illustrated the location of the myocardium around the aorta the around the aorta. The atrial myocardium lies behind the aortic wall bordering the entire non-coronary cusp

(NCC) and the posterior portion of the LCC and is attached behind the aortic wall at the base of the aortic cusps. Therefore, some ATs may be ablated sometimes within the NCC and rarely within the LCC. There is no atrial myocardium behind the aortic wall at the level of the right coronary cusp (RCC). The ventricular myocardium that extends below the RCC and the anterior portion of the LCC consists of spiral extensions of the ventricular septum, the so-called posteroinferior wall of the infundibulum, in which a large portion of ventricular myocardium lies beneath the RCC and LCC and also separates the right ventricular outflow tract from the left ventricular outflow tract.

A differential diagnosis of LCC ATs may include ATs arising from the sites adjacent to the LCC such as the NCC and left atrial appendage (LAA) that is located laterally. Shehata et al. provided fluoroscopic images exhibiting the aortography and catheter positions which are helpful to understand the location of the successful ablation site within the LCC. The LCC is most easily identified in the

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left anterior oblique projection where this cusp is on the far lateral aspect of the aortic root, leftward, and superior to the His bundle (HB) catheter. The NCC is readily identified as the most inferior and posterior of the 3 ASCs and by its close relation to the HB catheter. The fluoroscopic images demonstrated that the successful ablation site was located at the posterior portion of the LCC. The electrocardiographic characteristics may be helpful for differentiating those ATs. NCC ATs always exhibit positive P waves in leads I and aVL and negative/ positive P waves in lead V1, whereas LCC and LAA ATs always exhibit negative P waves in leads I and aVL and positive P waves in lead V1.2-3-6 It may be challenging to differentiate LCC ATs from LAA ATs by using an electrocardiographic algorithm. Activation mapping during ATs may be helpful for differentiating those ATs. The local atrial activation in the HB region always precedes the P wave onset during NCC and LCC ATs whereas it does not during LAA ATs.²⁻³⁻⁵⁻⁶ The atrial activation sequence within the CS is from proximal to distal during NCC and LCC ATs whereas that is the reverse during LAA ATs.²⁻³⁻⁵⁻⁶ This is due to the short distance of the conduction to activate the right atrium (RA) via the interatrial septum rather than via the roof of the left atrium (LA) or the high septal region during NCC and LCC ATs. An A/V amplitude ratio in the local electrogram at the successful ablation site is likely to be more than 1 for NCC ATs and less than 1 for LCC ATs. This electrophysiological feature may be helpful for locating an ablation site within the NCC or LCC.

ATs originating from the LA behind the aortic wall could be ablated through a transseptal approach within the LA directly which may be a safer approach and obviates the need for aortography or coronary angiography. However, ablation at the posterior portion of the LCC through a retrograde aortic approach may be the only option for reaching the epicardial aspect of a thick LA wall if ablation through a transseptal approach is unsuccessful.

Although further study with a larger case series may be required to reveal the exact electrocardiographic and electrophysiological characteristics and results of the catheter ablation of LCC ATs, this case report provided a better understanding of the diagnosis, mapping and catheter ablation of ATs arising from the myocardium around the aorta based on the anatomical background.

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