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<p>The left ventricular summit corresponds to the epicardial side of the basal superior free wall, extending from the base of the left coronary aortic sinus. The summit composes the floor of the compartment surrounded by the aortic root, infundibulum, pulmonary root, and left atrial appendage. The compartment is filled with thick adipose tissue, carrying the coronary vessels. Thus, the treatment of ventricular tachycardia originating from the summit is challenging, and three-dimensional understanding of this complicated region is fundamental. We revisit the clinical anatomy of the left ventricular summit with original images from the Wallace A. McAlpine collection.</p>	
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<p>The left ventricular summit is a source of idiopathic ventricular arrhythmias and presents distinct challenges for mapping and ablation. These arrhythmias are typically targeted from the distal coronary venous system or most often from endocardial vantage points such as the left coronary cusp, basal left ventricle or septal right ventricular outflow tract. In this article, we review the electrocardiographic patterns that suggest a possible origin from the left ventricular summit and the features that may help to predict the most likely site of successful ablation.</p>	
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<p>Endocardial catheter ablation of ventricular arrhythmias (VAs) originating from the left ventricular summit (LVS) at remote structures adjacent to the LVS may be an alternative (anatomic approach) but may not be so successful. This type of catheter ablation is successful most commonly in the left ventricular outflow tract followed by the aortic cusps and rarely in the right ventricular outflow tract. A right bundle branch block QRS morphology and anatomic distance between the earliest ventricular activation site in the coronary venous system and endocardial ablation site (<13 mm) could be predictors of a successful endocardial catheter ablation of LVS VAs.</p>	
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<p>The left ventricular summit (LVS) is the highest point of the left ventricular epicardium, and ventricular arrhythmias originating from this area accounts for 10% to</p>	

15% of idiopathic outflow tract ventricular arrhythmias. Direct epicardial ablation of outflow tract ventricular arrhythmias arising from the LVS is successful only in a minority of patients because of close proximity to the coronary artery or thick epicardial fat. Therefore, alternative strategies should be prioritized before performing epicardial approach. When performed, electrocardiogram characteristics suggestive of the site of origin to be the accessible area within the LVS needs be evaluated to avoid ineffective epicardial approach.

Catheter Ablation of Left Ventricular Summit Arrhythmias from Adjacent Anatomic Vantage Points

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Jorge Romero, Maria Gamero, Isabella Alviz, Michael Grushko, Juan Carlos Diaz, Marta Lorente, Mohamed Gabr, Cristian Camilo Toquica, Suraj Krishnan, Alejandro Velasco, Aung Lin, Andrea Natale, Fengwei Zou, and Luigi Di Biase

Idiopathic ventricular arrhythmias (VA), particularly left ventricular outflow tract (LVOT) VA accounts for up to 10% of all VAs referred for ablative therapy. In addition to being infrequent, its intricate anatomy and its pathophysiology make catheter ablation (CA) of these arrhythmias a challenge even for experts. In this scenario, detailed right ventricular outflow tract as well as LVOT electroanatomic mapping including epicardial mapping are essential. In this article, we will emphasize our approach toward the CA technique used for LVOT VA, particularly IVS and/or LVS VA originating from intramural foci, along with its acute and long-term efficacy and safety.

Intramyocardial Mapping of Ventricular Arrhythmias via Septal Venous Perforators: Defining the Superior Intraseptal Space

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Gustavo S. Guandalini

Left ventricular outflow tract arrhythmias that fail endocardial mapping and ablation have traditionally been labeled as originating from the epicardial left ventricular summit. Although these sometimes can be targeted from the epicardial surface of the left ventricular ostium, such approach poses significant technical challenges. A significant proportion of such arrhythmias, however, exhibit intramyocardial origin, demonstrated by mapping intraseptal branches of the anterior interventricular vein, and henceforth defined as the basal superior intraseptal space.

Ablation of Focal Intramural Outflow Tract Ventricular Arrhythmias

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Jackson J. Liang and Frank Bogun

Most idiopathic ventricular arrhythmias (VAs) originate from the outflow tract (OT) region and can be targeted with ablation either from the endocardial aspect of the right and left ventricular outflow tracts or from the aortic sinuses of Valsalva. It is important to exclude scar in patients with OT VAs. In some patients, the site of origin may be intramural. Ablation of intramural OT VAs can be challenging to map and ablate due to deep intramural sites of origin. The coronary venous branches may permit mapping and ablation of intramural OT VAs.

Bipolar Radiofrequency Catheter Ablation of Left Ventricular Summit Arrhythmias

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Piotr Futyma and William H. Sauer

Challenging anatomic and morphologic conditions of the left ventricular (LV) summit architecture and its surrounding sites may prevent sufficient heating of the targeted

area during standard radiofrequency catheter ablation. Bipolar ablation can result in higher likelihood of efficacy for ablation of LV summit arrhythmias from inaccessible regions and increase the chance of achieving a transmural lesion. In this review, the authors describe the present approaches for bipolar ablation of the LV summit arrhythmias refractory to standard approaches.

Retrograde Coronary Venous Ethanol Infusion for Ablation of Refractory Left Ventricular Summit Arrhythmias

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Thomas Flautt and Miguel Valderrábano

Chemical ablation using the transc coronary arterial system has a lengthy but arduous history. Although it has shown to be efficacious in controlling ventricular arrhythmias, safety concerns from cannulation of the coronary arterial system to unwanted ethanol downstream effects have limited transc coronary ethanol ablation (TCEA)'s use. Retrograde coronary venous ethanol ablation (RCVEA) has shown promising results. Although it appears to be in its infancy, RCVEA appears to be the future of chemical ablation in comparison to TCEA due to its increased safety and efficacy. Prospective randomized trial data is needed for this adjunctive treatment to radiofrequency ablation.

Fluoroless Catheter Ablation of Left Ventricular Summit Arrhythmias: A Step-by-Step Approach

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Jorge Romero, Juan Carlos Diaz, Maria Gamero, Isabella Alviz, Marta Lorente, Mohamed Gabr, Cristian Camilo Toquica, Suraj Krishnan, Alejandro Velasco, Aung Lin, Andrea Natale, Fengwei Zou, and Luigi Di Biase

Fluoroscopy use during catheter ablation (CA) of arrhythmias is associated with significant exposure to ionizing radiation and risk of orthopedic injuries. CA of ventricular arrhythmias (VAs) arising from the left ventricular (LV) summit requires vast knowledge of cardiac anatomy and careful imaging delineation of the different structures, which is frequently performed using fluoroscopy. Fluoroless CA procedures are feasible and appear to have similar safety and efficacy compared with conventional techniques. To be successfully performed, it is important to be fully acquainted with intracardiac echocardiography (ICE) imaging and electroanatomic mapping (EAM). We describe our approach for fluoroless LV summit CA.

Outcomes of Catheter Ablation of Left Ventricular Summit Arrhythmias

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Abigail Louise D. Te-Rosano, Fa-Po Chung, Yenn-Jiang Lin, and Shih-Ann Chen

The left ventricular summit (LVS) is the area in the highest portion of the left ventricular epicardium, bounded by the left coronary arteries and the coronary venous circulation, and can be surrounded by thick epicardial fat that may preclude epicardial ablation. Ablation of LVS ventricular arrhythmias (VA) can be achieved from adjacent structures with good success rates. The long-term freedom from LVS VA recurrence remains variable. This article reviews the spatial and anatomic relationship of the structures surrounding the LVS, which provide vantage points for ablation, and the acute and long-term outcomes of different ablation approaches in LVS VA ablation.

Preventing Complications During Mapping and Ablation of Left Ventricular Summit Arrhythmias

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Video content accompanies this article at <http://www.cardiacep.theclinics.com>.

The left ventricular summit is a site of origin for idiopathic ventricular arrhythmias. With advancements in mapping and ablation techniques, sites previously considered inaccessible can now be approached. Anatomical knowledge of the 3-dimensional landmarks of this space is important, as critical structures reside within its boundaries and are potentially liable to collateral injury during ablation. This article reviews reported complications from ablation of ventricular arrhythmias arising from the left ventricular summit and its vicinity and discusses the pros and cons of different ablation technique and the role of an individualized anatomical approach to reduce procedural related complications and improve outcomes.