



Spot diagnosis of inferior axis and concordant R-pattern predicts left ventricular inflow tract tachycardia Ablation from the great cardiac vein of an underdiagnosed entity



Harilaos Bogossian^{a,e,*}, Gerrit Frommeyer^{b,1}, Ilias Ninios^a, Fuad Hasan^a, Quy Suu Nguyen^a, Zana Karosiene^a, Dejan Mijic^a, Dirk Bandorski^a, Melchior Seyfarth^{c,e}, Johannes Friemann^d, Bernd Lemke^a, Lars Eckardt^b, Markus Zarse^{a,e}

^a Märkische Kliniken GmbH, Department of Cardiology and Angiology, Klinikum Lüdenscheid, Lüdenscheid, Germany

^b Division of Electrophysiology, Department of Cardiovascular Medicine, University of Münster, Münster, Germany

^c Department of Cardiology, Helios Klinikum Wuppertal, Wuppertal, Germany

^d Märkische Kliniken GmbH, Institute of Pathology, Klinikum Lüdenscheid, Lüdenscheid, Germany

^e Department of Cardiology, University Witten/Herdecke, Witten, Germany

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ABSTRACT

Background: The present literature holds an enormous variation concerning origin and ablation site of idiopathic ventricular arrhythmias (VA), ranging from 2.5 to 15% for the origin within the coronary venous system (CVS). The aim of the study was to detect positive predictive ECG morphology patterns to discriminate VA stemming from the CVS.

Methods: 110 consecutive patients (P) with 111 premature ventricular capture beat (PVC) morphologies undergoing successful ablation for VA were retrospectively analyzed concerning their ECG patterns.

Results: 20/110 P (18%) displayed their VA origin in the CVS with anterior/anterolateral left ventricular inflow tract (LVIT) (epicardial/GCV) in 16 P (14%), anterior/anterolateral LVIT (endo- and epicardial/GCV) in 3 P (3%), and anterior interventricular vein (AIV) 1 P (<1%).

ECG morphology of all GCV cases demonstrated an inferior axis and concordant R-pattern in all precordial leads resulting in 100% sensitivity. One VA demonstrating this pattern was ablated outside at the LVOT resulting in 95% specificity for origin in the anterior/anterolateral LVIT. 3/20 P that were ablated in the CVS required additional endocardial ablation from the anterior/anterolateral LVIT resulting in 80% specificity for sole successful ablation in the CVS. **Conclusion:** An inferior axis and concordant R-pattern in all precordial leads serve as diagnostic markers for an LVIT origin in the surface ECG and suggest a high primary ablation success via the GCV.

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1. Introduction

Catheter ablation of sustained ventricular tachycardia and premature ventricular capture beats (PVC) have become an established clinical treatment [1,2]. The best long-term success rates have been observed for endocardial radiofrequency ablation of right or left ventricular outflow tract PVC [3,4]. Ablation of PVC or ventricular

tachycardias arising from the epicardium, however, can be more challenging. Epicardial space is most commonly reached via the subxiphoidal access [5–8], which may be accompanied by severe complications including liver or colon trauma [9]. To avoid these complications, epicardial ablation from the coronary venous system (CVS) is a feasible, less invasive alternative to target possible foci [10]. However, the variable anatomy of the coronary venous system itself must be regarded as the most important limitation of this access. Mountantonakis et al. described successful ablation inside the CVS and discriminate tachycardias originating from the anterior interventricular vein (AIV), the great cardiac vein (GCV) and the middle cardiac vein (MCV). Likewise he points out the limitations due to proximity to the coronary arteries, inability to reach or deliver adequate power at the earliest activation site [11].

Pre-interventional ECG screening of PVC or ventricular tachycardias for possible epicardial origin is crucial for a targeted ablation. A few algorithms have already been introduced to distinguish between right ventricular and left ventricular origin:

Abbreviations: AIV, anterior interventricular vein; CS, coronary sinus; CVS, coronary venous system; IVS, interventricular septum; LA, left atrium; LAA, left atrial appendage; LAD, left anterior descending artery; LCX, left circumflex artery; LVIT, left ventricular inflow tract; LVOT, left ventricular outflow tract; MV, mitral valve; PVC, premature ventricular capture beats; RA, right atrium; RAA, right atrial appendage; RVIT, right ventricular inflow tract; RVOT, right ventricular outflow tract; VA, ventricular arrhythmias; VT, ventricular tachycardia.

* Corresponding author at: Department of Cardiology and Angiology, Märkische Kliniken GmbH, Paulmannshöherstr, 14, 58515 Lüdenscheid, Germany.

E-mail address: Harilaos.bogossian@klinikum-luedenscheid.de (H. Bogossian).

¹ Both authors contributed equally.

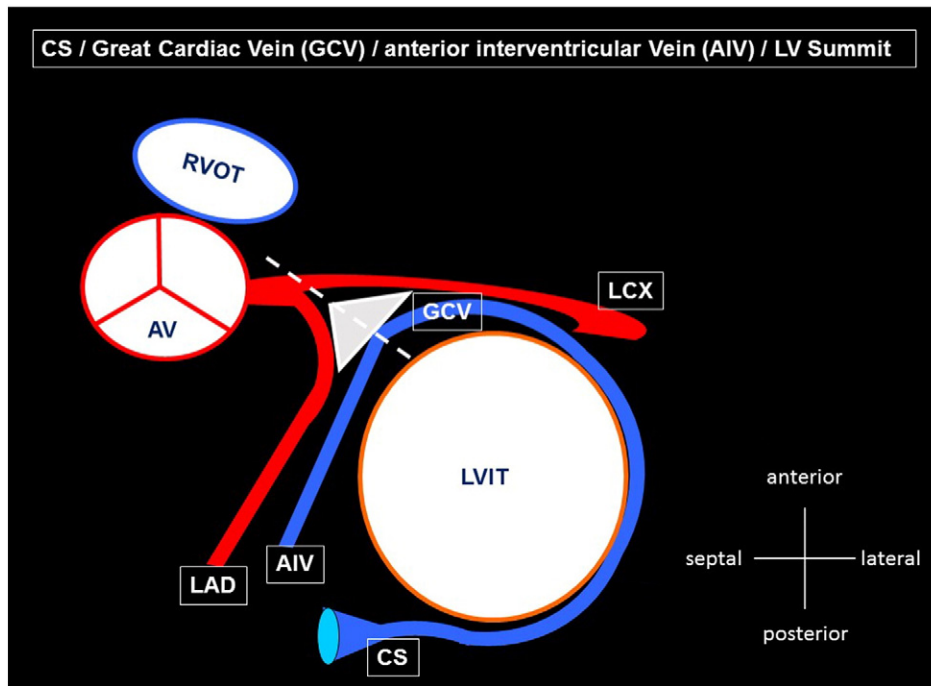


Fig. 1. Schematic overview of the anatomy of the coronary venous system (AV = aortic valve; LVIT = left ventricular inflow tract; RVOT = right ventricular outflow tract; LAD = left anterior descending artery; LCX = left circumflex artery; CS = coronary sinus; GCV = great cardiac vein; AIV = anterior interventricular vein, green triangle = LV summit).

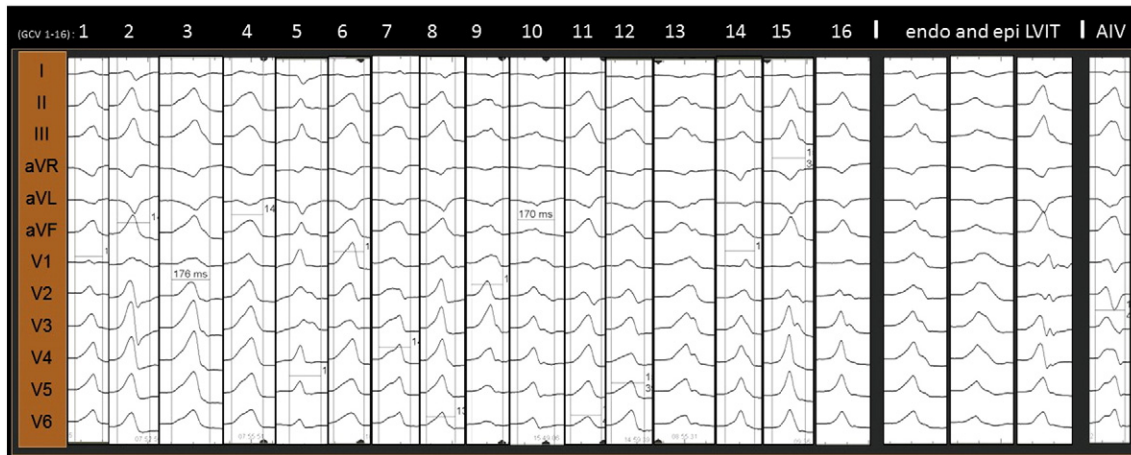


Fig. 2. PVC morphology of patients with successful ablation sites in the epicardial left ventricular inflow tract (LVIT, left), both endocardial and epicardial LVIT (middle): inferior axis and concordant R-pattern in all precordial leads (left). PVC morphology of the patient with successful ablation site in the AIV (right): negative precordial leads V1/V2 without concordant R-pattern.

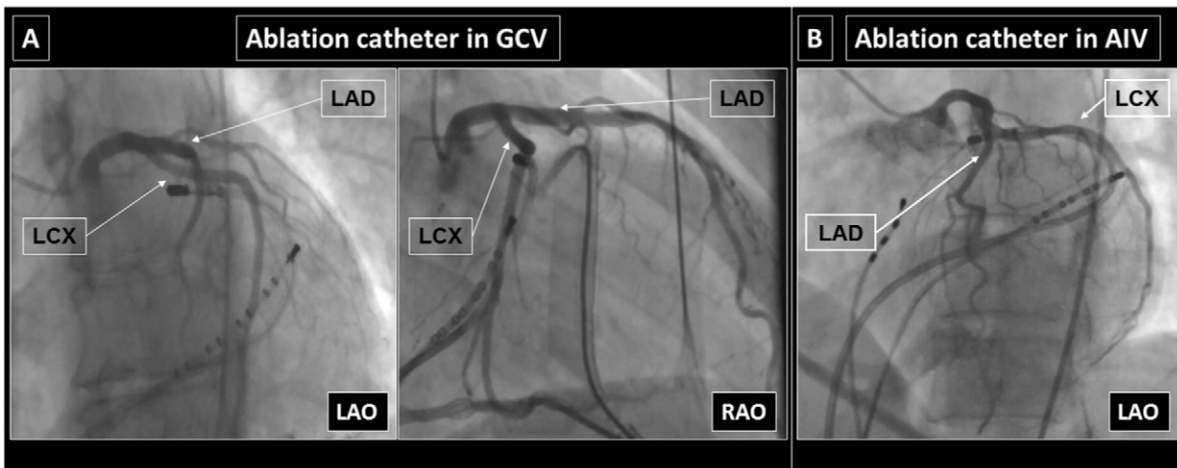


Fig. 3. Representative examples of fluoroscopic catheter positions during ablation in the GCV (A) and AIV (B).

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