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Editorial Commentary

Catheter ablation of the valsalva region using intracardiac echocardiography guidance

In this issue Al Asmar et al. [1] describe a large series from their institution, in which they performed catheter ablation of the sinus of valsalva region for ventricular arrhythmias (VA), guided by intracardiac echocardiography (ICE). The authors should be commended for producing such a large series of cases, the technical skill in which ICE was used to visualise the coronary ostia and the meticulous manner in which they assessed their acute and 30-day outcome follow up.

Arrhythmias from the outflow tract (OT-VAs) are traditionally viewed as benign with a good response to antiarrhythmic therapy. This dogma has in recent years been challenged by randomised controlled trials demonstrating a superiority of catheter ablation vs antiarrhythmic drug therapy [2]. Additionally, studies have demonstrated a longitudinal association between OT-VAs and a risk of heart failure and death [3], demonstrating that these arrhythmias may not always be benign. Thus in patients with symptomatic drug refractory OT-VA or VA mediated LV dysfunction, catheter ablation is an established treatment offering a recurrence rate of <30% without the use of antiarrhythmic drugs, and an acute success rate of 84%, in large volume centers [4].

Although catheter ablation of OT-VAs remains an important treatment strategy for patients, the complex three-dimensional nature of the anatomy and the overlapping nature of the left and right ventricular outflow tract pose a challenge in establishing the location of the ectopy based on the ECG. Indeed the ECG changes that differentiate OT-VAs from the right ventricular outflow tract (RVOT) and from other locations such as the left ventricular outflow tract (LVOT) and Sinus Of Valsalva (SoV) may be subtle [5–10]. This presents important challenges both in terms of procedural practice but also in terms of risks of complications to the patient. Ventricular arrhythmias (VA) arising from the Sinus SoV account for 17% of OT-VA arrhythmias in patients without structural heart disease [5]. Ablation of the OT-VAs arising from the SoV has been described in several previous series [5,11–13]. Successful ablation at the SoV most likely represents lesions created in nearby anatomical structures such as the interventricular septum and proximal left anterior fascicle/conduction system rather than modification of the SoV itself. These VAs may commonly have an intramural origin and the 12-lead ECG may provide clues as to their origin which may help guide ablation strategy. Left coronary cusp sites are typically associated with multiphasic QRS morphology consistent with an M or W pattern in lead V(1) with a precordial transition (R > S) no later than V2 [10,14]. Right coronary cusp VAs typically demonstrate a left bundle-type pattern with a broad small R wave in V2 and a precordial transition generally at V3 [10,14]. VAs arising from the aortomitral continuity are typically associated with a qR pattern that is not observed anywhere else in the left ventricular outflow tract [10,14]. This is in contrast to right ventricular outflow tract VA, where the precordial transition is often after V3 [15]. Because of the precarious anatomical location of these VAs in the SoV, patients will commonly have coronary angiography performed prior to ablation [12,13,15], to assess proximity to the coronary vessels prior to ablation and to look for coronary anomalies [15] and also after ablation to rule out coronary spasm, stenosis or occlusion [15]. The main concerns regarding safety of ablation within the SoV revolve around effect on the intimal layer of the aorta and also the deeper structures such as the media of the coronary vessels and the conduction system. Rillig et al. [16] assessed aortic valve and wall integrity at 6-months follow up after radiofrequency ablation within the SoV and found no structural damage of the aortic wall or myocardium of the LVOT was detected using transthoracic echocardiography, TEE, and cardiac MRI. However, coronary artery occlusion has been described [17]. If there are issues with ablation catheter stability, the coronary ostia may be protected by cannulation. A distance of >1.0 cm from the ablation catheter-tip to both the right and left coronary ostia is thought to be to be safe [18]. Due to the risk of thrombi formation and silent cerebral embolism and ACT of >250s is generally recommended [15].

In the present issue Al Asmar et al. [1] describe the use of ICE to guide SoV ablation in a retrospective cohort of 70 patients. Ablation locations were the left coronary cusp (28.6%), right coronary cusp (25.7%), non-coronary cusp (5.7%), mitral annulus (8.6%), aorto-mitral continuity (15.7%), right-ventricular outflow tract (4.3%), left ventricular outflow tract (2.9%), close to HIS location (2.9%) and LV summit (10%). Commendably, this seems to have resulted in an excellent safety profile with no adverse events recorded either immediately or at 30 day follow up. Angiography was only required in 4.3% of cases, and an acute success rate of 81.4% was noted in keeping with existing published data [4,5,14]. Though previous series have published on the use of ICE in SoV OT-VAs [19], the work of Al Asmar et al. [1] is the largest such published case series. It suggests that ICE guided ablation of the SoV may not only improve safety; by providing real time assessment of the anatomy, lesion formation and the location of the ablation catheter in relation to the coronary ostia; but may also be an important tool in reducing fluoroscopy. The use of ICE is not routine in many catheter labs in the world due to its expense and the significant learning curve for its adoption. The published work in this issue suggests that it is an important tool in the armory of all electrophysiologists to improve real-time catheter visualisation of lesion creation, catheter stability and location for anatomical safety. The novel use of ICE for

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SoV ablation will certainly improve electrophysiology practice in OT-VA ablation and is important for patient safety and outcomes.

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