Case Report

Radiofrequency ablation of ventricular premature contraction originating from a native coronary cusp after transcatheter aortic valve replacement

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1. Case report

An 85-year-old man presented with worsening palpitations three months after transcatheter aortic valve replacement (TAVR) with a 23-mm balloon-expandable transcatheter heart valve (THV) (SAPIEN 3; Edwards, Irvine, CA). Monomorphic ventricular premature contraction (VPC) occurred in 26.4% of the total beats on a 24-h Holter electrocardiogram. Despite being prescribed 5 mg bisoprolol once daily, the frequency of VPC increased to 40.4% one month later. Because the patient presented with decompensated heart failure at the time, he was admitted for catheter ablation (CA) for VPC. An electrocardiogram showed a high R-wave amplitude on the inferior leads and a transition zone in lead V3, indicating VPC originating from the left ventricular outflow tract (LVOT) (Fig. 1A). The procedure was performed with navigation via fluoroscopy and intracardiac echocardiography (ICE) with a three-dimensional mapping system (CARTO3; Biosense Webster, Diamond Bar, CA), using an irrigated ablation catheter (Smart Touch; Biosense Webster). Activation mapping of the LVOT during VPC was performed via a transaortic approach. A fractionated prepotential preceding QRS onset by 36 ms, was recorded at the earliest activation site at the native aortic valve annulus between the left and right coronary cusps, without any abnormal potential during sinus rhythm (Fig. 1B). Pacing from this site produced a good pace map (Figs. 1C, 2A, and B). Computed tomography (CT) did not show any signs of TAVR-related complications (Fig. 2C). To avoid noise interference due to contact with the stent frames, the ablation catheter was guided to this site through the gap between the sinotubular junction and the THV with ICE and fluoroscopic guidance (Fig. 2D-F). A single application of irrigated radiofrequency ablation (35 W, 50 s) at this site eliminated the VPC. Three months later, the Holter electrocardiogram showed that the frequency of VPC had significantly decreased to 0.001%.

2. Discussion

Conduction abnormality is a well-known TAVR-related complication [1], but ventricular arrhythmia is rarely reported. Recently, Dvir et al. reported a case of ventricular tachycardia (VT) with LVOT origin, 8 days after implantation of a 29 mm CoreValve (Medtronic, Minneapolis, MN) [2]. They proposed that irritation of the myocardium by the THV may be a plausible etiology of VT with LVOT origin. Although there are many differences in the valve design between CoreValve and SAPIEN 3, the skirt of SAPIEN 3 can be extended widely at the inflow level. This feature exerts significant mechanical pressure on the native aortic annulus. Therefore, mechanical irritation by the THV may play an important role in the occurrence of ventricular arrhythmia originating from the LVOT. Indeed, the minimum diameter of the aortic annulus on CT...
increased from 19.4 to 21.9 mm after TAVR. Furthermore, no abnormal potential was recorded at the successful ablation site, which may indicate that neither scarring nor tissue inflammation were involved in this case. However, the mechanism of increased incidence of VPC over time remains unclear. The latent change in the autonomic nervous system might cause increasing VPCs even after beta-blocker administration.

The optimal timing for performing CA around the THV after TAVR remains unclear. Valve displacement is a rare but life-threatening complication of TAVR. Prakash et al. reported the most delayed case of valve migration, 63 days after TAVR [3]. Moreover, Blumenstein et al. demonstrated the feasibility of coronary angiography and intervention after TAVR, in which these procedures were safely performed 232.8 ± 158.4 days after TAVR [4]. Considering these previous studies and the timing of CA in our case, performing CA nine months after TAVR may be feasible with careful catheter manipulation around the THV. Further studies are required to assess the safety and efficacy of this technique.

Conflict of interest

All authors declare no conflict of interest related to this study.
References

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