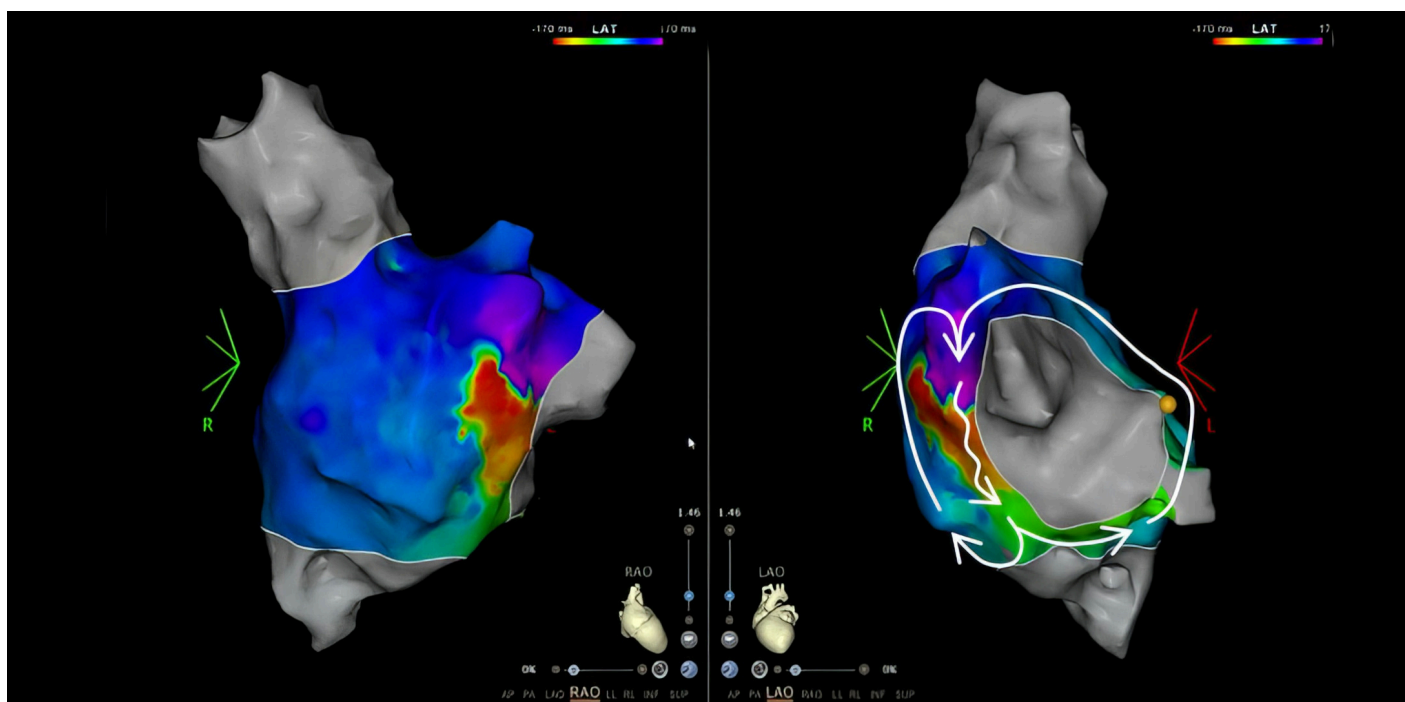




An Unusual Case for a Usual Arrhythmia

Right-sided Atrial Flutter Ablation after Tricuspid Valve-in-Valve Replacement

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Case Report

A 49-year-old patient presented to the outpatient clinic with palpitations, dizziness and exercise intolerance for about two months and was found to be in atrial flutter (fig. 1A). Recurrent flutter episodes were known for several years requiring repeated direct current cardioversions in the past as well as intermittent amiodarone treatment. His past medical history included bioprosthetic tricuspid valve (TV) replacement (Shelhigh 33mm) for severe tricuspid regurgitation due

to endocarditis related to intravenous drug abuse at the age of 35. Thirteen years after, he was successfully treated with transcatheter tricuspid valve-in-valve replacement with an Edwards SAPIEN 3 (29 mm) valve due to severe bioprosthetic TV stenosis. His recent echocardiography revealed a normally functioning TV prosthesis with mildly reduced right ventricular function and normal right atrial (RA) size (fig. 1B). Due to symptomatic recurrent atrial flutter, we opted for catheter ablation.

At baseline, the tachycardia cycle length (TCL) was 340 ms with concentric coronary sinus activation and 2:1 ventricular conduction. Three-dimensional electroanatomical mapping of the right atrium was performed using the CARTO[®] 3 mapping system (Biosense Webster, Diamond Bar, CA, USA). The local activation time map confirmed an incisional and cavo-tricuspid isthmus (CTI) dependent RA flutter with the reentry circuit corresponding to a figure of eight (fig. 1C, video 1). The critical isthmus

at the lateral RA wall adjacent to the annulus/prosthetic valve was ablated with a power output of 35-40 watts and extended to the CTI using an irrigated ablation catheter (THERMOCOOL SMARTTOUCH® SF, Biosense Webster) (fig. 1D, 1E). During ablation, gradual lengthening of the TCL was observed with termination of flutter and restoration of sinus rhythm (fig. 1F). Bidirectional CTI block was confirmed and no tachycardia was inducible anymore. During two years of follow-up, the patient remained asymptomatic and maintained sinus rhythm with a stable valve function and no evidence of prosthetic valve damage.

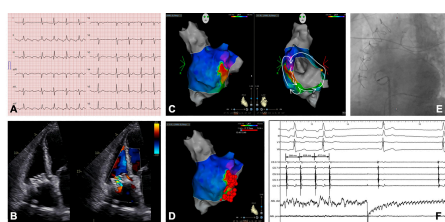


Figure 1: Right sided atrial flutter ablation after tricuspid valve-in-valve replacement. (A) Patient presented with symptomatic atrial flutter. (B) Echocardiography demonstrated normal valve function. (C) 3D electroanatomical mapping of the right atrium confirmed incisional and cavo-tricuspid isthmus dependent flutter. Arrows in the left anterior oblique projection indicate the reentry circuit corresponding to a figure of eight. (D–F) Ablation of the critical isthmus at the lateral right atrial wall and the CTI sustainably terminated the flutter.

Discussion

Atrial arrhythmias are commonly seen in patients with tricuspid and mitral valve replacement. On the one hand this is a consequence of surgical incisions resulting in fibrosed areas of slow electrical conduction, but also occur secondary due to altered haemodynamics associated with the causative valvular pathology. The most common arrhythmias after TV surgery were found to be CTI dependent arrhythmias in a large cohort of adult congenital heart disease (ACHD) patients [1]. CTI

ablation with radiofrequency energy is known to be a highly effective and safe procedure [2]. However, CTI ablation in patients after prosthetic TV replacement can be technically challenging due to a portion of the atrial myocardium participating in the reentry circuit potentially being covered by prosthetic material, thus remaining inaccessible for ablation [1]. Moreover, there is concern that the sewing ring near the annulus might generate an anatomical obstacle for linear ablation [3, 4]. However, several prior case reports have demonstrated successful CTI ablation in the presence of a prosthetic TV [3–7], highlighting their particular challenges. One case required subvalvular needle puncture to reach the protected myocardium below the bioprosthetic valve for successful ablation [7]. Another case study highlighted the importance of multimodal imaging to increase success and reduce complication rates [8]. These included preprocedural computed tomography imaging to assess the anatomical relationship between the prosthetic valve and the true atrioventricular annulus, intracardiac echocardiography to monitor catheter contact and stability combined with electroanatomical mapping and fluoroscopy. A larger case series of CTI ablation in ACHD patients with prosthetic TV or tricuspid annuloplasty ring demonstrated, that atrial tissue critical to the arrhythmia may require ablation from the ventricular side of the prosthesis without damage to the valve and good short-term outcomes [9]. In contrast to the case reports, the largest case series so far, involving several experienced ACHD centres systematically investigating the impact of TV surgery on catheter ablation outcomes, found, that catheter ablation success was lower and tachycardia recurrence was higher after TV ring/replacement surgery compared to patients without prior TV surgery or with TV repair only [1]. In addition, procedures after TV surgery were longer and required greater fluoroscopy exposure and energy delivery.

Despite the above-mentioned reports of CTI ablation after TV replacement, so far there have been no reports on atrial flutter/CTI ablation in patients with transcatheter tricuspid valve-in-valve replacement. To the best of our knowledge, our case report is the first reported CTI dependent atrial flutter ablation in a patient of this kind, demonstrating its feasibility, safety and efficacy. One case study also reported a patient with valve-in-valve replacement, however this valve intervention was carried out during the same procedure as the CTI ablation, which was performed prior to the valve-in-valve intervention and thereafter only focal atrial tachycardias were treated [7]. Whether a valve-in-valve procedure impacts atrial physiology and comprises additional challenges differently compared to a single prosthetic valve remains unknown. However, valve-in-valve implantations may be associated with further expansion of the surgical bioprosthesis and mechanical modulation of cardiac tissue adjacent to the sewing ring of surgical bioprosthesis [10].

In our case, we have not required ablation from the ventricular side of the valve to achieve bidirectional CTI block and the fluoroscopy time was around nine minutes and therefore not excessive. The incisional and CTI dependent right atrial flutter was terminated successfully and no other arrhythmia was inducible with good long-term outcomes and no damage to the prosthetic valve. Our case demonstrates the feasibility, effectivity and safety of CTI dependent atrial flutter ablation in patients with transcatheter tricuspid valve-in-valve replacement.

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Conflict of Interest Statement

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Abstract

A patient with previous transcatheter tricuspid valve-in-valve replacement underwent catheter ablation for symptomatic atrial flutter. An incisional and cavo-tricuspid isthmus (CTI) dependent right atrial flutter was confirmed. Ablation of the critical isthmus at the lateral right atrial wall and CTI ablation sustainably terminated the flutter. This case highlights the feasibility and safety of CTI-dependent atrial flutter ablation after tricuspid valve-in-valve replacement, which has not been reported so far.

Keywords: Atrial flutter; electroanatomical mapping; ablation; transcatheter tricuspid valve-in-valve replacement

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