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An unexpected result of successful radiofrequency ablation of the persistent typical atrial flutter paroxysm lasting 12 years on the reduction of the transvalvular tricuspid bioprosthesis gradient

**Short title:** Unexpected result of 12-year Aflutter paroxysm termination

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Typical atrial flutter (AFlu) is a type of a macro-reentrant atrial tachycardia. The crucial, slow-conducting part of the AFlu circuit lays in the cavo-tricuspid isthmus (CTI).[1,2] The success rate of pharmacotherapy of AFlu is limited.[3] Class IC drugs are not recommended [3] and an initial strategy of rate control is usually preferred followed by a pre-scheduled cardioversion.

A 77-year-old man after the tricuspid valve (TV) replacement (Liotta bioprosthesis no. 29,9) and a surgery of ventricular septal defect in 1984, with severe stenosis of the bioprosthesis and long-standing persistent AFlu was admitted to have a dual chamber pacemaker (DDDR) implanted due to registered episodes of advanced atrioventricular (AV) block.

On the admission, the medical records revealed the presence of typical AFlu lasting more than 10 years with bifascicular block (figure 1A and 1B). The ECHO examination showed the enlargement of all the heart chambers (including left atrial (LA) area 33cm², RA area 40cm²), enlarged coronary sinus, reduced left ventricular ejection fraction (35-40%), moderate mitral regurgitation and severe tricuspid bioprosthesis stenosis (mean and maximal gradients of 9 mmHg and 17 mmHg, respectively).

Taking into account the presence of typical AFlu, the decision was made to perform radiofrequency ablation (RFA). Having confirmed the participation of CTI in the circuit, the RFA was performed resulting in arrhythmia termination. The patient's state ameliorated, but he revealed serious sinus bradycardia. Due to the presence of severe TV stenosis and bifascicular block a decision was made to implant DDDR with the introduction of ventricular electrode through the coronary sinus bed (figure. 1E) and programming long AV delay to avoid ventricular pacing (Vp). Simultaneously, the patient was referred for percutaneous TV “valve-in-valve” procedure.
After one month the patient was re-admitted. The control right chamber catheterisation and transoesophageal echocardiography (TEE) preformed directly before the new valve implantation revealed a marked reduction of the mean trans-tricuspid gradient to 3.5-5mmHg (Figure 1C and 1D). The Vp% was close to 1%. Due to the lack of the symptoms and the TV prosthesis gradient reduction, the valve-in-valve procedure was not performed.

The RFA is the first line treatment of symptomatic typical AFru and may be an alternative to electrical cardioversion while dealing with the ongoing arrhythmia.[3] The success rate of RFA is close to 100% with the recurrence rate of less than 10%.[3] The chosen treatment was efficacious, leading to significant gradient reduction and preventing complex valvular procedure. The mechanism of this result remains unclear. The sinus rhythm restoration could have reversed increased RA and LA pressures and decreased right ventricular end-diastolic pressure caused by AFru.[4] Another mechanism could be unmasking the stenosis (caused by an undersized bioprosthesis) in the circumstances of an elevated transvalvular flow during AFru – similarly to a low-flow low-gradient aortic stenosis during stress test.[5] The influence of the left ventricular pacing can be ruled out as the control Vp% was low. The case shows the potential of the modern invasive cardiac treatment which may be efficacious even in the case of extremely long typical AFru paroxysm.
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Figure 1. – Figure legends:

The limb leads ECGs with typical atrial flutter showing “saw-tooth” like, inverted flutter wave in leads II, III and aVF and positive wave in V1 with bifascicular (RBBB+LAFB) recorded in 2007 (A) and directly before the ablation (in 2018) (B). The CW Doppler registration showing the values trans-valvular gradient trough the TV prosthesis before (C) and after (D) the ablation procedure. The chest X-ray scan after in the PA (E) and the lateral (F) projections showing the position of ventricular electrode placed trough the coronary sinus to the great cardiac vein. Due to a presence of RBBB+LAFB a decision was made to
introduce the electrode close to the intraventricular septum instead of typical left ventricular lead position (as in typical cardiac resynchronization) (white arrows).

Abbreviations: CW – continuous wave, LAFB – left anterior fascicular block, LAO – left anterior oblique, PA – posterior anterior, RAO – right anterior oblique, RBBB – right bundle branch block, TV – tricuspid valve.