

# Infective endocarditis of an aortic bioprosthesis causing life-threatening incessant junctional tachycardia: a case report

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Received 4 September 2020; first decision 21 September 2020; accepted 30 October 2020; online publish-ahead-of-print 30 November 2020

## Background

Infective endocarditis with paravalvular abscess can be complicated by atrioventricular block (AVB), but junctional ectopic tachycardia (JET) has as yet never been described.

## Case summary

A 68-year-old male recently admitted with *Staphylococcal aureus* endocarditis of his aortic valve bioprosthesis, presented with a regular tachycardia at 240 b.p.m. with a pre-existent right bundle branch block pattern. Haemodynamic collapse necessitated electrical cardioversion, following which high-grade AVB was observed. Multiple recurrences of the same tachycardia required repeated electrical cardioversions and emergent electrophysiological study, which indicated JET. The tachycardia was unresponsive to overdrive pacing, adenosine and intravenous amiodarone, and external cardioversions. Radiofrequency catheter ablation of the atrioventricular node was performed emergently with interruption of the tachycardia. A temporary external pacemaker was implanted via a jugular route. The tachycardia recurred after 48 h at a slower rate, and the patient underwent redo ablation. Transoesophageal echocardiography revealed a pseudoaneurysm of the right sinus of Valsalva probably corresponding to an evacuated abscess. A permanent pacemaker was implanted after active infection had been ruled out. At 3 months of follow-up, the patient had complete AVB, without arrhythmia recurrence.

## Discussion

This is the first case report of JET complicating a paravalvular abscess of the aortic valve with concomitant AVB. Junctional ectopic tachycardia is very rare arrhythmia which is usually seen in children as a congenital arrhythmia or following surgical correction of paediatric heart disease. The differential diagnosis is discussed in detail in the article.

## Keywords

Infective endocarditis • Paravalvular abscess • Junctional ectopic tachycardia • Atrioventricular node ablation • Radiofrequency catheter ablation • Case report

## Learning points

- Junctional ectopic tachycardia is a rare complication of paravalvular abscess of the aortic valve.
- The arrhythmia can result in haemodynamic collapse and may be unresponsive to intravenous drugs and external electrical cardioversion.
- Emergency radiofrequency catheter ablation may be required as a bailout solution.

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Handling Editor: John Camm

Peer-reviewers: Richard Ang and Konstantinos Iliodromitis

Compliance Editor: Kajaluxy Ananthan

Supplementary Material Editor: Ross Thomson

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## Introduction

Aortic valve endocarditis with a paravalvular abscess can be complicated by atrioventricular block (AVB) due to the proximity of the aortic root to the His bundle, which lies adjacent to the junction of the right and non-coronary cusps.<sup>1</sup> We hereby report a case of junctional ectopic tachycardia (JET) resulting in haemodynamic collapse, which was triggered by a pseudoaneurysm of the right sinus of Valsalva due to infective endocarditis of a bioprosthetic valve.

## Timeline

26 March 2020

Admission for fever, dyspnoea and dysarthria.  
Subsequent diagnosis of MSSA endocarditis of an aortic bioprosthesis, complicated by secondary haemorrhagic stroke due to septic embolus.  
Treatment by intravenous antibiotics (surgery impossible due to haemorrhagic stroke).

25 April 2020

Discharged for neurological rehabilitation.

29 April 2020

*H0–H6*: Admission to the emergency department for recurrent wide QRS complex tachycardia which required multiple synchronized electrical cardioversions (no response to intravenous adenosine).

*H6*: Emergent electrophysiology study with atrioventricular nodal catheter ablation for incessant junctional ectopic tachycardia (JET).  
Temporary pacemaker insertion.

4 May 2020

Recurrent JET requiring redo catheter ablation.

12 May 2020

Permanent pacemaker insertion.

27 August 2020

Pacemaker interrogation at 3 months.

## Case presentation

A 68-year-old male with biological aortic valve replacement due to severe aortic stenosis in 2013, right coronary artery disease and persistent atrial fibrillation had been recently hospitalized for methicillin-sensitive *Staphylococcus aureus* (MSSA) endocarditis of the aortic valve prosthesis, complicated by secondary haemorrhagic stroke, with Wernicke's aphasia due to septic embolization. The patient is treated conservatively by intravenous antibiotics (cefazolin and rifampicin), as cardiac surgery was contra-indicated due to the recent haemorrhagic stroke. He had been recently transferred to a neighbouring hospital for neurological rehabilitation.

The patient was admitted to our emergency department with 2 h of palpitations without chest pain. He was afebrile, with a heart rate

of 240 b.p.m., blood pressure of 105/70 mmHg, and respiratory rate of 22 breaths/min. Saturation was 93% and a rapid arterial blood gas test showed normal lactate levels and no electrolyte abnormality. The inflammatory markers were slightly elevated (white blood cells 11 G/L, C-reactive protein 45 mg/L). The electrocardiogram (ECG) revealed a regular wide QRS complex tachycardia ([Figure 1A](#)) with a right bundle branch block (RBBB) pattern which was identical to a recent ECG with known RBBB ([Figure 1B](#)). Vagal manoeuvres and adenosine injection (6–12–18 mg) were ineffective.<sup>2</sup> Rapidly, the patient presented signs of haemodynamic instability which necessitated synchronized electrical cardioversion (120 J) which resulted in asystole, required advanced cardiac life support. After 2 min of cardiopulmonary resuscitation and adrenaline injections (1 mg), spontaneous circulation resumed, and the patient was intubated. An ECG showed long PR intervals possibly with 2:1 AVB ([Figure 1C](#)).

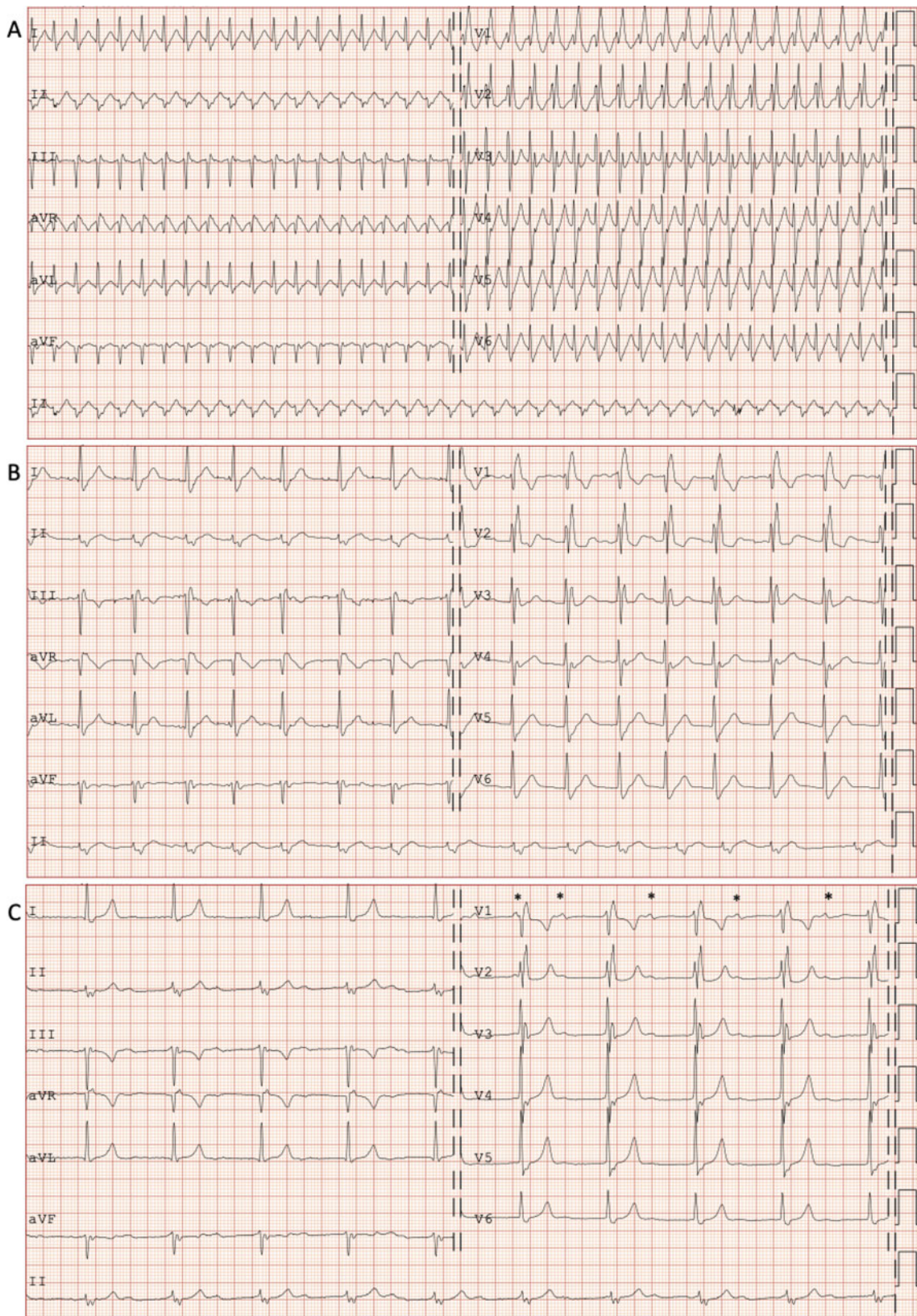
A transthoracic echocardiogram revealed normal left ventricular ejection fraction, an aortic bioprosthesis without dysfunction but dilation of the right sinus of Valsalva, possibly corresponding to a pseudoaneurysm ([Figure 2A and B](#)).

The patient was admitted to the intensive care unit for where he presented multiple recurrences of the same tachycardia, which required repeated synchronized electrical cardioversion and an increasing need for vasopressor drugs. The patient was urgently transferred to the electrophysiology lab. A temporary wire was inserted in the right ventricle, and the tachycardia recurred. The wire was pulled back to the right atrium, which showed ventriculoatrial (VA) dissociation ([Figure 3A](#)). Overdrive pacing from the right ventricular apex was ineffective. Synchronized shocks were either ineffective or were followed by re-initiation of the tachycardia almost immediately. Amiodarone 300 mg iv was administered, without effect. After 17 synchronized shocks and in this critical situation with haemodynamic collapse, emergency catheter ablation was performed (without an electro-anatomic mapping system). Due to the hypothesis of JET, the atrioventricular node (AVN) was targeted. A His potential was not visible, so the ablation catheter was positioned anatomically below the aortic prosthesis (the electrogram at the ablation site is shown in [Figure 3B](#)).

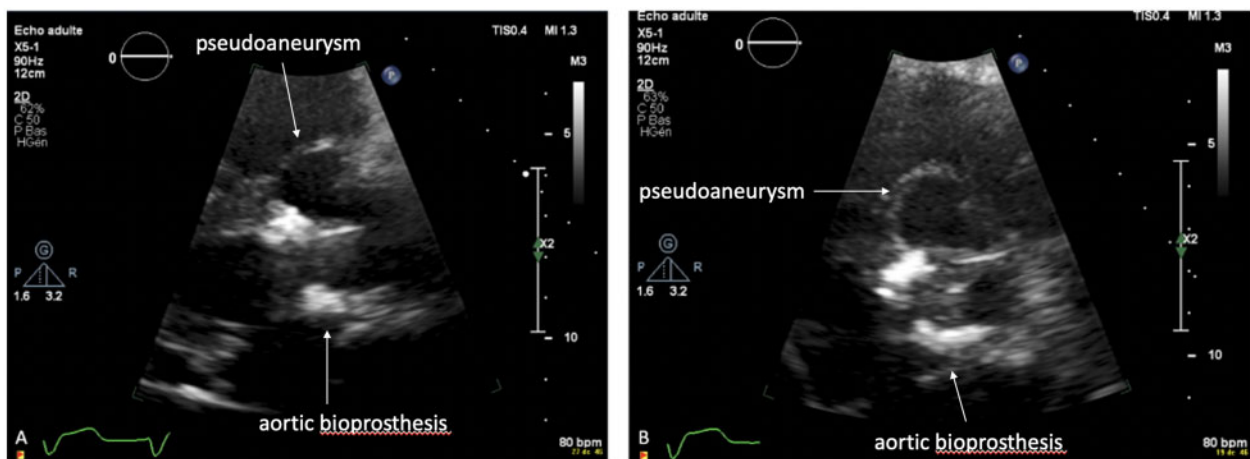
At the second application of non-irrigated radiofrequency energy at 30 W/60°C, the tachycardia stopped after 17 s ([Figure 3C](#)). The application was terminated after 20 s due to concern for perforation of the aortic root pseudoaneurysm. Fluoroscopy of the ablation site is shown in [Figure 4](#). The arrhythmia did not recur over the following 40 min. Temporary pacing via right jugular venous access was initiated by implanting an externalized pacemaker lead connected to an explanted pacemaker.

The arrhythmia recurred transiently after 2 days, albeit at a slower rate of 180 b.p.m. for up to 2 h and was better tolerated. A redo ablation was performed, without induction of the arrhythmia by programmed ventricular pacing or by isoprenaline infusion. A His potential was not visible, and ablation was performed at sites corresponding to the previous effective site at 25 W/50°.

Thereafter, blood cultures remained negative, and the patient remained afebrile, with implantation of permanent pacemaker after 2 weeks. The pacemaker interrogation at 3 months did not show any recurrence of arrhythmia. At 2 months, the ejection fraction was



**Figure 1** (A) Regular wide QRS complex tachycardia with a right bundle branch block pattern at admission. (B) Previous recent electrocardiogram in atrial fibrillation with right bundle branch block. (C) Long PR intervals with possible 2:1 atrioventricular block (with P waves hidden in the QRS complexes). Visible P waves are highlighted with the asterisks.



**Figure 2** (A) Transthoracic echocardiogram parasternal short axis centred on the aortic bioprosthesis, with dilation of the right sinus of Valsalva, possibly corresponding to a pseudoaneurysm. (B) Transthoracic echocardiogram parasternal long axis with dilatation of the right sinus of Valsalva.

65–70% and the patient was capable of walking and climbing stairs with assistance.

## Discussion

The differential diagnosis of the arrhythmia at presentation showing regular tachycardia with morphology identical to pre-existent bundle branch block was (i) atrial tachycardia/flutter, (ii) atrioventricular nodal tachycardia (AVNRT), (iii) atrioventricular re-entrant tachycardia (AVRT), (iv) JET, (v) intrahisian re-entry, and (vi) bundle branch re-entrant ventricular tachycardia. Ventricular tachycardia from a high septal area with activation of conduction tissue would have yielded fusion complexes with a different QRS morphology compared with intrinsic rhythm, due to local myocardial activation (by analogy, non-selective His bundle pacing yields different QRS complexes compared with intrinsic rhythm, especially in patients with underlying RBBB).

Atrial tachycardia/flutter, AVNRT, and AVRT were from the onset ruled out by high-grade AVB observed after cardioversion. Atrioventricular re-entrant tachycardia was also ruled out by VA dissociation, which has exceptionally been reported with AVNRT.<sup>3</sup> Longitudinal dissociation of the His bundle with intrahisian re-entry is theoretically possible, but has to our knowledge never been reported. Bundle branch re-entrant ventricular tachycardia with RBBB morphology has been described in patients after aortic valve surgery.<sup>4</sup> The circuit would involve retrograde conduction up the right bundle branch (assuming that retrograde conduction is preserved despite anterograde RBBB) and anterograde conduction down the left bundle branch. This was, however, unlikely due to efficacy of ablation at a site distant from the bundle branches. A re-entrant mechanism was also unlikely given the lack of efficacy of

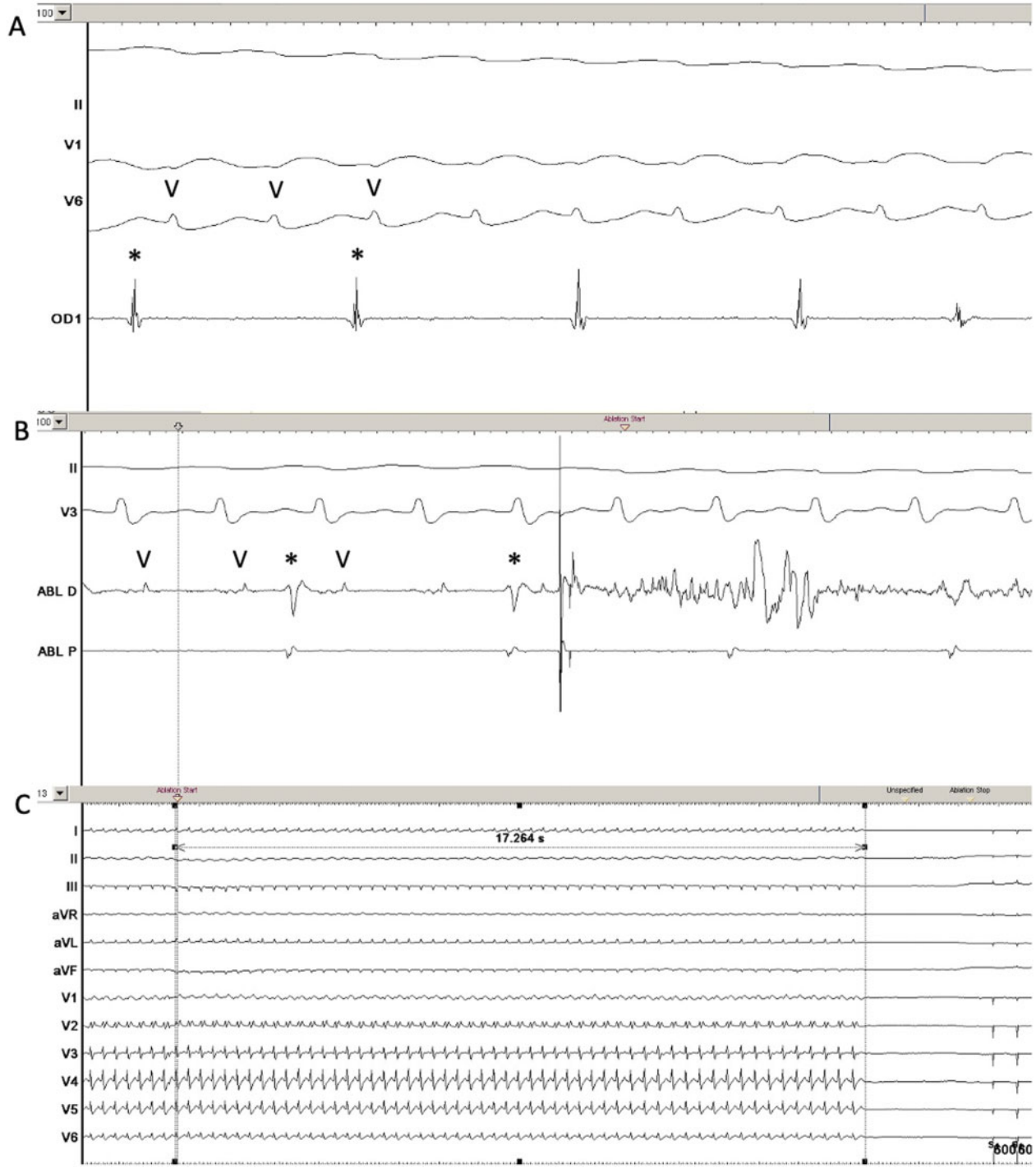
overdrive pacing (and in some instances of electrical cardioversion), non-inducibility by programmed ventricular stimulation, and spontaneous initiation without ectopic beats. These findings were, however, suggestive of automaticity, also due to the ‘warm-up’ phenomenon which was observed. Junctional ectopic tachycardia was also suggested by the efficacy of ablation at a site corresponding AVN. Due to haemodynamic collapse and the critical situation, detailed mapping for a His potential was not performed but the above-mentioned observations make JET the most likely diagnosis.

Junctional ectopic tachycardia has most often described in children, either as a congenital arrhythmia or after cardiac surgery.<sup>5</sup> Post-operative JET is attributed to direct trauma or stretch injury to the AVN, which was most probably the mechanism in our patient. Junctional ectopic tachycardia in an adult with structurally normal hearts is exceedingly rare.<sup>6,7</sup> Ectopic junctional rhythm has also been related to digoxin toxicity, due to delayed after depolarizations rather than automaticity.<sup>8</sup> Amiodarone is the therapy of choice, especially for post-operative JET,<sup>2</sup> but may be ineffective<sup>6</sup> as was the case in our patient.

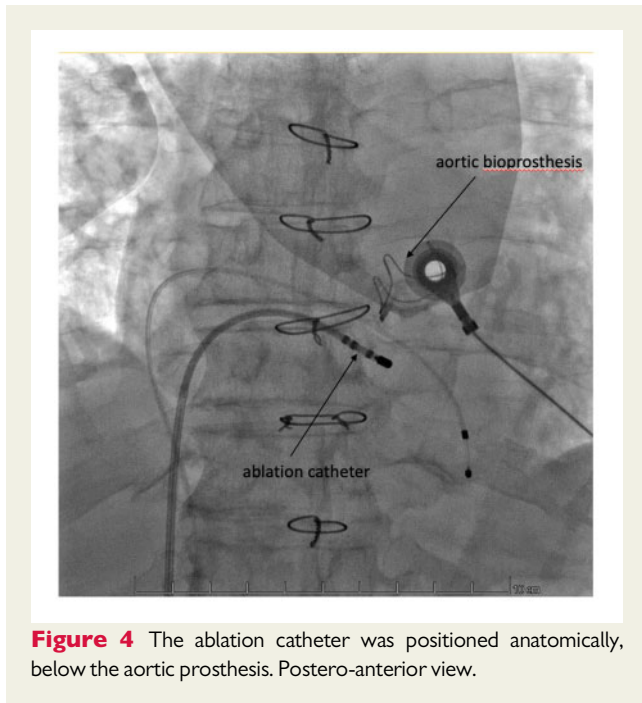
Radiofrequency ablation with sparing of atrioventricular conduction has been described.<sup>6</sup>

## Conclusion

This is the first case report of JET complicating a paravalvular abscess of the aortic valve. Atrioventricular block was found concomitantly. The arrhythmia resulted in haemodynamic collapse and was unresponsive to intravenous drugs and external electrical cardioversion. Emergency radiofrequency catheter ablation of the AVN was required as a bailout solution.



**Figure 3** (A) VA dissociation. (B) Electrograms at site of application of radiofrequency ablation. Note that the atrial potential (\*) is of higher amplitude than the ventricular potential (V), indicating a site in the atrium. Also, the local ventricular potential is late compared with QRS onset. (C) Interruption of the tachycardia after 17 s of radiofrequency application (30 W/60°C).



**Figure 4** The ablation catheter was positioned anatomically, below the aortic prosthesis. Postero-anterior view.

## Lead author biography



Quentin Chatelain is a graduate of the University of Geneva in Switzerland in 2015. He has completed his residency in Internal Medicine and has been undertaking his residency in Cardiology in Geneva University Hospital since 2019.

## Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

## Acknowledgements

The authors are grateful to our colleagues (Prof. D. Shah, Dr H. Müller, Dr G. Giannakopoulos, Dr V. Valiton), who contributed invaluable clinical information.

**Slide sets:** A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

**Consent:** The authors confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

**Conflict of interest:** none declared.

**Funding:** none declared.

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