

## Delay in the left-sided conduction system after TAVI masks right bundle-branch block

# Paradoxical QRS complex narrowing following transcatheter aortic valve implantation

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### Summary

Peri- or postprocedural conduction disorders following transcatheter aortic valve implantation remain frequent, and identification of electrocardiogram predictors of postinterventional high-degree atrioventricular block is challenging. Here we present a case of paradoxical normalisation of QRS complex duration following transcatheter aortic valve implantation, suggesting a high risk for subsequent complete atrioventricular block.

**Key words:** transcatheter aortic valve implantation; conduction disorders; left bundle branch block; complete atrioventricular block; permanent pacemaker implantation



### Introduction

Since the first procedure in 2002, transcatheter aortic valve implantation (TAVI) has evolved from an experimental procedure into a routine intervention with fewer complications and shorter hospital stay. However, the occurrence of peri- or postinterventional conduction disorders remains a concern, with a slightly higher occurrence in patients receiving self-expanding than balloon-expanding valves [1, 2]. New left bundle-branch block appears to be the most frequent conduction disorder reported, with an incidence ranging from 7 to 65% in the literature [3, 4]. Moreover, identification of electrocardiogram (ECG) predictors of postinterventional high-degree atrioventricular block (AVB) is still challenging, and postinterventional rhythm monitoring remains important. Here we present a case of paradoxical normalisation of QRS complex duration following TAVI suggesting nevertheless a high risk for subsequent complete AVB.

### Case report

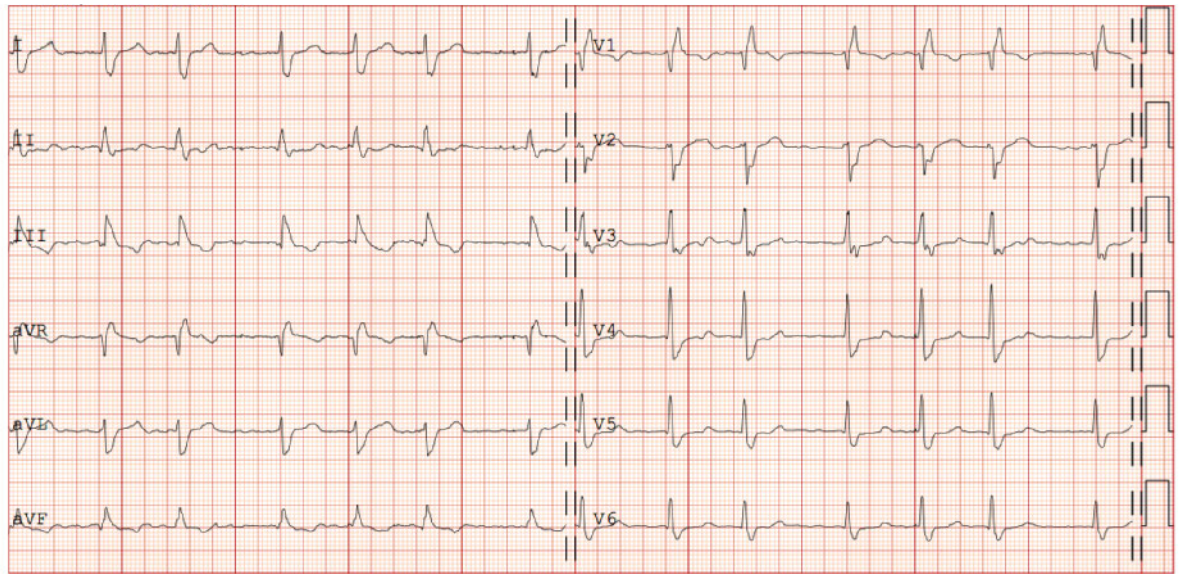
An 87-year-old man was admitted because of progressive disabling dyspnoea. Transthoracic echocardiogram revealed severe aortic stenosis with a low pres-

sure gradient and decreased left ventricular function (aortic valve area: 0.8 cm<sup>2</sup>; transvalvular mean gradient: 30 mm Hg; left ventricular ejection fraction: 42%, indexed cardiac output measured by means of cardiac catheterisation: 1.9 l/min/m<sup>2</sup>). The baseline ECG (fig. 1) showed atrial fibrillation and right bundle-branch block (RBBB) with QRS duration of 160 ms.

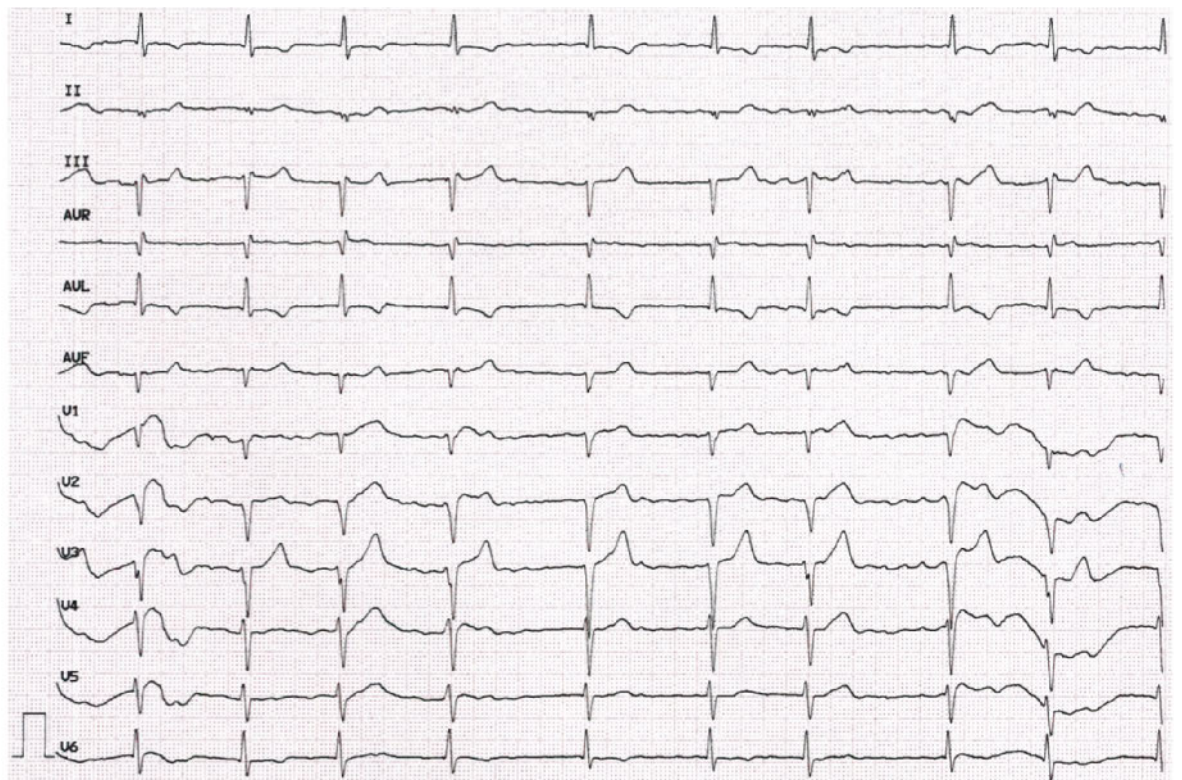
After evaluation by the heart team, in consideration of his age and frailty, left transfemoral TAVI was chosen as the appropriate treatment. At the beginning of the procedure, as is routine in our institution, a temporary transjugular ventricular pacemaker lead was implanted with use of a screw-in lead [5]. Thereafter, a 29-Evolut R (Medtronic Inc, MN, USA) bioprosthesis was successfully deployed under pacing at 100 bpm in an aortic annulus perimeter of 75 mm without predilatation. No valve repositioning was required as implantation depth was considered optimal (3 mm depth at the noncoronary cusp) with only mild postprocedural paravalvular leak.

Immediately after valve deployment, the patient developed transient, self-limiting, complete AVB. Surprisingly, the acute care unit admission ECG (fig. 2) revealed atrial fibrillation with a narrow QRS (100 ms). With respect to the new QRS morphology, the axis was deviated to the left from 95° (baseline) to -38° (postprocedural). In the context of atrial fibrillation, conduction delay could not be reflected by PR interval prolongation. Thus, an electrophysiological study was performed, which showed slight prolongation of the His-ventricle interval (60 ms). In the context of RBBB at baseline, paradoxical narrowing of the QRS complex was presumably secondary to the development of additional delay in the left-sided conduction system following TAVI leading to similar conduction delay in both bundle branches. However, an ECG 4 hours later showed a return to complete RBBB (fig. 3).

Even though QRS duration remained stable during follow-up, without additional conduction disturbances, a permanent pacemaker was implanted at day 2 because



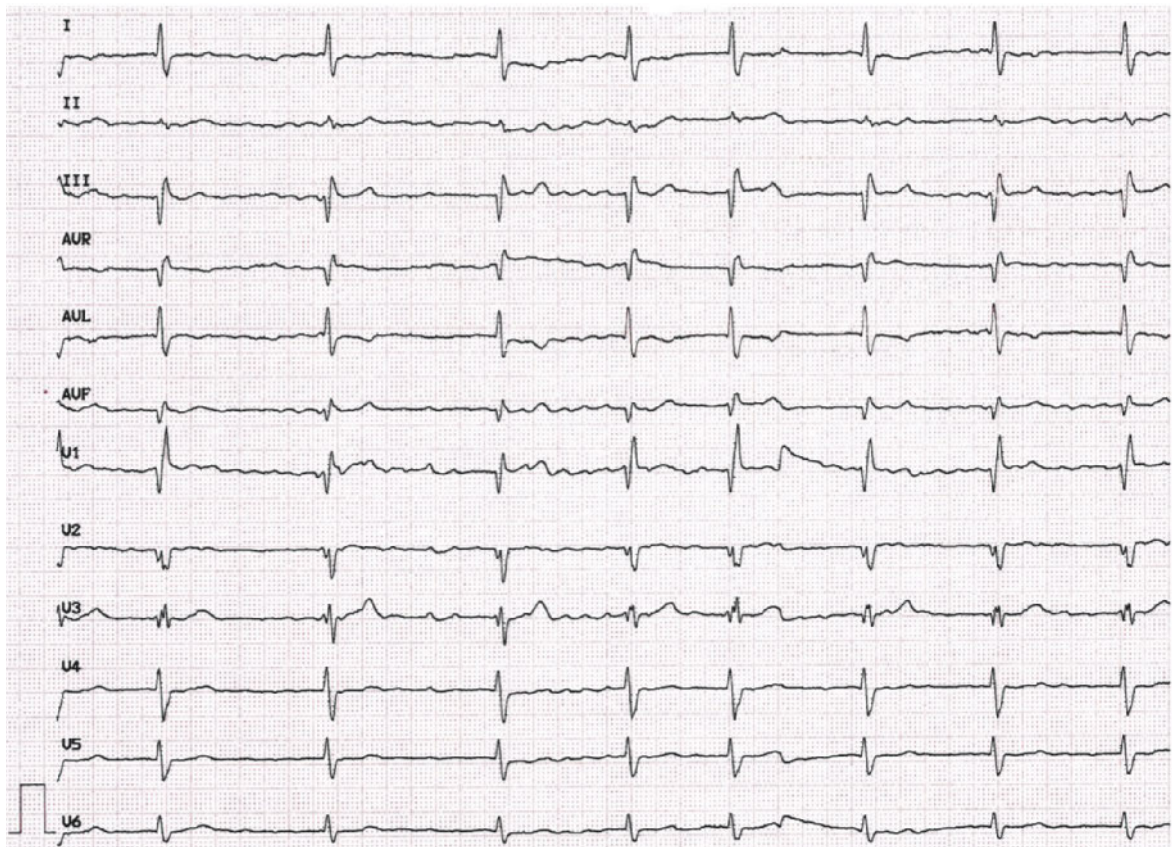
**Figure 1:** Baseline electrocardiogram showing atrial fibrillation with complete right bundle-branch block.



**Figure 2:** Immediate postprocedural electrocardiogram showing atrial fibrillation with complete right bundle-branch block and narrow QRS complexes.

of, at least, bifascicular dysfunction and a consequent significant risk of delayed high-degree AVB. The temporary pacemaker was retrieved at the time of the permanent pacemaker implantation. No other procedure-related complication was re-

ported. The pacemaker was programmed in a VVI mode with a baseline rate of 60 beats per minute. Control at discharge and 30-day follow-up reported a non pacemaker-dependant rhythm with a ventricular pacing percentage of 63 and 45%, respectively.



**Figure 3:** 4-hour postprocedural electrocardiogram showing relapsing complete right bundle-branch block.

## Discussion

In the context of the association between conduction disorders and negative outcomes, efforts were made to find predictors of conduction disorder. The height of prosthesis implantation was found to strongly predict the need of a permanent pacemaker [6]. Prior RBBB and prolonged PQ intervals have been identified as the main ECG predictors [7].

Our case, with a paradoxical transient QRS shortening, illustrates the difficulty of predicting high degree AVB when only the post-procedural ECG is considered. In a recent multicentre observational study, Toggweiler et al. suggested an algorithm for determining the need and duration of telemetry monitoring following TAVI [8]. According to their work, patients with a postprocedural ECG showing normocardic atrial fibrillation or sinus rhythm without bundle-branch block or AVB do not require telemetry. In our case, if the baseline ECG were not considered, one could have been misled by the immediate postprocedural paradoxical narrowing of QRS complexes.

Combined with the initial baseline ECG analysis, an electrophysiological study remains useful in unclear cases with borderline conduction disorders, as it might show prolonged His-ventricle delays. Conservative management could have been a reasonable option, on the basis of the recovery of the left-sided conduction system, but because of the self-limited transient periprocedural complete AVB and persistent RBBB, complete AVB was deemed likely and the patient was referred for permanent pacemaker implantation.

## Conclusion

The case presented here highlights the importance of an initial close monitoring following TAVI to detect new conduction disorders and identify patients at high risk of complete AVB.

### Disclosure statement

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### References

The full list of references is included in the online version of the article at [www.cardiovascmed.ch](http://www.cardiovascmed.ch).

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