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IMAGE FOCUS

Wearable smartwatch monitoring arrhythmias for patients who at high risk of pacemaker implantation after transcatheter aortic valve replacement

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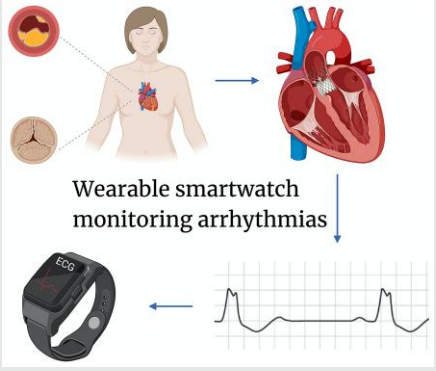
Graphical Abstract



A 72-year-old woman was admitted to the hospital due to exertional dyspnoea, which persists for 5 years and has worsened over the past 6 months. The patient had a medical history of hypertension and underwent a transcatheter aortic valve replacement (TAVR) procedure with a Venus A-valve (26 mm) implanted. Concurrently, coronary stenosis was observed, resulting in the implantation of stents in the left main artery and the left circumflex artery. Two days later, post-operative electrocardiogram (ECG) monitoring indicated the presence of new-onset left bundle branch blocks (LBBBs) (*Figure 1A*). Given the new-onset LBBB with long QRS duration (160 mm) after TAVR, remote health monitoring was recommended to the patient after discharge, utilizing a HUAWEI Watch GT 2 Pro series smartwatch. According to the previous periodic planning (SMART TAVR trial, NCT04454177), the patient was instructed to activate the smartwatch's electrocardiography recording by placing her finger on the digital crown. In addition, if patients experience any cardiovascular symptoms such as dyspnoea, chest pain, palpitations, dizziness, or presyncope, they must activate the SMART Watch readings. A designated heart team member would access the data via a cloud database and contact the patient if additional investigation or management appeared to be required. Post-TAVR, the patient received treatment with aspirin, clopidogrel, furosemide, spironolactone, and valsartan.

The patient underwent regular follow-ups after TAVR, and 1 month post-procedure, the ECG still exhibited LBBB (*Figure 1B*). Continuous smartwatch monitoring was maintained, and according to the data monitored by the smartwatch, the patient's ECG PR

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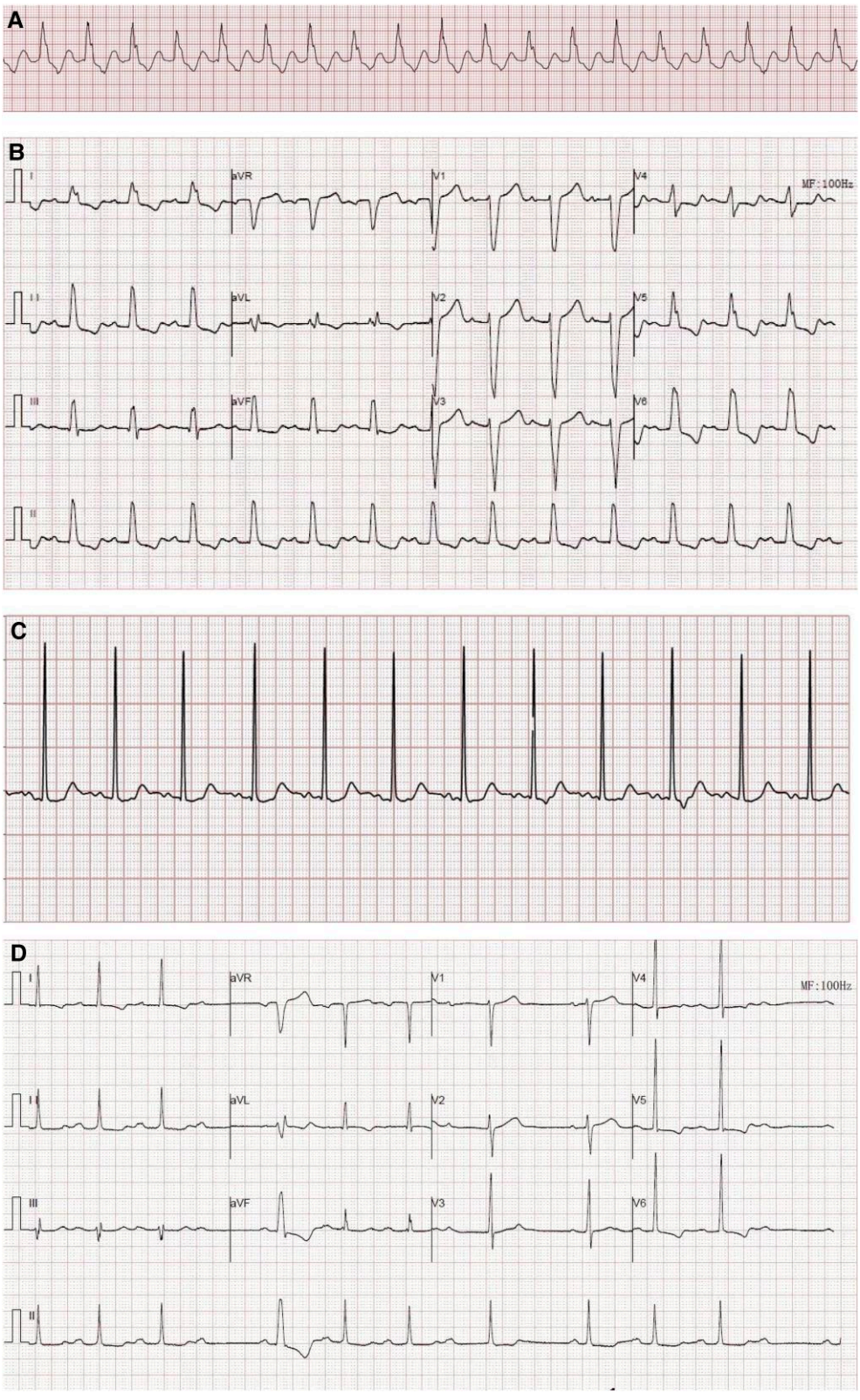

Figure 1 Post-transcatheter aortic valve replacement electrocardiogram. (*A*) Two days after transcatheter aortic valve replacement: new-onset left bundle branch blocks; (*B*) 1 month after transcatheter aortic valve replacement: left bundle branch blocks; (*C*) 11 months after transcatheter aortic valve replacement: sinus rhythm; (*D*) 13 months after transcatheter aortic valve replacement: Mobitz Type I second-degree atrioventricular block.

interval fluctuated in the range of 120–240 ms, the QRS width fluctuated in the range of 150–200 ms, and 33 episodes of Mobitz Type I second-degree atrioventricular block (AVB) were detected in the first year after TAVR. The patient's new-onset LBBB persisted until 11 months post-TAVR, with spontaneous recovery for LBBB and no progression to high-degree AVB at 11 months after TAVR (*Figure 1C*). Now, 13 months after the TAVR, the latest 12-lead ECG at clinic follow-up revealed that Mobitz Type I second-degree AVB and the new-onset LBBB have spontaneously resolved (*Figure 1D*). This is consistent with recovery times in previous studies.

New-onset LBBB was the most common conduction disturbance after TAVR and can progress to second-/third-degree AVB or disappear over time. Some studies have shown that patients in new-onset LBBB with QRS interval ≥150 ms had a high risk of developing late high-degree conduction defect and sudden death.[1–4] According to 2021 ESC guidelines, Class IIa recommends the use of ambulatory electrocardiographic monitoring in new LBBB patients with QRS >150 ms or PR >240 ms after TAVR.[5] Wearable devices such as smartwatches can enable remote monitoring of at-risk populations while providing critical alerts for events requiring immediate medical attention or hospitalization. Smartwatch monitoring is a potentially safe and cost-effective solution for early detection of new conduction abnormalities in the early post-TAVR discharge period. At the same time, non-continuous monitoring and the need for patient self-touch are also disadvantages.

Conflict of interest: None declared. Graphical abstract was created with biorender.com.

Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

References

1. Jørgensen TH, De Backer O, Gerds TA, Bieliauskas G, Svendsen JH, Søndergaard L, *et al.* Immediate post-procedural 12-lead electrocardiography as predictor of late conduction defects after transcatheter aortic valve replacement. *JACC Cardiovasc Interv* 2018;**11**: 1509–1518.
2. Urena M, Webb JG, Eltchaninoff H, Muñoz-García AJ, Bouleti C, Tamburino C, *et al.* Late cardiac death in patients undergoing transcatheter aortic valve replacement: incidence and predictors of advanced heart failure and sudden cardiac death. *J Am Coll Cardiol* 2015;**65**:437–448.
3. Auffret V, Puri R, Urena M, Chamandi C, Rodriguez-Gabella T, Philippon F, *et al.* Conduction disturbances after transcatheter aortic valve replacement: current Status and future perspectives. *Circulation* 2017;**136**:1049–1069.
4. Muntané-Carol G, Guimaraes L, Ferreira-Neto AN, Wintzer-Wehekind J, Junquera L, Del Val D, *et al.* How does new-onset left bundle branch block affect the outcomes of transcatheter aortic valve repair? *Expert Rev Med Devices* 2019;**16**:589–602.
5. Glikson M, Nielsen JC, Kronborg MB, Michowitz Y, Auricchio A, Barbash IM, *et al.* 2021 ESC guidelines on cardiac pacing and cardiac resynchronization therapy. *Eur Heart J* 2021; **42**:3427–3520.