CASE REPORT

Successful leadless pacemaker implantation in a patient with profound bradycardia following transcatheter aortic valve replacement and mitral valve-in-valve procedure

Transkateter aort kapak değişimi ve mitral kapak kapak içi prosedürü sonrasında derin bradikardi hastalarında başarılı kablosuz kalp pili uygulaması

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Summary– Leadless pacemakers provide a potential alternative to conventional transvenous pacemakers for patients undergoing high-risk transcatheter valve replacement procedures. This is a description of a successful leadless pacemaker implantation in a 51-year-old woman who developed profound bradycardia following a transcatheter aortic valve replacement and mitral valve-in-valve procedure.

Özet– Kablosuz kalp pilleri, yüksek riskli transkateter kapak değiştirme prosedürleri geçiren hastalar için geleneksel transvenöz kalp pillerine potansiyel bir alternatif sunar. Transkateter aort kapak değişimi ve mitral kapak kapakçığı prosedürünü takiben derin bradikardi gelişen 51 yaşında bir kadın hastada, başarılı bir kablosuz kalp pili uygulaması olgusu sunuldu.

The recent introduction of leadless pacemaker technology into real-world practice has proven to be safe and effective in appropriately selected patients.[1] The pacemaker and lead are integrated into a single unit in these systems, thereby minimizing the quantity of permanently implanted hardware and reducing the risks associated with the pacemaker pocket, leads, and connections.[2] The pacemaker is directly implanted into the right ventricle (RV) without the need for a subcutaneous pocket to contain the pacemaker generator. RV lead implantation may cause tricuspid valve (TV) dysfunction and an increase in tricuspid insufficiency.[3] Leadless pacemaker implantation may be a better choice by eliminating the need for a lead passing through the TV. This is a case report of successful leadless pacemaker implantation in a patient who underwent percutaneous-based treatment of both the aortic and mitral valves.

Abbreviations:

ECG	*Electrocardiogram*
RV	*Right ventricle*
TV	*Tricuspid valve*

CASE REPORT

A 51-year-old woman with a history of bioprosthetic mitral and aortic valve replacement and tricuspid ring annuloplasty presented at the outpatient clinic with shortness of breath, fatigue, and dyspnea. She had an irregular heart rate and low blood pressure (85/60 mmHg). A baseline 12-lead electrocardiogram (ECG) revealed atrial fibrillation with a rate of 80 bpm. A transthoracic echocardiogram revealed preserved left ventricular systolic function (Left ventricular ejection fraction: 50%), severe aortic and tricuspid valve regurgitation, tricuspid stenosis, and a high transmitral gradient (maximum gradient: 35 mmHg, mean gra-

Received: October 20, 2019 *Accepted:* January 29, 2020
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dient: 12 mmHg). The estimated pulmonary arterial systolic pressure was 60 mmHg. After a multidisciplinary team discussion, the patient was deemed a high risk for surgical valve replacement. A percutaneous-based approach to both the aortic and mitral valves and a percutaneous-based approach to the TV were planned.

The procedure was performed under general anesthesia with stand-by cardiopulmonary support. A temporary transvenous RV pacing wire was implanted. A successful transcatheter aortic valve replacement with a 26-mm Sapien 3 valve (Edwards Lifesciences, Irvine, CA, USA) was performed. Following the transseptal puncture, a mitral valve-in-valve implantation was also performed without complications. During the procedure, the patient developed profound bradycardia and became temporary pacemaker-dependent. Due to the pacemaker dependency, the percutaneous approach to the TV was postponed, and the patient was subsequently admitted to the coronary care unit. A post-procedure echocardiogram showed reduced gradients across the aortic (mean gradient: 6 mmHg) and mitral (mean gradient: 5 mmHg) valves, with no paravalvular leaks. The estimated pulmonary arterial systolic pressure was reduced to 40 mmHg. Severe tricuspid regurgitation and tricuspid stenosis were still present. At 7 days, the patient was still pacemaker-dependent. Therefore, a leadless pacemaker implantation was proposed, and the percutaneous approach to the TV was postponed.

The patient was transferred to the catheter laboratory for implantation of a Micra leadless pacemaker (Medtronic Inc., Minneapolis, MN, USA). The Micra leadless pacemaker was successfully implanted through the right femoral vein into the RV apical septum (Fig. 1b-f). The pacing threshold at implantation was 1.13 V at 0.24 milliseconds and the impedance was 630 Ohms. There was no native R wave for sensing. A tug test showed that 3/4 tines were connected to the RV muscle. The lead position was confirmed with

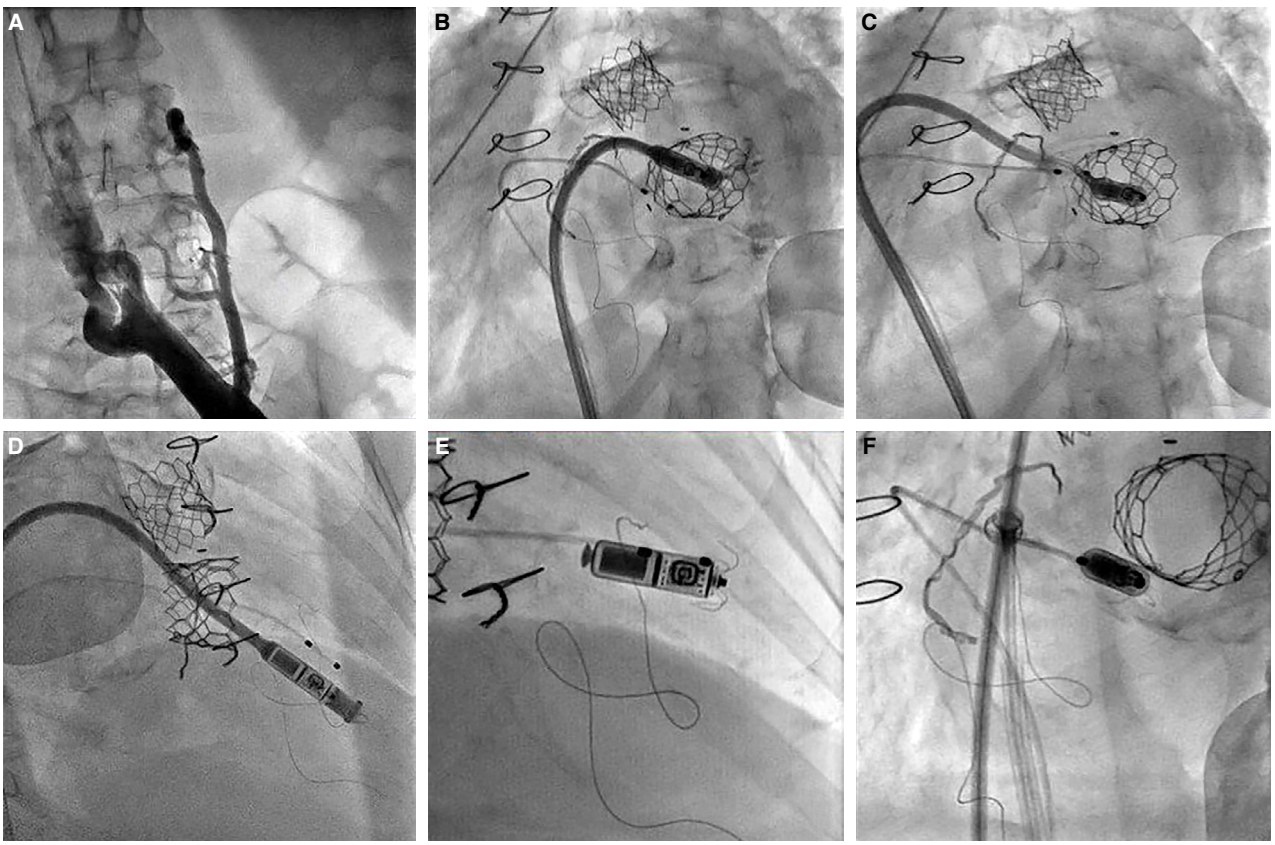

Figure 1. Step-by-step successful implantation of the leadless pacemaker. **(A)** Venogram performed via the left femoral vein revealing tortuous venous anatomy; **(B, C)** Left anterior oblique view (LAO) view showing the location of deployment of the leadless pacemaker; **(D)** Right anterior oblique (RAO) view showing the location of the device in the apical septum; **(E, F)** Deployed leadless pacemaker with opened tines in the RAO and LAO views, respectively.

both left and right anterior oblique views. The sheath and temporary wire were removed, and the access site was closed using a subcutaneous venous figure-8 suture. A post-procedure ECG documented a ventricular pacing rate of 60 bpm with narrow QRS morphology, supporting the septal position of the pacemaker. A chest X-ray confirmed a stable pacemaker position. There were no complications, and the patient was discharged on the ninth day of admission and scheduled for follow-up in the cardiac device clinic.

At a 6-week follow-up visit, the pacemaker demonstrated stable parameters, with a pacing threshold of 0.88 V at 0.24 milliseconds and an impedance of 710 Ohms, The patient was fully pacemaker-dependent. At a 6-month follow-up, an echocardiogram showed stable gradients across the aortic and mitral valves. The severity of the tricuspid regurgitation had decreased to a moderate level, and the estimated pulmonary arterial systolic pressure was reduced to 30 mmHg. The patient's New York Heart Association functional class improved to Class II. No further intervention was performed for the TV.

DISCUSSION

The advent of leadless cardiac pacemakers provides an attractive alternative to conventional transvenous pacemakers for patients undergoing high-risk transcatheter valve replacement procedures. Furthermore, a leadless pacemaker eliminates the risk of TV dysfunction. The recent approval of the Micra leadless pacemaker offers a potential solution to lead-related complications of conventional pacemakers in these patients. The safety and feasibility of leadless pacemakers have been well described in non-randomized studies.[4,5] Leadless pacemakers are an ideal alternative in patients with tachycardia-bradycardia syndrome, slow atrial fibrillation, and in patients with vascular access complications.[6] In our case, a leadless pacemaker implantation offered the potential for future percutaneous valve procedures involving the TV. Traditional transvenous lead implantation, while not contraindicated, may carry a heightened risk of lead shrinkage and valve erosion in patients with percutaneous TV implantation.[7] In order to avoid this risk, a transvenous lead may be implanted into the coronary sinus or an epicardial lead.[8,9]

A combined approach to the implantation of leadless pacemakers and transcatheter valvular interventions has been reported to be feasible and safe. Tang et al.[10] have described a successful transcatheter strategy to treat lead-associated severe tricuspid regurgitation using a leadless pacemaker and a MitraClip device (Abbott Vascular, Inc., Santa Clara, CA, USA). Kerwin et al.[11] described a case of leadless pacemaker implantation in a patient with a bioprosthetic TV. In our case, the issue of lead interference was resolved with the leadless pacemaker, providing the option of further percutaneous procedures if the TV becomes symptomatic.

Conclusion

Our case demonstrates that leadless pacemaker implantation can be a safe and feasible alternative to a traditional transvenous pacemaker and epicardial pacemaker implantation in patients undergoing transcatheter valvular intervention.

Disclosures

This case was selected the best case report presentation at the National Arrhythmia Meeting in Fethiye, Turkey on April 4, 2019.

Peer-review: Externally peer-reviewed.

Conflict-of-interest: None.

Informed Consent: Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

Authorship contributions: Concept: E.E.G.; Design: E.E.G., Y.B.H., S.H.; Supervision: E.E.G., O.A.; Materials: R.A.; Data collection: E.E.G., R.A., O.A.; Literature search: Y.B.H, S.H.; Writing: E.E.G., Y.B.H., S.H.; Critical revision: R.A., O.A.

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Keywords: Leadless pacemaker; mitral valve repair; transcatheter aortic valve replacement.

Anahtar sözcükler: Kablosuz kalp pili; mitral kapak onarımı; transkateter aort kapak değişimi.