


**CASE REPORT**

# Arteriovenous femoral fistula after insertion of leadless pacemaker—A case with an anomaly of the deep femoral artery

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Email: mourinho384@yahoo.co.jp**Abstract**

With the increasing number of implanted leadless pacemakers, complications related to the implantation procedure are being reported. We herein report a case of an 87-year-old male with an arteriovenous fistula after leadless pacemaker implantation due to an anomaly of the right deep femoral artery (DFA). In this present case, a right DFA arising from the antero-medial side of the main femoral artery was attributed to this complication.

**KEYWORDS**

anomaly, arteriovenous fistula, complications, leadless pacemaker

## 1 | INTRODUCTION

With the aging society, the prevalence of sick sinus syndrome is increasing. The leadless pacemaker is being used since 2013 for mainly bradycardia due to chronic atrial fibrillation. However, with the increasing use of the leadless pacemaker, complications due to leadless pacemaker insertions are sometimes reported.<sup>1</sup>

We herein report a case of an arteriovenous femoral fistula after insertion of a leadless pacemaker in a patient with an anomaly of the right deep femoral artery (DFA) arising from the antero-medial aspect of the common femoral artery.

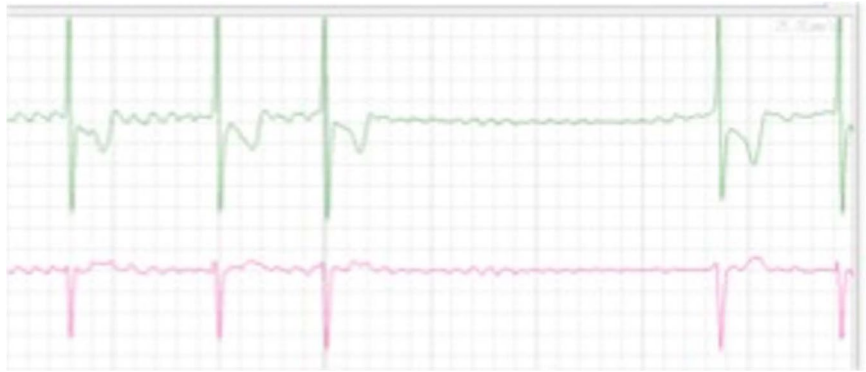
## 2 | CASE REPORT

An 87-year-old Japanese man with a history of chronic atrial fibrillation, hypertension, and aortic regurgitation status post aortic valve replacement was hospitalized for recurrent episodes of dizziness during his daily activities and exercises. His usual daily medication included warfarin (3.5 mg/day), azosemide (30 mg/day), spironolactone (25 mg/day). His 12-lead electrocardiogram showed bradycardia

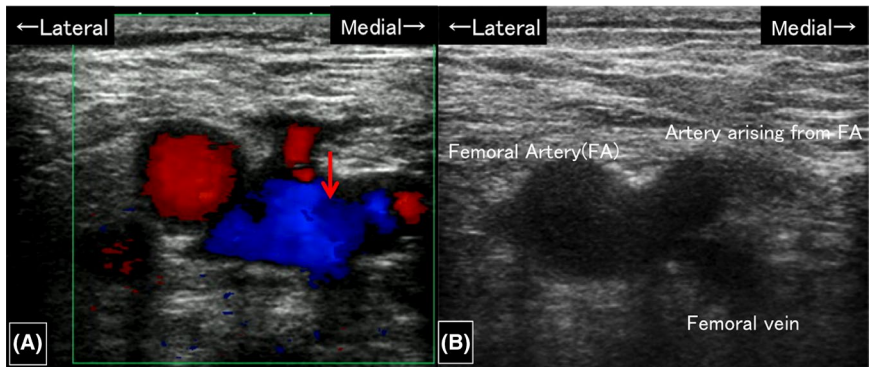
and atrial fibrillation. Twenty-four-hour Holter electrocardiogram revealed the total of 87 138 heart beats per day and pauses longer than 3.7 seconds in the daytime, which were considered to be the underlying cause of the recurrent episodes of dizziness (Figure 1). The presence of chronic atrial fibrillation with symptomatic ventricular pause that was suggestive of transient arterioventricular block made this patient a candidate for the placement of a leadless pacemaker. The right femoral vein was punctured with the anatomical landmark method, in which the physicians firstly identify the location of arterial pulsation below an inguinal ligament and then puncture the 1 cm medial side of the site since the femoral vein usually accompanies with the medial side of femoral artery. A guide wire and a 27 French steerable sheath were inserted under fluoroscopy. The leadless pacemaker (Micra Transcatheter pacing system, Medtronic, VVI setting; 60 bpm) was then deployed successfully. Amplitude and pacing threshold were in the normal range. No major bleeding was observed/reported from the puncture site during the procedure.

After removal of the large caliber sheath, subcutaneous Z-stitch was performed to achieve hemostasis. Soon after the removal of the sheath, arterial bleeding was observed from the puncture site despite manual compression after the venous sheath removal.

**FIGURE 1** Holter electrocardiogram showing the presence of chronic atrial fibrillation with ventricular pause that was suggestive of transient arterioventricular block



**FIGURE 2** A, Ultrasound echocardiography of the puncture site suggesting the presence of an arteriovenous fistula. Arrows show the shunt flow from an artery to a vein. B, One artery is thought to be arising from the antero-medial side of the right femoral artery



Although bleeding from the puncture site was stopped after three hours of compression, shunt sounds on suggesting the presence of an arteriovenous fistula (AVF) were observed. Sonographic assessment was subsequently performed, and the presence of an AVF was diagnosed (Figure 2).

Contrast computed tomography (CT) scan was performed to determine the cause/etiology of the fistula. CT scan revealed that the right DFA was branching off the medial side of the femoral artery 3 cm below the inguinal ligament, passing above the femoral vein (Figure 3). Simultaneous presence of contrast in both artery and vein revealed an AVF. Since the patient had no apparent symptoms other than mild pain and hematoma at the puncture site, it was decided not to perform an urgent fistula closure operation. Blood testing showed an increase in serum BNP (180 pg/mL to 813 pg/mL) due to the AVF. However, during the follow-up period of six months, the patient did not complain of any symptom, such as dizziness, puncture site pain, and dyspnea related to AVF.

### 3 | DISCUSSION

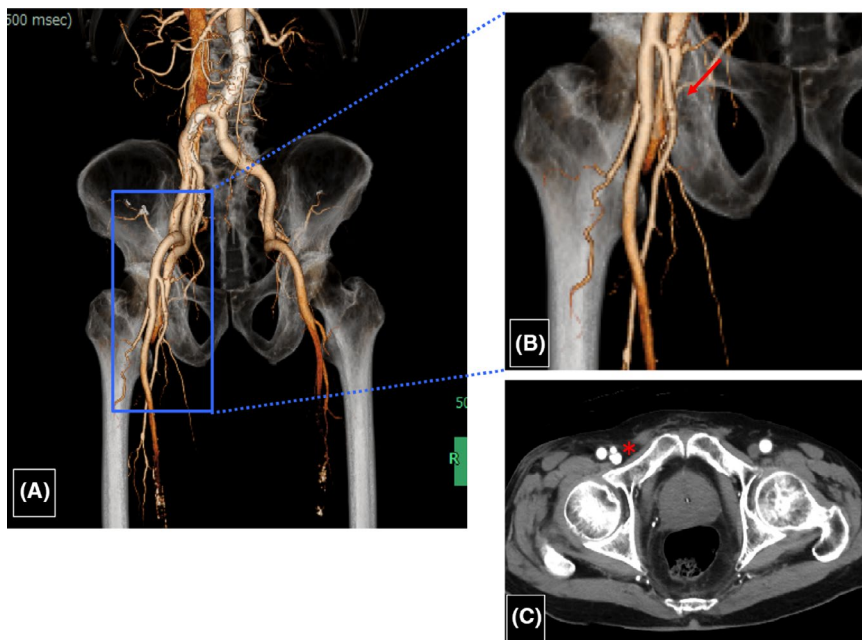
With the increasing number of bradycardia due to atrial fibrillation, the usage of leadless pacemaker has been increasing.

The sheath used for leadless pacemaker placement is thickest sheath available on the market, and therefore physicians must pay attention to potential vascular complications such as AVF, venous dissection, and vascular injury.

Based on previous reports,<sup>2,3</sup> the number of DFAs arising from the anterior side of the femoral artery is minimal. It is reported that in the majority of the cases, it arises from the lateral or posterior aspect of the femoral artery, 4 cm or 5 cm below the inguinal ligament. There are no previous dissection or angiography review studies mentioning the presence of a DFA originating from the anterior side of the FA. A meta-analysis study mentioned that approximately 2% ~ 4% of DFAs from the medial and posteromedial side of the FA, the percentage of DFAs originating from the anteromedial side is unknown.

In the present case, iatrogenic AVF was not closed with surgery or other procedure including endovascular stenting or embolization since the patient didn't complain any symptoms related to the fistula and significant enlargement was not observed during several months follow-up with ultrasound assessment. Generally, repair of AVF is indicated for patients with clinical symptoms related to the AVF such as steal syndrome causing claudication or distal limb ischemia, significant edema, heart failure due to a high-flow fistula, and progressive enlargement under ultrasound follow-up. Although the previous study mentioned that 38% of all fistula after the percutaneous coronary intervention with 7 or 8-French sheath were spontaneously closed,<sup>4</sup> the physicians have to carefully consider the indication of repair procedure of large AVF regardless of the symptom in the similar case.

In the current era, numerous clinicians use central ultrasound-guided venous catheter cannulation instead of the landmark method cannulation. Recent reports suggest that real-time ultrasound-guided catheterization of the central vein is superior in safety



**FIGURE 3** A, Three-dimensional contrast computed tomography (CT) performed after the leadless pacemaker procedure revealed that the patient's right deep femoral artery (DFA) arises from the antero-medial side of the femoral artery as well as the presence of an arteriovenous fistula illustrated by simultaneous presence of contrast in both artery and vein. B, Red arrow suggests the puncture site, where the right DFA overlaps the right femoral vein. C, Axial CT scan revealed the overlapped DFA arising from antero-medial side of main femoral artery and matched the image of ultrasonography (Figure 2B). Asterisk (\*) suggests the puncture site

to both quick-look ultrasound technique and landmark insertion method.<sup>5,6</sup>

In this case, a fistula closure procedure was not performed because the patient did not complain of any symptoms related to the fistula.

It is important for physicians to pay attention to the minor anomalies of the femoral artery and use the ultrasound-guided method for catheterization procedure.

#### CONFLICT OF INTEREST

The authors declare no conflict of interests for this article.

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