DEVICE THERAPY

COMPLEX CASE STUDY

Acute Thrombosis in a Subclavian Vein Caused by an Implantable Cardiac Defibrillator Lead Extraction

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ABSTRACT. As the prevalence of cardiovascular diseases is increasing in the older population, the number of patients requiring implantable cardioverter-defibrillators (ICDs) is significantly higher. It is occasionally necessary to remove defibrillator leads. We present a rare case of a subclavian vein thrombus manifested during an ICD lead extraction in a 75-year-old male. The “so-called” right ventricle lead was found to be originally placed in one of the coronary sinus branches and was pacing the left ventricle. Unfortunately, after the right atrial lead was removed and access was lost, multiple attempts were done to establish a new venous access through the left cephalic and then subclavian veins, aiming to place a new right ventricular high voltage lead for resynchronization therapy purposes. Intravenous unfractionated heparin was prophylactically used. During the procedure, a new right ventricular coil lead and a new right atrial lead were eventually placed. Incidentally, during fluoroscopy, the patient was found to have multiple mobile thrombi in his left subclavian vein. However, 2 weeks before the scheduled procedure, no thrombi were seen. The patient was continued on continuous intravenous heparin along with Coumadin and then was discharged home in a stable condition.

KEYWORDS. implantable cardioverter-defibrillator indications, implantable cardioverter-defibrillator lead extraction complications, subclavian vein thrombosis.

Introduction

As the prevalence of cardiovascular diseases is increasing in the older population, the number of patients requiring implantable cardioverter-defibrillators (ICDs) is significantly higher. The conventional indications for ICD implantation include patients with cardiomyopathy who have left ventricular ejection fraction (LVEF) ≤35% and New York Heart Association (NYHA) functional class II or III on optimal medical treatment for 90 days in non-ischemic cardiomyopathy and 40 days after coronary artery revascularization in patients with ischemic cardiomyopathy.1 This category of patients with advanced heart failure has a higher hospital admission rate, longer hospitalization stay, and frequent need for intravenous access. These facts are associated with the higher incidence of infection. It is occasionally necessary to remove defibrillator leads, most often because of infection or mechanical lead failure. We present a rare case of a subclavian vein thrombus manifested during an ICD lead extraction.

Case report

A 75-year-old male with a history of hypertension, diabetes mellitus, and non-ischemic cardiomyopathy with LVEF of 25% was admitted to the hospital for an elective upgrade of his pacemaker to a biventricular ICD. He had been experiencing progressive shortness of
breath, general fatigue, and dizziness for several weeks prior to admission despite documented compliance with his medical regimen.

The “so-called” right ventricle (RV) lead was found to have been originally placed in one of the coronary sinus branches and pacing the left ventricle (LV), as confirmed by the electrocardiogram morphology of the QRS with right bundle branch block pattern and by fluoroscopy in the left anterior oblique (LAO) view.

**Procedure details**

The right atrial (RA) lead was extracted using the laser technique in an attempt to preserve venous access for placement of the new lead.

Knowing that there was a total occlusion of the subclavian vein, confirmed by venogram under fluoroscopy 2 weeks prior to the planned procedure, we decided to perform RA lead extraction and use its venous tract as new access for the placement of the RV coil high-voltage lead in an attempt to upgrade his pacemaker to a biventricular ICD.

The “so-called” RV lead was found to be originally placed in the left posterior coronary sinus branch location and was functioning as an LV lead.

Unfortunately, after the right atrial lead was extracted, venous access was accidentally lost. Multiple attempts over a period of 30 min to establish new venous access through the left cephalic and then subclavian veins were carried out; finally access was gained.

Owing to the lengthy procedure and multiple vascular punctures, intravenous unfractionated heparin was used prophylactically.

A new RV coil lead and a new RA lead were eventually placed after using angiography guidance. Incidentally, during a venogram using fluoroscopy, we found multiple mobile thrombi in his left subclavian vein demonstrated on the angiogram real time images taken after lead extraction (**Figure 1**). Two weeks before the scheduled procedure, the patient had a diagnostic venogram of his left subclavian vein for confirming access availability for lead extraction. However, no thrombi were found at that time.

After the new venographic finding of multiple thrombi in his subclavian vein, intravenous heparin was continued along with Coumadin. The patient was observed overnight in the coronary care unit. A repeated echocardiogram showed an LVEF of 35–40%. No arrhythmias or other complications had been noted. He was discharged home fully anticoagulated in a stable condition.

**Discussion**

Lead extraction is a complex surgical procedure with some unavoidable risks. Each time the lead is separated from scar tissue, there is a small chance of tearing the surrounding blood vessel or perforating the heart. Other major complications include blood clot formation and clot dislodging in the lung causing pulmonary embolism, acute stroke, severe tricuspid regurgitation, and myocardial perforation leading to bloody pericardial effusion that can cause cardiac tamponade and death. Less serious problems that have been reported include mild pericardial or pleural effusion, hematoma at the wound site, swelling of the arm, and a small amount of air entry into the vein. Our case described a rare complication of an ICD lead extraction that resulted in an acute thrombus formation in a subclavian vein triggered and precipitated by prolonged lead extraction and access establishment attempts.

**References**