Case Report

Innovative Endovascular Defibrillator Lead Use in Superior Vena Cava Obstruction

Tomasz Stys, Shalini Kapoor, Danielle Carter-Adkins, and Roman T. Pachulski
Department of Medicine, State University of New York at Stony Brook, NY

Abstract. Background: We describe an unusual case of severe heart failure (HF) and rapid atrial fibrillation (AF) improved through ablation and pacemaker implant despite superior vena cava obstruction (SVCO).

Methods: SVCO precluded upper body venous access to the heart for procedural rate control. Both AV Junctional ablation and permanent endovascular lead placement were achieved through the inferior vena cava (IVC).

Results: Clinical improvement from NYHA Class IV to Class II HF was observed with effective nonpharmacologic ventricular rate control.

Conclusions: HF patients with rapid AF and SVCO can achieve ventricular rate control through lower body venous access to the heart utilizing 100-cm endovascular defibrillator rate sensing leads.

Key Words: pacemaker, SVC obstruction, atrial fibrillation, heart failure

Introduction

There has been recent emphasis on device based heart failure (HF) therapy for patients with left bundle branch block using potentially costly three chamber pacemakers (PM) [1]. Simpler interventions in larger numbers of HF patients with rapid atrial fibrillation (AF) are often possible. PM implant following radiofrequency ablation of the AV junction is an accepted means of achieving persistent nonpharmacologic ventricular rate control. Direct benefits include rate reduction and regularity shown to improve ejection fraction [2]. Indirect benefits may include discontinuation of negative inotropic medications used for rate control.

Traditional pacemaker pulse generator placement in the infraclavicular fossa affords stable access, bony protection and avoids crossing joint creases [3,4]. Superior vena cava obstruction (SVCO) precludes upper body venous cannulation for cardiac access [5,6]. Transfemoral access often requires lead lengths greater than available with permanent pacemaker leads. We describe an unusual case in which the combination of SVCO and left hemiparesis led to successful left thigh pacemaker implant utilizing a 100 cm endovascular defibrillator rate sensing lead.

Case Report

A 64 year old gentleman with history of Marfan’s syndrome, repaired thoracic aortic dissection, mechanical aortic valve replacement and coronary artery bypass grafting, and left hemiparesis was admitted with NYHA Class IV congestive heart failure with medically refractory rapid AF. The patient was referred for AV Junction ablation and permanent pacemaker implantation.

Due to radiographic persistence of the aortic arch aneurysm, left subclavian access was not attempted. Right subclavian vein access was obtained without difficulty; however, the guidewire would not pass beyond the level of the junction of the azygous and the superior vena cava. A right internal jugular venogram was performed (Fig. 1) demonstrating superior vena cava obstruction with only trivial runoff to the right atrium. The procedure was abandoned because upper body venous access to the heart was insufficient to permit lead placement. Surgery was consulted for epicardial lead placement, but felt the patient was not well enough for thoracotomy.

The patient was therefore returned to the electrophysiology lab and a pulse generator pocket was formed in the subcutaneous fat of the hemiparetic left thigh. A 100-cm bipolar pacing and defibrillation lead (Oscor RX100TBV), was placed in the right ventricular apex from the left femoral vein under fluoroscopic control. The 10 Fr peel-away sheath and guide wire were removed. The

Address for correspondence: Roman T. Pachulski, M.D., F.A.C.C., Director of Arrhythmia Services and Electrophysiology Laboratory, Health Sciences Center T-17-020, SUNY Stony Brook, Stony Brook, New York 11794-8171. E-mail: roman01866@aol.com

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**Fig. 1.** Right internal jugular venogram showing gross dilatation and superior vena cava obstruction (white arrow). Also shows radiopaque marker of gauze in right infraclavicular pacemaker pocket.

**Fig. 2.** RAO projection fluoroscopy image showing superficial electrodes (●), superficial ablation patch electrode (□), sternal wire sutures and Star-Edwards valve in the aortic position. White arrow points to temporary right ventricular quadripolar catheter placed for pacing support during ablation. Black dotted arrow points to radiofrequency energy delivery catheter at AV junction. Black solid arrow points to permanent right ventricular bipolar pacing catheter. All endovascular catheters placed via the inferior vena cava.