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Case Report

Extraction of an Infected Active Fixation Coronary Sinus Lead with the Aid of a Tissue Stabilizer

Abstract

We present a 49-year-old man who required extraction of a cardiac resynchronization device due to lead infection. While 2 leads were successfully retrieved by a transvenous approach the third one with active fixation and entrapped into a coronary sinus side-branch, required surgical intervention. During the operation, performed on cardiopulmonary bypass on a beating heart, lead extraction was greatly facilitated by employment of a tissue stabilizer routinely used for off-pump coronary surgery.

Introduction

Coronary sinus (CS) lead implantation for cardiac resynchronization therapy (CRT) is associated with a significant rate of lead dislodgment [1,2]. The use of a lead with an active-fixation mechanism (e.g. deployable polyurethane lobes on the lead body) inserted into a CS branch allows reduction of lead dislodgment rate and decreases the risk of loss of pacing and phrenic nerve stimulation [3]. Because of fibrotic adhesions between polyurethane lobes and coronary sinus endothelium removal of implanted active-fixation leads, at variance with those with passive-fixation, may be technically challenging and sometimes it cannot be performed transvenously thus requiring surgical intervention [4].

We describe the case of a patient with an infected CRT device who required surgical removal of an active-fixation lead, entrapped into a CS collateral vein on cardiopulmonary bypass and beating heart; lead extraction was greatly facilitated by the use of a tissue stabilizer.

Case Report

A 49-year-old male was admitted to our hospital in October 2015 to perform a lead extraction procedure for a CRT device-related infection. In 2008, after evidence of dilated cardiomyopathy he received a CRT defibrillator employing three different leads among which an Attain StarFix™ Model 4195 (*Medtronic Inc., Minneapolis, MN, USA)* was implanted; this is an unipolar lead with an extendable active fixation mechanism through small polyurethane lobes which, after deployment, are conceived to firmly fixate the lead into a CS venous collateral. The patient had a good clinical response to the CRT therapy but after 5 years he had a reintervention to fix a traumatic fracture of the StarFix™ lead; after 14 months signs of local pocket infection appeared without signs or symptoms of systemic infection (white cells 7660/uL, ESR 12 mm/hr, procalcytonin 0,10 ng/ml). Hospital admission was performed to extract the entire CRT system. The generator was removed and transvenous extraction of the leads was attempted. Two of the three leads were completely removed with conventional mechanical dilatation [4], however, multiple attempts to remove the StarFix™ lead were unsuccessful since it appeared to be entrapped into a CS side-branch most likely occluded by thrombosis (Figure 1). Therefore surgical extraction of the lead was considered indicated.

The procedure was performed through a standard median sternotomy; an intraoperative trans-esophageal echocardiogram showed a 30% ejection fraction with moderate mitral regurgitation. Due to the hemodynamic instability during cardiac manipulation it was decided to perform lead extraction on pump with a beating heart. The ascending aorta and the right atrium were cannulated and normothermic cardiopulmonary bypass instituted. The heart was then lifted upwards and on the right side exposing the distal part of the lead which was entrapped into the posterior left ventricular coronary vein. To facilitate lead extraction an Octopus Tissue Stabilizer® (*Medtronic Inc., Minneapolis, MN, USA*) was used for focal immobilization of the ventricular wall; a 4 cm incision of the vein confirmed vein thrombosis and exposed the lead which was isolated and could be removed only after dissection of the fixing polyurethane lobes which were incorporated in the vein wall (Figure 2). A new bipolar drug-eluting MyoDex 1084T epicardial lead (*St. Jude Medical, Saint Paul, MN, USA)* was

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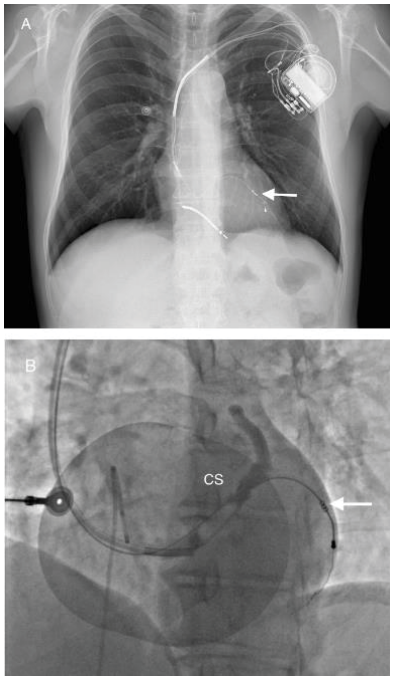

Figure 1: A) Chest x-ray in the postero-anterior projection showing the leads and the device. The white arrow indicates the lead positioned into a coronary sinus (CS) collateral vein. B) CS venogram showing thrombotic occlusion of the CS side-branch where the active-fixation lead is located (white arrow).

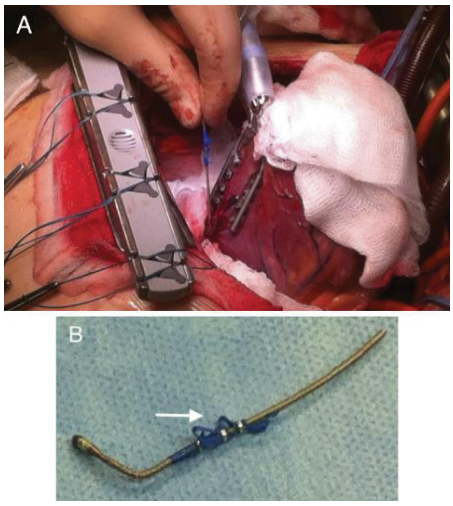

Figure 2: A) Intraoperative view showing the retracted heart with the Octopus Tissue Stabilizer® used during lead extraction.
B) Distal part of the extracted lead together with its polyurethane lobes (white arrow).

screwed in the lateral wall of the left ventricle and tunnelled in the right prepectoral region for the connection to a new CRT device. The patient was weaned from bypass without difficulty and the post-operative course was uneventful.

Discussion

The Attain Starfix™ Model 4195 is a steroid eluting unipolar CS lead with an active-fixation mechanism by means of three soft polyurethane lobes near its tip which allow the lead to be fixed once positioned into a CS collateral vein. While deployment and removal of such lead has been reported to be achieved successfully in the acute setting [3], information regarding both function of the fixation mechanism and easiness of lead removal in the long-term are limited [3]. As shown previously [5] transvenous extraction of the StarFix™ lead may be extremely challenging requiring complex mechanical dilatation techniques in order to completely remove it without fracturing and dislodgement of the polyurethane lobes. Furthermore, as showed by venography also in the present case, this particular lead is often associated with a significant thrombotic reaction with chronic occlusion of the CS vein branch and lead entrapment [5]. Cronin et al. described CS vein occlusion and fibrotic adhesions between polyurethane lobes and CS endothelium as an important mechanism making transvenous lead extraction extremely difficult and preventing implantation of a new lead in the same CS vein branch [6].

Many techniques to perform transvenous lead removal have been proposed, ranging from isolated direct manual traction to use of locking stylets, to cutting or laser extraction sheaths [6]. However, when transvenous lead extraction results unsuccessful surgical intervention is necessarily required. In this respect, Maytin et al. have reported a thoracoscopic approach, through a left anterior and mid axillary access, for surgical extraction of a CS lead [3]. In the present case extraction of a CRT device was mandatory because of infection. Removal of the endocardial leads by a transvenous approach resulted in failure to extract one active-fixation lead entrapped into a CS collateral. Surgical extraction was therefore required which was performed with the aid of cardiopulmonary bypass without arresting the heart, due to the need of heart manipulation in the presence of a dilated and hemodynamically unstable left ventricle. Operation was greatly facilitated by employment of a tissue stabilizer, commonly used during off-pump myocardial revascularization procedures; this provided a quiet operative field, allowing complete removal of the lead together with its polyurethane lobes thus contributing to eradicate the infection and furthermore avoided the need for cardioplegic arrest.

The present case describes a potential complication of an active-fixation pacing lead suggesting a further use of the Octopus TissueStabilizer®.

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