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The Bridge Occlusion Balloon as a safety net in a high-risk transvenous lead extraction procedure

Simon Pecha*, Julia Vogler, Hermann Reichenspurner and Samer Hakmi

Department of Cardiovascular Surgery, University Heart Center Hamburg, Hamburg, Germany

* Corresponding author. Department of Cardiovascular Surgery, University Heart Center Hamburg, Martinistraße 52, 20246 Hamburg, Germany. Tel: +49-040-741058585; e-mail: s.pecha@uke.de (S. Pecha).

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Abstract

Injuries to the superior vena cava (SVC) during transvenous lead extraction (TLE) procedures are a rare but life-threatening complication. The Bridge Occlusion Balloon (BOB) is specifically designed for temporary SVC occlusion in TLE procedures. We report the first case of a 27-year-old man using the BOB as a safety net in a high-risk TLE procedure. This patient, with a congenitally corrected transposition of the great arteries and a third-degree atrioventricular block, presented with 4 dysfunctional pacemaker leads, venous stenosis and the necessity for a new pacemaker system. The leads were implanted for 10 and 19 years. The BOB was placed with a radiopaque marker at the cavoatrial junction and was inflated with 46 ml of an 80/20 saline/contrast agent mixture. An angiography was performed to confirm SVC occlusion. With the deflated balloon in place, the TLE procedure with laser and mechanical sheaths was performed. Successful extraction of 2 dysfunctional leads, as well as venous recanalization, for the new right atrial and right ventricular lead implantation was achieved. We have shown the feasibility of using powered extraction sheaths with a deflated BOB in place. This allows for immediate balloon inflation, in case of an SVC perforation.

Keywords: Bridge Occlusion Balloon • Superior vena cava • Lead extraction

INTRODUCTION

The most common site for vessel injury during lead extraction procedures is the superior vena cava (SVC). This complication mostly results in acute haemodynamic compromise with the necessity for emergent open surgical repair [1, 2].

The Bridge Occlusion Balloon (BOB) (Spectranetics Corporation, Colorado Springs, CO, USA) was specifically designed for temporary SVC occlusion during transvenous lead extraction (TLE). We here report the use of a BOB as a safety net in a high-risk TLE procedure.

CASE PRESENTATION

A 27-year-old male patient with congenitally corrected transposition of the great arteries and pacemaker dependency due to third-degree atrioventricular-block presented with 4 dysfunctional leads (2 right atrial and 2 right ventricular leads, all with an exit block), implanted 10 and 19 years ago. Furthermore, venous stenosis of the left subclavian vein and innominate vein was seen. The patient needed recanalization of the vein, and new implantation of a right atrial and right ventricular lead.

A 12-Fr sheath was introduced via the right femoral vein for placement of the BOB. A 6-Fr sheath was placed in the left femoral vein for temporary pacing with an additional 4-Fr sheath in the left femoral artery for safety reasons, if emergent cardiopulmonary bypass is needed (Fig. 1).

The BOB was then advanced via the 12-Fr sheath to the SVC area. The radiopaque marker was placed at the cavoatrial junction, and the BOB was inflated with 46 ml of an 80/20 saline/

Figure 1: Preparation of the femoral groin with vascular sheaths.

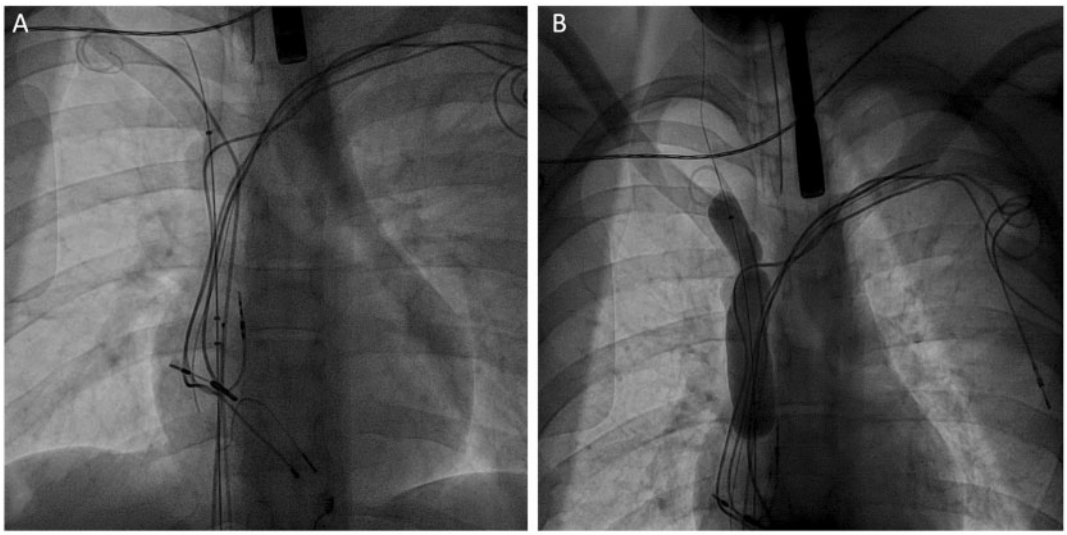

Figure 2: (**A**) Deflated Bridge Occlusion Balloon (BOB) in the superior vena cava (SVC). (**B**) Inflated BOB in the SVC area.

contrast agent mixture. Correct positioning and vessel occlusion were confirmed by venography (Fig. 2). No haemodynamic compromise was observed during 30 s of balloon inflation.

After deflation of the balloon, lead extraction was started with a 14-Fr, 80-Hz GlideLight laser sheaths. Aggressive calcified adhesions at SVC site necessitated the use of a mechanical extraction sheath, TightRail 11 Fr. Two leads were successfully extracted, allowing for recanalization of the stenotic vein and facilitating transvenous new implantation of a right atrial and a right ventricular lead. After the procedure, the balloon was checked for integrity, and no damage or leakage was present. The patient was extubated in the operating room, and further postoperative course was uneventful.

DISCUSSION

We have shown that the use of the BOB as a safety net in high-risk TLE procedures is safe and feasible. The extraction can be performed with the deflated occlusion balloon in place. In case of SVC perforation, the balloon can be immediately inflated, without loss of time for insertion or positioning of the balloon. The short time of inflation for balloon positioning was not associated with haemodynamic compromise. Furthermore, no short-term complications were observed when having the deflated occlusion balloon in the SVC during the extraction procedure. During 6 months of follow-up, no complications such as pulmonary embolism or symptomatic venous stasis were observed.

In an animal study, the time from insertion of the balloon to SVC occlusion was 1 min if the balloon was prepared on the table and a 12-Fr femoral sheath was already in place [3]. In the first case series of 4 patients treated with the BOB for SVC perforation, the time for balloon positioning and inflation was ranging between 30 s and 2 min, although in all cases, a 12-Fr sheath and a guidewire were in place preoperatively [4]. In case of a large venous tear, one can imagine the amount of blood loss until the balloon is inflated.

It can be discussed if it is necessary to have the balloon in place or just to have a 12-Fr sheath and a guidewire in position. This will likely depend on the procedural risk of the TLE.

Conflict of interest: Dr. Samer Hakmi is Proctor for Spectranetics Corp.

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