Percutaneous Retrieval of a Knotted Provisional Pacemaker Using Proximal Electrode Cut off and Distal End Snaring

Mohsen Mohandes, Natalia Rodríguez¹, Francisco Fernández, Cristina Moreno, Oscar Palazón², Alfredo Bardaji³

Department of Interventional Cardiology, Division of Cardiology, Joan XXIII University Hospital, ¹Vascular and Endovascular Surgery, Joan XXIII University Hospital, Tarragona, ²Department of Cardiology, San Joan de Reus University Hospital, Reus, ³Division of Cardiology, Joan XXIII University Hospital, Tarragona, Spain

ABSTRACT

Although provisional pacemaker implantation can safely be done in many cases, a rare complication such as knotted electrode has been described, especially when the procedure is performed without fluoroscopy guidance. We describe a case of knot creation in a provisional pacemaker which was successfully retrieved using a snare after cutting the electrode proximally.

Key words: Knot, provisional pacemaker, snare

INTRODUCTION

Temporary transvenous endocardial pacing was first described by Furman and Robinson in 1958.[1] Temporary pacemaker catheter is basically indicated in patients with second- or third-degree atrioventricular block or severe symptomatic bradycardia, and the most wide modality used is ventricular pacing. Although the catheter placement is relatively safe, several potential complications such as cardiac tamponade, ventricular arrhythmia, sepsis, and deep venous thrombosis can be associated with device implantation.[2] In emergent scenario, a provisional pacemaker might be blindly placed without fluoroscopic guidance, but if the patient’s clinical circumstances permit, the device should be preferably inserted under fluoroscopy control.

We describe a case of a rare complication consisting of a knot appearance in a provisional pacemaker lead, inserted by jugular vein, which made impossible the normal device retrieval. The catheter could finally be withdrawn using a snare to catch the distal part and cutting the provisional pacemaker proximally.

CASE PRESENTATION

A 74-year-old female was admitted to a hospital in our province due to dizziness and electrocardiographic signs of sinus node dysfunction. A provisional pacemaker was implanted through the right jugular vein in the Intensive Care Unit without fluoroscopy control. A few days later, a definitive VVI-R pacemaker was implanted through the left subclavian vein without any complication. Attempts to retrieve the provisional pacemaker were unsuccessful, and the patient was referred to our cath lab.

Under fluoroscopy, we found a knot in the distal part of the provisional catheter at the level of superior vena cava [Figure 1]. We inserted an 8-French (F) sheath introducer through the right femoral vein. Our first strategy was to try to introduce a 0.014 wire and 5F catheter within the knot to untie the system, but this attempt was unsuccessful [Figure 2]. We proximally cut off the provisional catheter and with a 15 mm snare, caught the distal end of the electrode through the femoral
Mohandes, et al.: Percutaneous extraction of a knotted provisional pacemaker lead

vein [Figures 3-6]. The electrode was pulled back till the knot hitched at the tip of the sheath introducer. While gently pulling back the system, the knot became increasingly smaller, but did not completely introduce into the 8-F sheath introducer [Figures 7 and 8]. We felt some resistance while pulling back the whole system, so we called the vascular surgeon for the evaluation of an eventual incision at the level of the femoral vein to extract the piece. At this moment, we made a few gentle lateral and pulling movements, and finally, the whole system was successfully retrieved [Figures 9 and 10]. A few minutes of manual compression was made with an appropriate hemostasis. The patient remained under observation for 24 h, and she was discharged without any remarkable events.

DISCUSSION

The case presented here shows an uncommon complication during a provisional pacemaker implantation with a knot creation which prevented a normal device extraction. We could percutaneously retrieve the pacemaker lead by cutting proximally the catheter and by distal pull back while the knot got increasingly smaller during extraction.

This is not a frequent complication associated with provisional pacemaker implantation and it is preventable when the catheter is advanced under fluoroscopic control. In our case, the creation of a knot prevented the retrieval of the normal device by jugular access. Furthermore, the device manipulation could have put at risk the permanent electrodes.

After identification of the problem under fluoroscopy, we realized that the knot was large enough to be withdrawn without additional maneuvers. Our initial strategy was to untie the knot by simultaneous introduction of a catheter into the knot and proximal pull back of the electrode through jugular access, but we did not achieve it.

Valenzuela-García et al. described an interesting technique consisting of balloon dilatation within a

![Figure 1: Provisional pacemaker electrode with its corresponding knot at superior vena cava level](image1)

![Figure 2: Unsuccessful passage of a pilot 50-guidewire through the knot, supported by a 5-French catheter](image2)

![Figure 3: The provisional pacemaker distal end, successfully caught by a 15 mm snare](image3)

![Figure 4: Electrode withdrawal by a snare after the lead proximal end cut off](image4)
Mohandes, et al.: Percutaenous extraction of a knotted provisional pacemaker lead

**Figure 5:** Proximal end cutting of the electrode allows the retrieval of catheter toward femoral vein

**Figure 6:** Distal part of the electrode bends while it is being withdrawn with the snare

**Figure 7:** The knot becomes increasingly smaller while the electrode is being pulled back against the femoral vein sheath introducer tip

**Figure 8:** The knot becomes increasingly smaller while the electrode is being pulled back against the femoral vein sheath introducer tip

**Figure 9:** Gentle lateral and pulling movement allowed the retrieval of the whole system at the level of femoral vein

**Figure 10:** Extracted electrode shows a tight and small knot due to the forced withdrawal by a snare against sheath introducer tip
Swan-Ganz’s (SG) knot. Once the knot was loosened by the balloon, a pigtail through the femoral vein seized the catheter at the level of the knot, and simultaneous pulling back of the SG catheter proximally through the subclavian vein and pigtail by femoral access could successfully retrieve the system. Another percutaneous technique which could potentially untie a tight knot of a pacing electrode is to use a long sheath over the electrode, cutoff proximally, and with the added support provided by the sheath introducer, try to pug back and forth the catheter to untangle the knot.\[9\]

We do believe the complication reported in our case is due to the blind implantation of provisional pacemaker. This kind of rare complication can be prevented if the device is inserted and manipulated under fluoroscopy control.

Although in our case we could not untie the pacing electrode knot, the use of a sheath introducer by femoral access and the electrode capture by a snare made possible a successful percutaneous removal of the catheter without needing surgical approach.

**CONCLUSION**

The rare complication described above was related to the blind provisional pacemaker implantation. The combination of pacing-electrode proximal end cut-off and distal snaring via femoral vein enabled a progressive size reduction of the knot and the electrode successful percutaneous retrieval.

**Financial support and sponsorship**
Nil.

**Conflicts of interest**
There are no conflicts of interest.

**REFERENCES**

1. Furman S, Robinson G. The use of an intracardiac pacemaker in the correction of total heart block. Surg Forum 1958;9:245-8.
2. López Ayerbe J, Villuendas Sabaté R, García García C, Rodríguez Leor O, Gómez Pérez M, Curós Abadal A, et al. Temporary pacemakers: Current use and complications. Rev Esp Cardiol 2004;57:1045-52.
3. Silver MD. Intracardiac knotting of a transvenous pacemaker. Can Med Assoc J 1969;100:581-2.
4. Valenzuela-García LF, Almendro-Delia M, González-Valdayo M, Muñoz-Campos J, Dorado-García JC, Gómez-Rosa F, et al. Percutaneous retrieval of a pulmonary artery catheter knot in pacing electrodes. Cardiovasc Intervent Radiol 2007;30:1082-4.
5. Naik AM, Iyer RN, Vora AM. Innovative use of a long sheath for removal of a knotted pacing electrode. Cathet Cardiovasc Diagn 1996;39:111-2.