CASE REPORT

Breakage of a Circular Catheter Wedged in a Right Pulmonary Vein during Cryoballoon Pulmonary Vein Isolation

Hisaki Makimoto, Malte Kelm, Dong-In Shin and Christian Blockhaus

Abstract

A 50-year-old man with paroxysmal atrial fibrillation underwent pulmonary vein isolation (PVI) using a cryoballoon. During the PVI procedure, a circular diagnostic catheter (CDC) was wedged deeply into the right PV (RPV). The lung tissues seemed to be tightening around the CDC. After various attempts to resolve the situation, the shaft of the CDC was completely torn, and the circular part remained in the RPV. At a follow-up of three months, the patient showed neither atrial fibrillation events nor clinical symptoms. We herein report a broken CDC shaft during PVI with a cryoballoon, which has not yet been reported.

Key words: atrial fibrillation, cryoballoon ablation, pulmonary vein isolation, complication

(CIntern Med 56: 1057-1059, 2017)
(DOI: 10.2169/internalmedicine.56.7924)

Case Report

Cryoballoon ablation is accepted as a cornerstone therapy in the treatment of atrial fibrillation (AF) servicing a broad user base. Its safety and efficacy has been shown previously (1). As with most intracardiac techniques, the majorities of associated complications are of vascular nature and found at the puncture site. Pericardial effusion and thromboembolic events are comparatively rare, so are atrio-esophageal fistulae. Slightly more often the development of temporary phrenic nerve palsy is observed (2). One group reported a near fatal coronary spasm during ablation (3).

We herein report the case of a rare complication that could have resulted in a fatal condition during cryoballoon pulmonary vein isolation (PVI).

A 50-year-old man with paroxysmal AF presenting with EHRA III symptoms was admitted to our institution for PVI using the cryoballoon technique. He was receiving anticoagulation treatment with rivaroxaban. The only comorbidity was arterial hypertension. The medication consisted of docixton, ramipril and rivaroxaban.

The PVI was planned with a 28-mm cryoballoon (Medtronic, Minneapolis, MN, USA) under deep sedation with midazolam and propofol. A transeptal puncture was performed without any complication, and angiography of the left atrium (LA) showed four independent pulmonary veins (PV). Heparin was given to maintain an activated clotting time of >300 s. First, we targeted the two left PVs with a single freeze, each under observation of the esophageal temperature using an internal esophageal probe. Afterwards, the coronary sinus catheter was moved into the superior vena cava to monitor phrenic nerve capture during ablation, and a 20-mm circular diagnostic catheter [CDC (achieve mapping catheter by Medtronic)] was advanced in the superior right pulmonary vein to deliver a successful freeze. However, after thawing of the cryoballoon, it was not possible to remove the CDC from the PV.

On fluoroscopy, the CDC was found to be wedged in a small branch of the PV. We first tried to push the CDC gently, attempting to untangle it, to no avail. Afterwards, while softly pulling the catheter, the patient started to cough, and fluoroscopy showed that the surrounding tissues of the lung seemed to be tightening around the catheter. As the CDC is a circular catheter, several maneuvers where performed to turn the catheter clockwise. However, none of these maneuvers resulted in the desired movement of the catheter. While turning the catheter, the shaft of the CDC broke close to the...
Figure 1. Circular diagnostic catheter after breaking the shaft. a: After removing the circular diagnostic catheter (CDC) from the patient, the shaft was completely torn from the base of its circular part (black triangle) and at the part close to the steerable sheath holder (black arrow). The magnified figures are shown in the small frames. In both frames, the shaft and the wires in the shaft were twisted and completely torn. b: The circular part of CDC remained in the right pulmonary vein (white circle).

Figure 2. Angiography of the left atrium at the end of the procedure.

After the procedure, the patient showed no symptoms such as coughing or dyspnea. Pericardial effusion was excluded. A chest X-ray showed the remaining circular part of CDC still being present. Anticoagulation with rivaroxaban was continued, and the patient was discharged from the hospital.

At three months’ follow-up, the patient was free of any symptoms and had no AF recurrence. Another chest X-ray showed that the remaining catheter had not changed position (Fig. 3).

Discussion

We herein report a rare complication during PVI with cryoballon which could have led to a fatal situation. To our knowledge, no similar complications have been reported elsewhere.

Due to an interloop in a small branch of the right PV, a circular mapping catheter became wedged, and the investigators were not able to recover or remove the catheter. No practical way of resolving such a situation has been described. The intervention was attended by the CDC provider (Medtronic). As this type of complication has never been reported before, there was no determined suggestion as to how to handle the situation. The investigator was well experienced, having performed over 500 PVI procedures, and performed more than 50 Cryo-PVI procedures per year.

The CDC appeared to have been pushed too deep into the PV, although the investigator had felt no grating or resistance. As shown in Fig. 2, the CDC was located deep in a small branch of the RSPV; of note, the main trunk of the RSPV is usually sufficiently deep for the insertion of a CDC. In this case, the RSPV formed two small branches at the ostium (Fig. 2). Therefore, a relatively deep insertion of CDC was necessary to stabilize the balloon, resulting in this complication.

Neither soft pushing nor pulling of the catheter was an option, as the surrounding lung tissues had tightened around the catheter, risking a fatal bleeding event that would necessitate emergent thoracotomy. Another option was an operation in the heart and thoracic surgery clinic. As the shaft of the CDC broke coincidently and the remaining circular part did not move at all fluoroscopically, we decided to
leave the catheter in this position after consultation with surgeons.

Although the risk of translocation and thromboembolic event due to the remaining part of CDC was also taken into account, we suspected the risk of catheter displacement to be very low, and thromboembolism was considered to be prevented by continuation of anticoagulation. It is possible that the CDC perforated a small branch of the pulmonary vein and remained in the lung parenchyma, which could not be evaluated because the patient declined a computed tomography scan.

The patient came back to our outpatient clinic three months later. We performed another X-ray of the chest showing a constant position of the catheter. The patient was free of any symptoms.

We herein report a broken CDC shaft during PVI with cryoballoon, a rare but possible complication using circular mapping catheters. This case reminds us that the manipulation of CDC should be performed very gently and carefully, particularly in the small pulmonary vein branches and when deep insertion into a branch is required.

The authors state that they have no Conflict of Interest (COI).

References
1. Su W, Kowal R, Kowalski M, et al. Best practice guide for cryoballoon ablation in atrial fibrillation: the compilation experience of more than 3000 procedures. Heart Rhythm 12: 1658-1666, 2015.
2. Mugnai G, de Asmundis C, Ciconte G, et al. Incidence and characteristics of complications in the setting of second-generation cryoballoon ablation: a large single-center study of 500 consecutive patients. Heart Rhythm 12: 1476-1482, 2015.
3. Lehrmann H, Potocnik C, Comberg T, et al. Near-fatal coronary artery spasm during cryoballoon pulmonary vein isolation: an unreported complication. Circ Arrhythm Electrophysiol 7: 1273-1274, 2014.

The Internal Medicine is an Open Access article distributed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view the details of this license, please visit (https://creativecommons.org/licenses/by-nc-nd/4.0/).

© 2017 The Japanese Society of Internal Medicine
http://www.naika.or.jp/imonline/index.html