Evasion maneuver for transseptal approach during cryoballoon pulmonary vein isolation

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Purpose: **Pulmonary vein isolation (PVI) is a cornerstone therapy in patients with symptomatic atrial fibrillation. One current method is performing a PVI using a cryoballoon (CB). The CB is inserted into the left atrium via a steerable sheath. However, at times, passing of the interatrial septum by the sheath is hindered, e.g., due to septal fibrosis. Here we report our experience with an evasion maneuver to facilitate this approach using a 6F multipolar and steerable coronary Sinus catheter (CS) for predilatation of the interatrial septum.**

Methods and results: **We report 10 patients undergoing a CB-PVI, where the investigator experienced difficulties in passing the interatrial septum with the CB sheath. In these cases, after three conventional abortive attempts, we predilated the transseptal puncture site using both the CS catheter and the dilatator of the CB sheath. Thereafter access of the CB sheath to the left atrium could be achieved instantly and without further resistance.**

Conclusion: **We report a safe and feasible maneuver to facilitate transseptal access with the CB steerable sheath in cases complicated by excessive interatrial resistance.**

Keywords: Coronary sinus catheter, Cryoballoon, Pulmonary vein isolation, Transseptal approach

Introduction

Atrial fibrillation (AF) is the most common sustained atrial arrhythmia with increasing incidence and prevalence [1,2]. Pulmonary vein isolation (PVI) is a cornerstone therapy in drug resistant AF. Several studies proved the superiority of PVI versus medical therapy in symptomatic patients [3,4]. As an alternative to radiofrequency (RF) ablation, PVI with cryoballoon (CB; Medtronic, Minneapolis, MN, USA) was established several years ago. Recently, a study reported a noninferiority of CB versus RF ablation [5]. During PVI with CB a special unidirectional and steerable sheath (FlexCath Advance Steerable Sheath; Medtronic) is introduced in the left atrium (LA). Its inner diameter is 12F and the outer diameter

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is 15F. In our clinical experience we noticed in several cases that passing the interatrial septum (IAS) with the CB sheath was difficult due to stiff or thickened tissue. We report on our experience of a simple evasion maneuver during transseptal access with the CB sheath using a 6F multipolar, steerable diagnostic catheter as a predilatator in conjunction with the dilatator of the CB sheath.

Material and methods

We report 10 patients who were treated by PVI using a CB catheter. PVI was performed under deep sedation using midazolam and propofol. After transseptal puncture was achieved with a fixed, 8F sheath (LAMP45; SJM, St. Paul, MN, USA) using a BRK needle (SJM), a stiff wire (Amplatz super stiff; Boston Scientific,

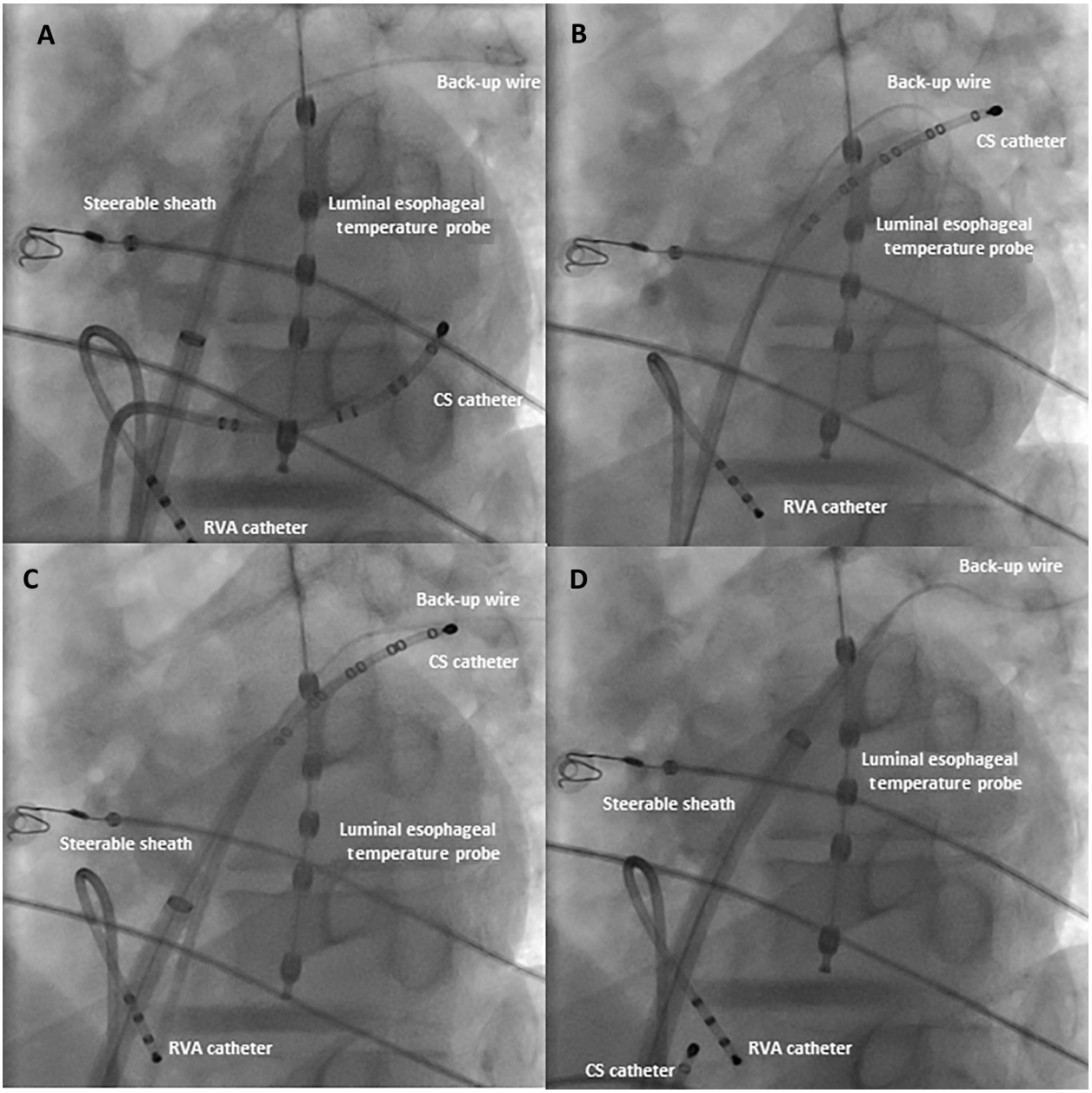

Figure 1. (A) Unsuccessful transseptal passage with the steerable sheath; (B) coronary sinus catheter placed in LSPV; (C) dilatation of the puncture site; (D) CB sheath placed in LA. Pictures taken in LAO 40° view. CB = cryoballoon; CS = coronary Sinus; LA = left atrium; LAO = left anterior oblique; LSPV = left superior pulmonary vein; RVA = right ventricular apex.

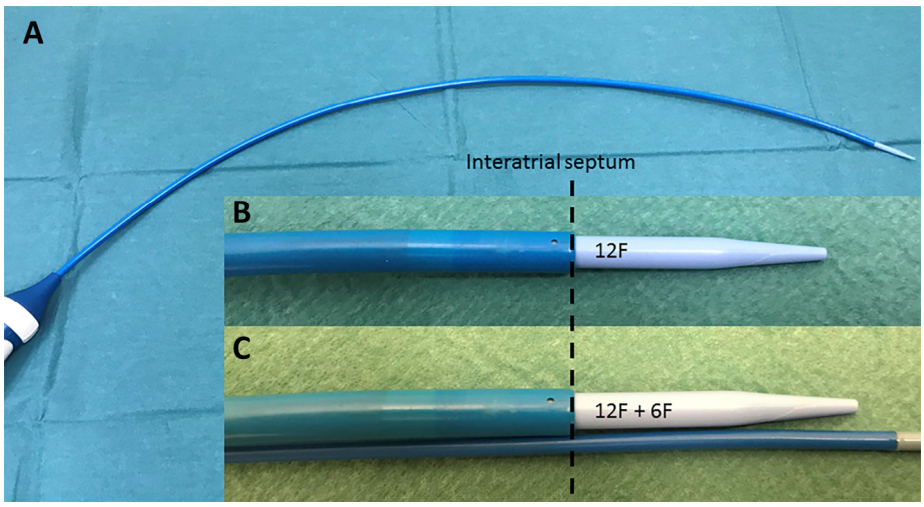

Figure 2. (A) CB steerable sheath; (B) schema of the 12F sheath (15F outer diameter) close to the interatrial septum (dashed line); (C) schema of 12F sheath + 6F CS catheter close to the interatrial septum (dashed line).

Marlborough, MA, USA) was placed as a guiding wire into the left superior pulmonary vein (LSPV). Then, the fixed 8F sheath was exchanged for the CB sheath over the wire. In case of an unsuccessful transseptal passage despite repeated attempts (pushing and drawing back of the 12F sheath, Fig. 1A), the sheath was placed in the right atrium a short distance from the IAS whereas the stiff wire was left in the LSPV. Subsequently, the transseptal puncture site was passed with the 6F CS catheter (Inquiry; SJM) which was also placed in the LSPV (Fig. 1B). We dilated the puncture site by gently pushing the dilatator of the CB sheath towards the LA with the CS catheter still being placed in the LA (Fig. 1C). Afterwards we withdrew the CB sheath again and removed the CS catheter from the LA into its original position. Finally, the CB sheath passed the transseptal puncture site into the LA (Fig. 1D). Fig. 2A shows a picture of the CB sheath and a closer look at its tip close to the virtual IAS (dashed line, Fig. 2B). The reported evasion maneuver is schematically shown in Fig. 2C with the CB sheath near this virtual IAS and the 6F CS catheter already placed in the LA.

Results

In all reported patients we initially failed to pass the atrial septum with the CB sheath three times. Predilatation of the interatrial puncture site by the 6F CS catheter plus the 12F dilatator of the CB sheath could be performed in all patients with no complications. After this evasion maneuver, access with the 12F CB sheath to LA could be achieved unhampered in all cases.

Discussion

We report on our experience in CB PVI where transseptal access with the 12F CB sheath (15F outer lumen) was difficult. Even for experienced investigators transseptal approach for ablation of LA arrhythmias remains challenging due to, for example, anatomic obstacles. In 2010 Cappato et al [6] published a worldwide survey with an incidence of pericardial tamponade—which of course may not only be caused by transseptal puncture but also by the ablation procedure—of 1.3% in >20,000 catheter ablation procedures. Reasons for difficulties during an LA approach may be a floppy septum, a thickened atrial septum after preceding transseptal puncture, or, for example, a lipomatous atrial septal hypertrophy [7]. In patients with congenital heart disease who underwent surgery the incidence of arrhythmias is even higher with a challenging atrial approach. Uhm et al [8] recently published a work with tips on how to perform transconduit and transbaffle puncture in those patients. Marcus et al [9] showed that repeated transseptal puncture is more difficult to achieve due to interatrial scarring. Of note, none of our reported patients had undergone transseptal puncture before. Several techniques to improve the safety and success of transseptal puncture have been developed [10,11]. Furthermore, guiding of transseptal puncture in the context of a complex atrial septal anatomy by intracardiac echocardiography has been described to be helpful [12,13]. In our clinic we usually do not use steerable sheaths or intracardiac echocardiography for transseptal puncture.

By using a predilatation maneuver we successfully gained access to the LA for the large CB sheath of 12F (with an outer diameter of 15F) without any further resistance and complications. Of note, the initial transseptal puncture with the 8F sheath was mostly unproblematic. The maneuver is easy to conduct with the employed material and investigators were not obliged to perform further unsuccessful attempts of transseptal passage with the CB sheath. As a limitation of our report, we have no data regarding occurrence of relevant and persistent iatrogenic atrial septal defect (ASD) caused by this predilatation approach as our patients did not undergo a follow-up transesophageal echocardiography. However, none of our patients presenting for redo ablation (irrespective of this maneuver) showed a persistent atrial defect in transesophageal echocardiography. Recently, Linhart et al [14] reported a relatively high incidence of ASD after CB PVI but without increased clinical complication. This is consistent with other groups' findings concerning persistent ASD after CB or RF PVI [15–17]. We report on an evasion maneuver to facilitate transseptal access with the 12F CB sheath (15F outer lumen) in patients undergoing PVI.

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