Transatrial management of inadvertent puncture of the posterior wall during transseptal access for atrial fibrillation ablation – Case report

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Abstract

Transseptal puncture for atrial fibrillation ablation is a safe and common procedure, however, complications, such as cardiac tamponade, are possibly fatal if not recognized and treated. Our goal is to report a case in which management of an inadvertent puncture of the posterior wall of the left atrium was accomplished using an unusual technique, followed by successful pulmonary vein isolation, and without the need of subsequent subxiphoid puncture.

Introduction

Transseptal access has been performed for over six decades under a variety of procedures in interventional cardiology.(1) It is routinely performed inside the electrophysiology (EP) laboratory, with a complication rate of less than 0.8% in different series.(2-4) Except for minor modifications, the technique has undergone small changes over the years.(5) Intracardiac echocardiography has been incorporated to provide real-time visualization of cardiac structures and to guide transseptal puncture(6), however, despite the increased safety, mechanical complications still occur and might lead to a fatal outcome when they are not recognized.(7)

The goal of this article is to describe an unusual strategy, which might be used in the management of inadvertent puncture of the posterior atrium wall during an attempt to access the left atrium in cases such as pulmonary vein isolation (PVI) in atrial fibrillation ablation. It is a viable strategy that can be used in case of cardiac perforation, when the operator suspects the sheath's tip lies inside the pericardial space.

Case Report

A 62-year-old female patient with paroxysmal atrial fibrillation, CHADS-VASc score 3, symptomatic despite treatment with propafenone, was referred for elective percutaneous ablation.

The procedure was performed under general anesthesia, after left appendage thrombus being discarded by transesophageal echocardiography. Triple femoral venipuncture was performed, flushed with 5,000 units of heparin. We positioned a standard deflective decapolar catheter across the coronary sinus. Transseptal puncture was performed in a conventional manner, guided by fluoroscopy, using right and left anterior oblique views. After first puncture, the sheath was advanced over the needle but no blood content was observed by lumen aspiration. We opted to advance a long guidewire to confirm that the sheath was inside the pericardial space (Figure 1). Due to maintained hemodynamic stability and absence of cardiac tamponade signs, we decided to insert a JR 6F angiography catheter in the pericardial space (Figure 2). Approximately 30 ml

of citrine pericardial fluid was aspirated. At that moment, the hemodynamic condition remained stable and therefore we opted to resume the procedure. Another transseptal puncture was performed without complications while maintaining negative pressure through the JR catheter. Activated clotting time (ACT) levels were monitored and maintained above 300 seconds. Electroanatomical mapping (CARTO 3 – Biosense Webster Inc., Diamond. Bar, CA, USA) and circumferential isolation of the 4 pulmonary veins were performed (Figure 3). The isolation time was approximately 70 minutes.

After that, we proceeded with reversal of heparin levels with protamine, followed by withdrawal of both sheaths. The JR angiographic catheter was initially positioned in different points of the cardiac silhouette as aspiration continued to maintain the negative pressure (total time of aspiration of 20 minutes). Transthoracic echocardiogram inside the EP laboratory discarded pericardial effusion. Anticoagulation was resumed in the day after and the patient was discharged after 24 hours of observation. No late-onset complications or arrhythmia recurrence were noted during six months of clinical follow-up.

Discussion

The case illustrates that posterior atrial wall perforation can be carried out in a conservative manner, without immediate subxiphoid access. Despite infusion of heparin and ACT greater than 300 seconds, all stages of ablation were performed without evidence of bleeding in the pericardial space. However, negative pressure was maintained by JR 6F catheter throughout the procedure.

Fisher et al. were the first to describe the possible management of hemopericardium in 2 patients in whom a long sheath was inadvertently positioned in the pericardial space, using the sheath itself to draw blood without the need for subxiphoid puncture[(8)].

Our group previously reported 2 cases in which, similarly, perforation in the posterior wall was identified and the ablation performed with isolation of the 4 pulmonary veins[(9)]. In both cases only a small amount of blood was identified in the pericardial space. However, the operator opted to perform subxiphoid puncture at the end of the procedure with maintenance of negative pressure in the pericardial space through this access after the removal of the transseptal sheath from the pericardial space. The feasibility of the transatrial access was then demonstrated in a swine model[(10)].

To the best of our knowledge, this is the first case in which, despite the atrial perforation with the placement of the sheath within the pericardial space, no hemopericardium occurred and no subxiphoid puncture was performed. Our hypothesis is that the bleeding did not occur because the sheath itself, once positioned in the pericardial space, worked like a plug, preventing bleeding despite heparin infusion. Another hypothesis is that the maintenance of negative pressure throughout the procedure might facilitate the adhesion of the parietal to the visceral pericardium, which avoided further bleeding after sheath removal.

Conclusion

Perforation of the atrial wall can be managed without subxiphoid access, using the transatrial route itself for intraoperative pericardial effusion aspiration. We suggest placement of an angiographic diagnostic catheter for continuous negative pressure maintenance throughout the procedure. Transatrial access might even be an alternative route in cases of hemopericardium in which subxiphoid access is not possible.

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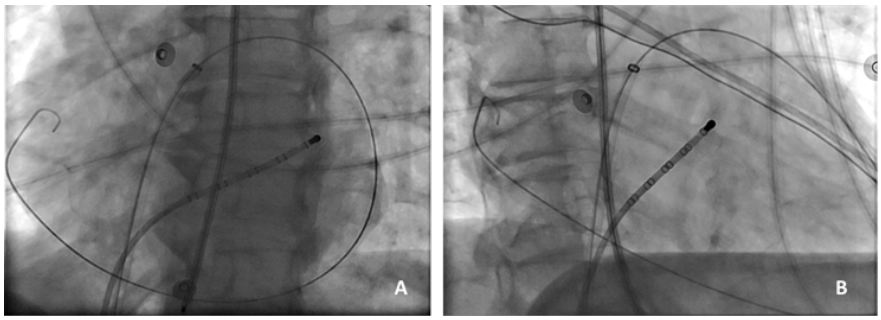

Figures:

Figure 1. A long guidewire inserted over sheath during transseptal puncture confirms inadvertent access to pericardial space.**A.** Left anterior oblique (LAO) view. **B.** Right anterior oblique (RAO) view.

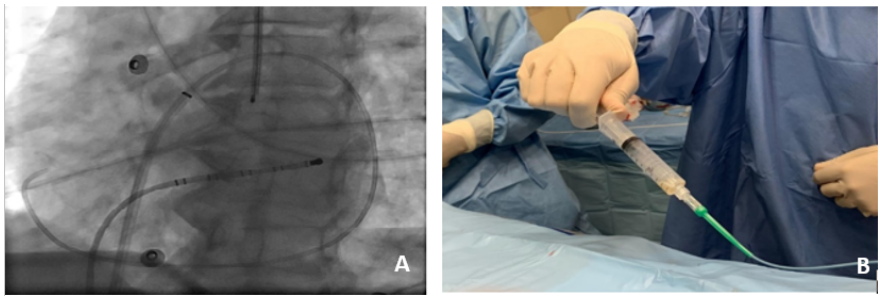

Figure 2. A. Left anterior oblique view showing standard 6F JR angiographic catheter placed within pericardial space after inadvertent posterior wall puncture. It allowed content aspiration and maintenance of negative pressure over the procedure's duration.**B.** Aspiration of citrine pericardial fluid, ensuring that no immediate hemopericardium occurred after inadvertent posterior wall puncture.

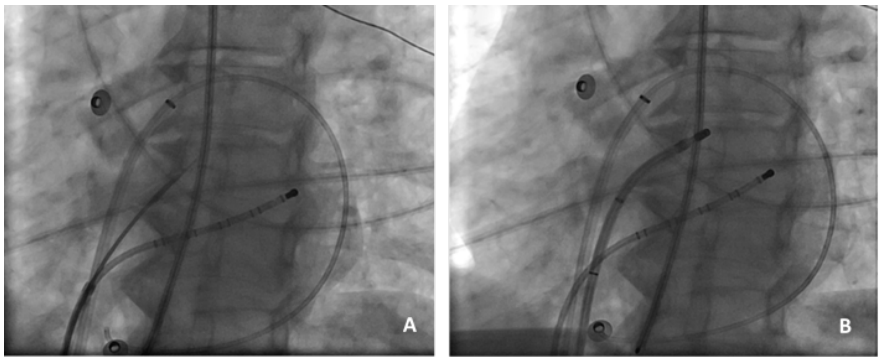

Figure 3. A. Second transseptal access performed under fluoroscopy, while JR angiography catheter remained within the pericardial space. **B.** Radiofrequency irrigated-tip catheter within the left atrium, resuming pulmonary vein isolation guided by electroanatomic mapping, while constant negative pressure was being applied through the JR angiographic catheter throughout the procedure.