ATRIAL FIBRILLATION

COMPLEX CASE STUDY

Balloon Dilatation Atrial Septostomy Permitting Difficult Transseptal Catheterization

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ABSTRACT. Left atrial access can be challenging in the case of a scarred fossa ovalis or lipomatous hypertrophy. In this case, puncture of the fossa ovalis was feasible when using a Nitinol-tipped J-wire; however, neither the dilator nor the sheath could cross the thickened fossa. Several established techniques used to pass the transseptal assembly failed. This report describes the use of a large caliber non-compliant angioplasty balloon to successfully introduce a sheath into the left atrium allowing for ablation of paroxysmal atrial fibrillation.

KEYWORDS. ablation of atrial fibrillation, lipomatous hypertrophy, transseptal catheterization.

Introduction

Transseptal catheterization (TSC) has become an indispensable skill for the interventional electrophysiologist, and is essential for left atrial ablation.\textsuperscript{1} However, the fossa ovalis (FO) may be resilient, making perforation of this thin structure quite difficult.\textsuperscript{2} Although there exist various tools and procedures to cross a fibrous FO, this report describes a case in which conventional methods were unsuccessful, leading to the use of balloon septostomy for successful access.\textsuperscript{3–5} The use of this technique and caveats are discussed.

Case

A 58-year-old woman with drug-refractory atrial fibrillation was referred for catheter ablation. The patient had no prior cardiac interventions. Antiarrhythmic therapy was discontinued for five half-lives. Therapeutic anticoagulation with warfarin was continued perioperatively. The procedure was conducted under general anesthesia. A steerable decapolar catheter was inserted into the coronary sinus via the right internal jugular vein. A phased-array intracardiac echocardiography probe (AccuNav\textsuperscript{TM}, Biosense-Webster, Diamond Bar, CA) was introduced to the lower right atrium via the right femoral vein. Another venous access at this site was used to introduce an SL-1 long sheath and Brockenbrough needle (BRK-1, Daig Corporation, Minnetonka, MN) for TSC. Transseptal puncture was achieved uneventfully with a Nitinol-tipped J-wire (SafeSept\textsuperscript{TM}, Pressure Products, San Pedro, CA) placed into the left superior pulmonary vein. Although the BRK-1 needle crossed into the left atrium, the dilator and sheath assembly met with considerable resistance and would not pass even with considerable forward pressure. Intracardiac imaging indicated that the FO was uniformly thickened and resistant. Although a “classic dumb bell” appearance of the atrial septum was not present, the clinical picture was suggestive of a variant of lipomatous hypertrophy. Transseptal instrumentation was repeated using two different sites, obtaining access but still meeting with the same difficulty. Therefore, electrocautery applied to the proximal needle hub was attempted but was unsuccessful.\textsuperscript{6} Moreover, direct radio-frequency ablation (Thermocool\textsuperscript{TM}, Biosense-Webster) was applied to the FO at 35 W for up to 10 s without being able to pass the catheter.

The assembly was again brought down to engage the FO; however, an 0.032-inch J-wire replaced the SafeSept wire. Dilatation with a long 6-Fr dilator permitted the latter to cross into the left atrium, but the sheath was still withheld on the right atrial aspect of the fossa. The procedure was repeated with a long 8-Fr dilator, but this could not cross the FO. At this point, a 6-Fr non-compliant balloon (8 mm × 80 mm) dilatation catheter

The Journal of Innovations in Cardiac Rhythm Management, October 2012

The authors report no conflicts of interest for the published content. Manuscript received July 20, 2012, final version accepted August 20, 2012.

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ISSN 2156-3977 (print)
ISSN 2156-3993 (online)
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DOJ: 10.19102/icrm.2012.031004

969

The Journal of Innovations in Cardiac Rhythm Management, 3 (2012), 969–972
(Mustang™, Boston Scientific, Natick, MA) was threaded over the wire, crossing the FO in an uninflated state. Then the balloon was slowly inflated with contrast to an estimated 2 atm until a balloon “waist” seen at the FO disappeared, correlating with an increase in aperture (Figures 1 and 2). The sheath could then be easily introduced into the left atrium to permit continuation of the procedure. Circumferential pulmonary vein isolation was completed (Figure 3). There were no complications, and the patient was discharged on the second postoperative day.

Discussion

Atrial septostomy has been largely reserved for the pediatric population with congenital heart disease and patients with pulmonary hypertension. There are scarce data on the use of this technique in patients undergoing ablation for atrial fibrillation. Zadeh et al reported the use of atrial septostomy in a patient with a fibrous FO; however, in the present report the main obstacle is the presence of probable lipomatous hypertrophy. Moreover, an 8-mm balloon was used rather than a 5-mm balloon, as cited in Zadeh et al. Predilation may have facilitated passage of the balloon however. The use of intracardiac echocardiography to visualize the FO and instrumentation was indispensable.

Although the histological nature of the fibrous tissue at the FO is uncertain in this patient without any prior cardiac instrumentation, adipose tissue in the fossa could have accounted for its tensile strength and resilience. This picture could be explained by the presence of a lipomatous hypertrophic variant. Echocardiographically, the atrial septum with lipomatous hypertrophy has a “dumb-bell” shape. However, this classic manifestation is not always so pronounced, since there are varying degrees of septal thickening. Shirani and Roberts concluded that lipomatous hypertrophy exhibited septal thickening of 1.5 cm or greater in a postmortem series. Hence, greater degrees of tissue hypertrophy will provide the dumb-bell appearance, but with less thickening this may not be so readily apparent.

Given the use of a single transseptal sheath, it is unlikely that any significant residual flow through the FO would remain. Prior publications have confirmed a high rate of spontaneous closure with little risk of thromboembolism after TSC. Hence, repeat echocardiography was deferred. At the 3-month follow-up, the patient remains in sinus rhythm.

Conclusions

This report validates the use of non-compliant balloon septostomy for permitting left atrial access in cases of

Figure 1: Fluoroscopic frames in a steep left anterior oblique view depict the sequential introduction of the dilator–sheath complex into the left atrium prior to, during, and after the atrial septostomy. A decapolar catheter is inserted into the coronary sinus as a reference. An intracardiac echocardiography probe is observed in the low right atrium. (a) A 0.032 cm J-wire is positioned into the left upper pulmonary vein. The sheath is positioned outside the fossa. The asterisk denotes the location of the distal balloon marker (proximal marker in inferior vena cava is not pictured). (b) Contrast inflation is initiated. (c) Balloon inflation on both sides of the fossa ovalis is visualized. The arrow highlights a “waist” at the level of the fossa prior to completing the septostomy. (d) The sheath is easily passed into the left atrium.
Figure 2: Intracardiac echocardiography images the septostomy. (a) The balloon is tenting the fossa. (b) The tension exhibited by the fossa relaxes after the balloon is fully inflated. (c) The inflated balloon catheter is displayed. Note, an open port used for guidewire insertion.

Figure 3: Integrated three dimensional CARTO map indicates the final product of pulmonary vein isolation in the anterior-posterior and posterior-anterior projections.
thickened fossa and lipomatous hypertrophy, particularly when other methods such as cautery and predilatation have failed.

References