First experience with the novel AcQCross[?] Qx system combined with Medtronic FlexCath TM Advance steerable sheath for cryoballoon pulmonary vein isolation.

Simone Zanchi[1], Carmelo La Greca[1], Amedeo Prezioso[1], Joseph Antoine Kheir[1], and Domenico Pecora[1]

[1]Fondazione Poliambulanza Istituto Ospedaliero

January 18, 2023

Abstract

Transseptal puncture is a fundamental learning step for a young electrophysiologist. New technologies have been developed to reduce the complexity of the procedure and improve safety. One of them is AcQCross[?]Qx. Our aim is to discuss our procedural approach with this new technology, during cryoballoon pulmonary vein isolation.

Introduction

Transseptal puncture (TSP) is the crucial step in a variety of cardiac procedures, including left side ablations[1]. The TSP technique was introduced into clinical practice during the late 1950s by Ross et al.[2] , and over the years the procedure has remained unchanged, except for the introduction of a new needle by Brockenbrough[3] in 1960s. TSP is a relatively safe procedure, even though complications related to TSP can be severe and life threatening, as a consequence special training is required, and only expert operators should perform TSP[4]. New technologies have been developed in order to simplify the puncture and increase its safety, however none of them has become the new standard tool for TSP. Recently a novel transseptal crossing device (AcQCross[?] Qx, Medtronic) was introduced: it has an integrated needle/dilator design, which removes the need for needle and guidewire exchange after TSP; it fits with the different existing sheaths; and the needle can also work with radiofrequency, in case of need. The aim of our paper is to describe our first experience with this novel technology applied for cryoballoon atrial fibrillation (AF) ablation, under fluoroscopy and pressure guidance.

Case Report

A 68-year-old male was referred to our centre for a primary AF and atrial flutter (AFL) ablation. His past medical history included dyslipidaemia and a previous interstitial pneumonia SARS-CoV-2 related, complicated by bilateral pulmonary embolism and typical atrial flutter, treated by pharmacological cardioversion. Since hospital discharge the patient has suffered from frequent atrial fibrillation episodes, as documented by multiple smartwatch ECG registrations. Laboratory blood investigations showed the following: hemoglobin, 15,8 g/dL; white cell count, 7.8 x 10^9/L; sodium, 143 mmol/L; potassium, 4.0 mmol/L; urea, 27 mg/dL; and creatinine, 0,8 mg/dL. An echocardiogram documented normal biventricular size and function with normal left atrial dimensions and normal valvular function. As patient's CHA(2)DS(2)-VASC was 1, according to our internal protocol, a transesophageal echocardiography was not performed. The procedure was made under uninterrupted anticoagulation with edoxaban. The patient provided written informed consent prior to the ablation procedure. The electrophysiological procedure was performed in deep sedation. After obtaining ultrasound-guided 2 left and 1 right femoral venous access[5], a decapolar diagnostic catheter (Dynamic XT^{TM}, Boston Scientific) was placed into coronary sinus (CS) and a steerable quadripolar diagnostic catheter

(Dynamic TIP™, Boston Scientific) was placed into the right ventricle. A 0.032 J-tip guidewire was placed from the right femoral access site to the superior vena cava (SVC). The AcQCross[?] Qx system combined with Medtronic FlexCath™ Advance steerable sheath was placed over the guidewire to the SVC. The AcQCross[?] Qx system was then connected to a pressure line by an Y connector (Fig.1A). After retracting the guidewire to the tip of the dilator, the sheath was pulled back caudally until an abrupt leftward movement (jump) of the tip below the aortic knob is observed (in the postero-anterior view) as the tip passes under the muscular atrial septum onto the fossa ovalis. After confirming the position of the tip in RAO and LAO view, the slider button was advanced forward on the AcQCross[?] Qx proximal handle, inducing the protrusion of the hollow stainless steel needle and resulting in effective puncture of the fossa ovalis (Fig.2A), as confirmed at first by the pressure line which showed LA pressure (Fig.1B). Thereafter the retained guidewire was easily advanced into LA and placed distally into the left superior pulmonary vein (Fig.2B) and finally the steerable sheath was advanced into the LA over the wire (Fig.2C-D). In this case the delivery of radiofrequency via the needle in order to puncture the septum was not necessary. The cryoballoon was then advanced without any need of sheat exchange and a conventional pulmonary vein isolation (PVI) with single application of cryoenergy for 240 sec per vein was performed. After PVI and during proximal CS pacing, an ablation index-guided cavotricuspid isthmus ablation with point by point lesions using 3D mapping (Carto 3, Biosense Webster) was performed. At the end of procedure an echocardiogram documented absence of pericardial effusion. The procedural data are displayed in Table 1. On the same evening of procedure an echocardiogram documented absence of pericardial effusion. On the next day after a clinical evaluation the patient was discharged. A follow-up with Holter ECG and medical evaluations at 3, 6 and 12 months from the ablation was scheduled.

Discussion

We present the first reported case of the use of a novel integrated dilator and needle system (AcQCross[?] Qx) in combination with a 15F steerable sheath (Medtronic FlexCath™) to perform a cryoballoon procedure, without the need of sheath exchange. So far, a few experiences with the AcQCross[?] Qx system have been published[1,6,7], which documented safety and improved procedural efficacy, as the time needed for TSP was significantly lower in AcQCross Qx groups as compared to traditional TSP approach. The main novelty of our approach consists in TSP monitoring. While Rizzi et al.[1] and Yap et al.[6,7] performed TSP respectively under transesophageal echocardiography monitoring the former and intracardiac imaging the latter, we chose to safely perform TSP with AcQCross[?] Qx system under fluoroscopy monitoring. The connection to a pressure line by using an Y connector allowed us to confirm the position of the needle by checking LA pressure after its protrusion and after that we could safely advance the guidewire into left superior pulmonary vein. This double check of LA pressure and fluoroscopically correct guidewire position before advancing the 15 F steerable sheath provides safety and reduces the need of cardiac imaging during the procedure. Eventually, AcQcross[?] Qx seems to be a promising novel TSP system, which has the potential to reduce the need of x-rays, the risk of air embolism due to sheath exchanges, and the complexity of TSP preserving safety by using echocardiographic monitoring or the double check suggested in this paper. Also young electrophysiologists and EP fellows may benefit from this new technology, as lowering complexity of this procedure could lead to a steeper learning curve. Further clinical studies need to be done to verify safety and feasibility outcomes and to finally assess the effective relevance of this new technology.

Key clinical message

The novel Cross[?] Qx system is a promising transseptal crossing device with integrated needle, which can be used with several existing sheaths with no need of sheath exchange after TSP. Fluoroscopy and pressure monitoring instead of cardiac imaging can be employed during TSP in order to ensure procedural safety.

References:

1. Rizzi S, Pannone L, Monaco C, et al. First experience with a transseptal puncture using a novel transseptal crossing device with integrated dilator and needle. J Interv Card Electrophysiol. 2022;65(3):731-737. doi:10.1007/s10840-022-01329-3

2. Ross J. et al. Transseptal Left Atrial Puncture. New technique for the measurement of left atrial pressure

in man. Volume 3, Issue 5, p653-655, may 01, 1959. DOI:https://doi.org/10.1016/0002-9149(59)90347-9

3. Brockenbrough EG, Braunwald E. A new technic for left ventricular angiocardiography and transseptal left heart catheterization. Am J Cardiol. 1960;6(6):1062-1064. doi:10.1016/0002-9149(60)90361-1

4. Russo G, Taramasso M, Maisano F. Transseptal Puncture: A Step-by-Step Procedural Guide. Cardiac interventions today may/june 2019 vol. 13, no. 3

5. Greca CL. Advantages of the integration of ICE and 3D electroanatomical mapping and ultrasound-guided femoral venipuncture in catheter ablation of atrial fibrillation. J Interv Card Electrophysiol.

6. Yap SC, Szili-Torok T. Optimization of the transseptal procedural workflow using a novel integrated dilator and needle during a cryoballoon procedure. Hear Case Rep. 2022;8(1):60-63. doi:10.1016/j.hrcr.2021.11.001

7. Yap SC, Bhagwandien RE, Szili-Torok T. Use of a novel integrated dilator-needle system in cryoballoon procedures: a zero-exchange approach. J Interv Card Electrophysiol. 2022;65(2):527-534. doi:10.1007/s10840-022-01294-x

Figure legend

Fig.1 A Connection between AcQCross[?] Qx to a pressure line and a contrast agent by an Y connector; **B** Left atrial pressure detected by pressure line after transseptal puncture.

Fig.2 A Protrusion of the hollow stainless steel needle and effective puncture of the fossa ovalis after sheath's tenting;**B** guidewire positioning into the left superior pulmonary vein;**C** steerable sheath's direct advancement into the left atrium over the wire; **D** AcQCross[?] Qx withdrawal after transseptal puncture.

Table 1. Procedural data. LA left atrium, AFL atrial flutter, TSP transseptal puncture, DAP dose area product

Total procedural time (min)	90
LA time (min)	45
AFL ablation time (min.)	15
Total Fluoroscopy time (min:sec)	6:07
TSP Fluoroscopy time (min:sec)	2:03
Total DAP (mGycmq)	31894