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ORIGINAL ARTICLE

Comparison of a Radiofrequency Powered Flexible Needle with a Classic Rigid Brockenbrough Needle for Transseptal Punctures in Terms of Safety and Efficacy

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Introduction This study aimed to evaluate the safety and efficacy of utilising an innovative radiofrequency (RF) powered flexible needle to achieve transseptal puncture (TSP).

Methods and Results A RF powered flexible needle (Toronto catheter, Baylis Medical Company Inc.) associated with a stiffer dilator (Torflex Superstrong, Baylis Medical Company Inc.) was used in 125 consecutive patients referred for left sided ablations (mean age = 55.6, male = 86.5%) and compared with a standard transseptal set (BRK needle, SL0 sheath and dilator, St Jude Medical, Inc.) used in the previous 100 patients (mean age = 56, male 82%). TSP was achieved in 95/100 patients in the Brockenbrough group and in all 125 patients in the Toronto group (p=0.01) despite an equivalent proportion of difficult situations (8 and 9% respectively) and patients with a prior TSP (17% vs 24%). 7/100 needle related events (failure, aborted attempt or pericardial effusion) occurred in the Brockenbrough group and none in the Toronto group (p=0.01). The Toronto needle crossed the septum at the first attempt in 123/125 (98.4%) patients and the Brockenbrough needle in 84/95 (88%) patients (p<0.001).

Conclusion Our data suggest that the Toronto RF powered flexible needle is safer and more efficient than a standard Brockenbrough needle and can be used not only in difficult situations but routinely to achieve TSP.

Keywords Transseptal punctures • Ablations • Safety

Introduction

Percutaneous transseptal puncture (TSP) as described by Ross and Brockenbrough in the early 1960s has allowed access to the left atrium initially to perform haemodynamic assessments [1,2]. More recently due to atrial fibrillation ablation the need for a transseptal approach has increased exponentially.

TSP with a standard rigid angulated Brockenbrough needle and based on a mechanical pressure may be challenging in the presence of a thickened fibrotic or aneurysmal septum. These situations may be sources of failure or inadvertent punctures of adjacent structures (aortic root, left atrial appendage or free wall, pulmonary vein or artery) potentially leading to a possibly life threatening tamponade [3].

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The average risk of TSP related complication is probably underestimated and may reach 6% of TSPs as described in an expert consensus statement on ablation for atrial fibrillation issued in 2007 by the Heart Rhythm Society, the European Heart Society Association and the European Cardiac Arrhythmia Society [4,5]. The incidence of AF ablation related tamponades is 3.1% among Medicare beneficiaries [6]. Atrial fibrillation ablation is associated with a significant proportion of necessary second (or more) procedures to achieve the expected result so that the related risk of failure or occurrence of adverse events during the TSP increases [7,8].

The assistance of transoesophageal echocardiography or intracardiac echography may reduce the risk by improving the positioning of the needle in its dilator and sheath on the septum, but the need for mechanical pressure remains, together with the related risk of overshooting in normal sized or moderately dilated left atria [9,10].

Several series have been reported on improving TSP not only in challenging situations but also routinely [11–16]. We describe our experience of utilising a radiofrequency (RF) powered *flexible* needle (Toronto needle, Baylis Medical Company Inc., Montreal, Canada).

Methods

Transseptal puncture attempted in 125 consecutive patients using a RF powered flexible needle (Toronto needle, Baylis Medical Company Inc., Montreal, Canada) was compared to standard transseptal puncture attempted in the previous 100 consecutive patients using a Brockenbrough needle (BRK, St Jude Medical Inc., St Paul, MN, USA).

Patients' Characteristics (Table 1)

The reference group (Brockenbrough group) comprised 100 patients undergoing left sided ablations (mean age: 56 years, male: 82). The indication for ablation was paroxysmal atrial fibrillation/flutter/tachycardia in 55 patients, persistent or permanent atrial fibrillation/flutter/tachycardia in 42 patients, left sided accessory pathway in two patients, left ventricular premature complexes in one patient. Seventeen patients had undergone a previous TSP.

Table 1 Patient's Characteristics.

	Brokenbrough group	Toronto group	p
n	100	125	NS
Mean Age	56 (±12)	55.6(±9)	NS
Gender (M/F)	82/28	108/17 (86.4%)	NS
Paroxysmal AT	55	78 (62.4%)	NS
Persistent/ Permanent AT	42	46 (36.8%)	NS
Accessory pathway	2	1 (0.8%)	NS
Other arrhythmia	1	0	NS

AT: atrial tachycardia.

In the second group (Toronto group) of 125 patients (mean age: 55.6 years, male: 86.4%) the indication for ablation was paroxysmal atrial fibrillation/flutter/tachycardia: 62.4%; persistent or permanent atrial fibrillation/flutter/tachycardia: 36.8%; left sided accessory pathway in one patient. A prior TSP had been performed in 30/125 (24%) patients.

Transseptal Puncture Characteristics

All procedures were performed under general anaesthesia. In all patients, transoesophageal echocardiography aimed to check the absence of intracardiac thrombus and to guide the TSP. At the time of TSP TEE helped to define the type of interatrial septum (IAS) as normal, fibrotic or aneurysmal. IAS was qualified ''fibrotic'' when it presented an unusual thickness and/or echodensity. IAS qualified as aneurysmal either because it was obviously floppy or because it was responsible for an excessive tenting, carrying the dilator tip close to the left atrial roof or free wall (less than 10 mm).

In both groups, a standard transseptal sheath (SL0, St Jude Medical Inc., St Paul, MN, USA) was advanced over a J shaped 0.035'' guidewire from the right femoral vein to the superior vena cava.

In the Brockenbrough group, once removed, the 0.035'' guidewire was replaced by a Brockenbrough needle (BRK, St Jude Medical, St Paul, MN, USA).

In the Toronto group, the dilator was replaced over the wire by a stiffer dilator (Torflex Superstrong, Baylis Medical Company, Inc., Montreal, Canada), then the guidewire was removed and a RF powered flexible needle (Toronto, Baylis Medical company Inc., Montreal Canada) was inserted through the dilator and advanced to 1 cm of the dilator tip.

The Toronto needle (Fig. 1) whose total length is 71 cm is a *flexible* needle with a stiffer proximal shaft and a thinner 5 cm more flexible distal curved portion. It has a 0.024'' internal lumen in the proximal shaft and a 0.018'' one in the distal curved portion allowing contrast infusion or pressure monitoring by four holes circumferentially located 0.5 cm to 1.5 cm before the closed 0.017'' thin short tip. Though radio-visible, a marker on the shaft indicates proximally when the Toronto catheter tip is at the edge of the dilator and beyond. RF energy is delivered by this tip only; otherwise the catheter is electrically insulated and connected to a dedicated RF generator (RFP-100 RF Puncture Generator, Baylis Medical Company Inc.).

The assembly of the sheath, dilator and needle (rigid or flexible) was pulled down with clockwise backward rotation (5 o'clock) under fluoroscopic and echocardiographic guidance to engage the fossa ovalis. In the Toronto group, the Torflex Superstrong dilator substituted the Brokenbrough needle in stiffness when handling the assembly so that its orientation was achieved by rotating directly the dilator. TEE assessed the tenting of the septum in both groups. Following Baylis Medical recommendations, the Toronto catheter tip was powered at 8 to 10 watts for 2 secs, and RF energy was started immediately before advancing the catheter out toward the septum. Effective perforation was confirmed by TEE and the recording of a left atrium pressure wave form. The entire flexible distal portion of the catheter was