Clinical Spotlight

Approach to the Difficult Transseptal: Diathermy Facilitated Left Atrial Access

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Percutaneous transseptal left atrial (LA) access is increasingly becoming a routine procedure in the electrophysiology and cardiac catheterisation laboratories. Our aim was to review an unselected large series of this procedure performed over a period of five years. We clinically characterised difficult cases and presented a method of safe and expeditious LA access. Overall, 543 transseptal punctures were performed. Of those, 10 were classified as difficult, with failure to access the LA in three or more attempts. In all 10 cases, surgical electrocautery was successfully used to facilitate needle puncture of the septum. All patients subsequently underwent an uncomplicated procedure. In conclusion, we describe a method to trouble-shoot the difficult transseptal access procedure, outlining the clinical characteristics, echocardiographic features and special precautions that need to be considered when utilising this method.

(Heart, Lung and Circulation 2012;21:108–112)

Keywords. Transseptal puncture; Radiofrequency; Left atrial access; Body surface area

Introduction

Transseptal puncture (TSP) to access the left atrium (LA) is now a routine procedure in the cardiac catheterisation and electrophysiology laboratory. Percutaneous LA access is required for procedures such as mitral valvotomy, radiofrequency ablation of left-sided arrhythmias, LA appendage occlusion and pulmonary vein stenting. Certain advantages of transseptal left atrial access include enhanced catheter stability for ablation of most left-sided accessory pathways and bypassing peripheral arterial disease when present [1]. With knowledge of the local anatomy and experience the risks associated with this procedure are low. Imaging modalities, such as transoesophageal echocardiography (TOE), intra-cardiac echocardiography (ICE) or aortography may assist in demarcating relevant anatomical landmarks, thus enabling a safer puncture [2]. However, on occasions the septum can be lipomatous or hypertrophied and scarred by repeated punctures such that access by this route is difficult to achieve [3]. On the other hand, a redundant or aneurysmal inter atrial septum may also make the procedure more difficult, with significant tenting and subsequent risk of cardiac perforation [4].

In this manuscript we present our approach to the difficult TSP. We discuss the clinical characteristics and present a quick, safe and low cost method for facilitating the difficult transeptal puncture.

Methods

We retrospectively evaluated all transeptal punctures performed in our institution from 2006 to 2011. We identified 10 cases representing a very difficult TSP, whereby access to the LA was not achievable in the conventional method, on three or more attempts. We described the clinical features of these difficult cases and the effects of contributing variables.

All patients having a TSP undergo a TOE one day pre procedure. Electrophysiologic procedures are performed either under general anaesthesia (GA) or conscious sedation, depending on pre-morbid status and patient preference.

The TSP procedure is commenced in the conventional method using an SLO sheath (St Jude Medical) and a BRK-1 transeptal needle (St Jude Medical) with continuous monitoring of needle-tip pressure. Patients undergoing a procedure under GA and airway protection would also have a TOE to assist in the difficult case or when distorted atrial anatomy is anticipated. However, when the procedure was undertaken with conscious sedation, a transvenous intra-cardiac echocardiography (ICE) catheter (Acuson Acunav, Siemens Medical Solutions, Mountain View, CA, USA) was used for guidance. Radio-opaque contrast is used to stain

Received 15 June 2011; accepted 22 July 2011; available online 6 September 2011

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1443-9506/04/$36.00
doi:10.1016/j.hlc.2011.07.010

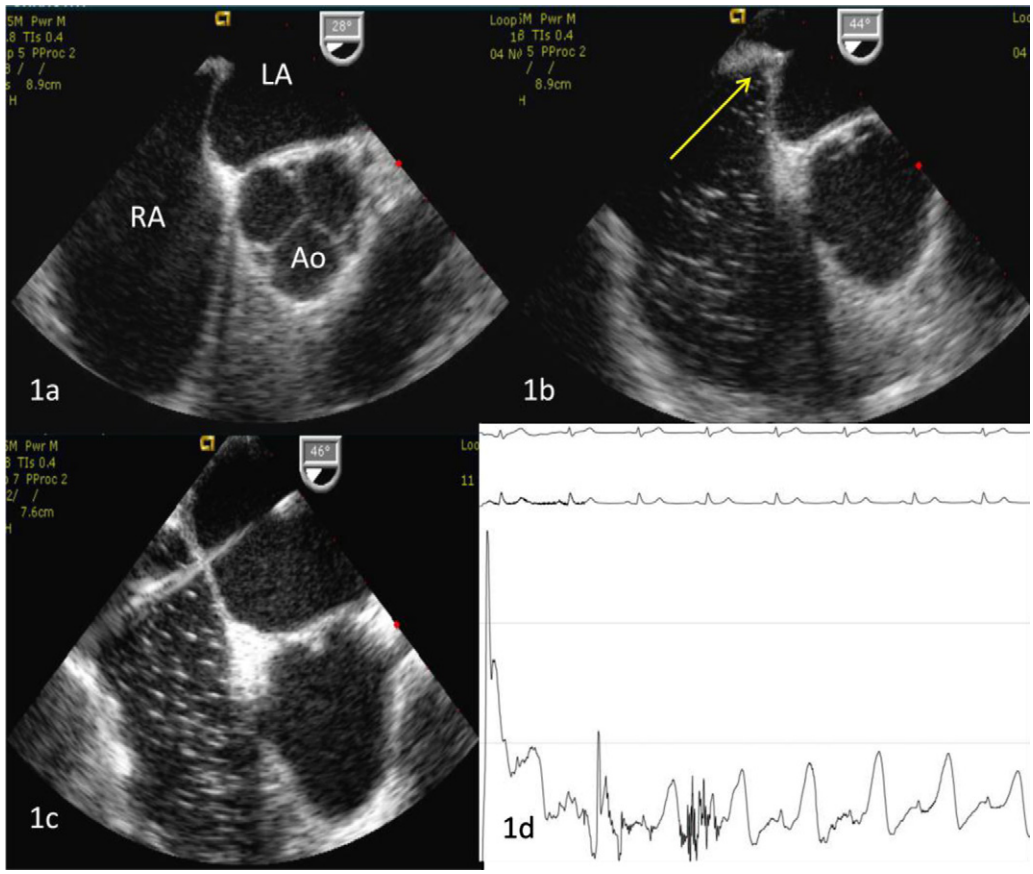

Figure 1. *TEE imaging of the needle and septum during TSP.* **1a:** *Shows marked tenting and pressure on the septum using the BRK1 needle; despite which the septum remained impermeable. Note the uniformly thick septum.* **1b:** *BRK1 needle with much less pressure immediately prior to permeation of the septum with diathermy (arrow). Note the early microbubble formation.* **1c:** *Shows permeation of the septum by the needle-dilator assembly with extensive microbubbles visualised within the right atrium.* **1d:** *Continuous pressure tracing shows transition from damping to a typical left atrial waveform as the needle tip traverses the septum. Ao aorta; LA left atrium; RA right atrium.*

the interatrial septum when the needle tip does not cross with ease, and to confirm LA entry following puncture.

Following confirmation of the BRK-1 tip using fluoroscopy in at least two projections and real time echocardiographic guidance, judicious force is applied and a 'give' is anticipated, coincident with a transition to a typical LA pressure waveform signifying LA entry [Figs. 1 and 2]. When significant force fails to penetrate the septum on three or more attempts, electrocautery is used to assist in the TSP. Using a combination of fluoroscopy and echocardiography (either TOE and/or ICE) the needle-sheath assembly is positioned centrally on the atrial septum foramen ovale, and diathermy (30 W of bipolar energy) is delivered in the cutting setting to the exteriorised aspect of the needle [Fig. 3]. Electrocautery application time is echocardiographically and pressure waveform guided. Immediately prior to puncture, brief echo densities are visualised on the right atrial side of the septum, signifying needle penetration of the septum and LA entry. Contrast injection confirms LA access. The procedure is carried out under continuous haemodynamic invasive monitoring.

Results

During the period 2006–2010, 543 TSP procedures were made. Of these, 10 were difficult, requiring diathermy assistance. The clinical and procedural characteristics of these patients are shown in Table 1. Spearman's correlation and partial correlation were significant at $P < 0.05$.

The majority of patients were males who had undergone one previous TSP puncture. Diathermy application duration was very brief in all but two cases (numbers 2 and 8), which required 10 s. In case number 4, the patient had no previous transeptal access. His echocardiographic appearance was that of lipomatous septum [Fig. 4]. In two patients (numbers 3 and 5), the septum was either aneurysmal or hyper mobile. Diathermy application time was correlated with body surface area (BSA) (correlation coefficient 0.702, $P = 0.024$). Adjusting for number of previous punctures and septal thickness, BSA remained highly correlated with application duration ($P = 0.039$).

Following access, the sheath is advanced into the LA safely without sequelae. In all cases the procedure