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C3 - Core Curriculum in Cardiology

How to perform transeptal puncture

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1. Introduction

Transeptal access is an integral skill for interventional cardiologists for a multitude of cardiac interventions including, balloon mitral valvotomy a commonly performed procedure in India and south Asia. The procedure was first performed by Braunwald, Ross and Morrow and later refined by Brockenbrough and Mullins, whose names have been intricately linked with this procedure.[1–3] The procedure, however, evokes considerable trepidation in many young interventionalists due its steep learning curve and potential catastrophic complications. However, the procedure is relatively simple in most patients, barring patients with extremely distorted anatomy like aneursymally dilated left/right atria where the anatomy of the interatrial septum is often grossly altered.

2. Equipment

The usual equipment required for transeptal access is a pre-shaped transeptal sheath with introducer and a pre-shaped transeptal needle. These sheaths and needles are available in both adult and pediatric sizes. The Mullins sheath is the most commonly used sheath for transeptal access (Fig. 1a). This is an 8 French 60 cm sheath that can be introduced over a 0.032 J-tipped guidewire. The needle most often used for atrial septal puncture is the stainless steel Brokenbrough needle (Medtronic Inc) (Fig. 1b). The needle is a hollow tube which is 18 gauge tapering to 21 gauge. The proximal end has a flange with an arrow that points towards the needle tip. The other needles available are the BRK, BRK-1, BRK-2 and BRK-XS needles which are marketed by St Judes Medical. The BRK is the standard needle with slight angulation between the tip and the shaft (19°) and is used for routine septal puncture. The BRK-1 needle has a greater angulation between the shaft and the tip (53°) and is preferred in cases with a very large right atrium. The larger angulation helps in sitting better on the septal wall. The needle is available in two lengths (71 or 89 cm).

3. Procedural technique

Following venous and arterial access from the right groin, the Mullins sheath is advanced over a 0.032″ Terumo guide wire into the superior vena cava. A pigtail catheter is placed in the aortic root in the non-coronary cusp which is the lower most part of the aortic root (Table 1). The Brockenbrough needle is then advanced into the Mullins sheath about 2–3 cms short of the tip (Fig. 2; Video 1). It is useful to keep a finger between the base of the Brockenbrough needle and the hub of the Mullins sheath to prevent inadvertent advancement of the needle (Fig. 3). While most operators attach a 2 or 5 ml syringe, preferably with a Luer lock, it is also possible to attach the needle to a pressure transducer.

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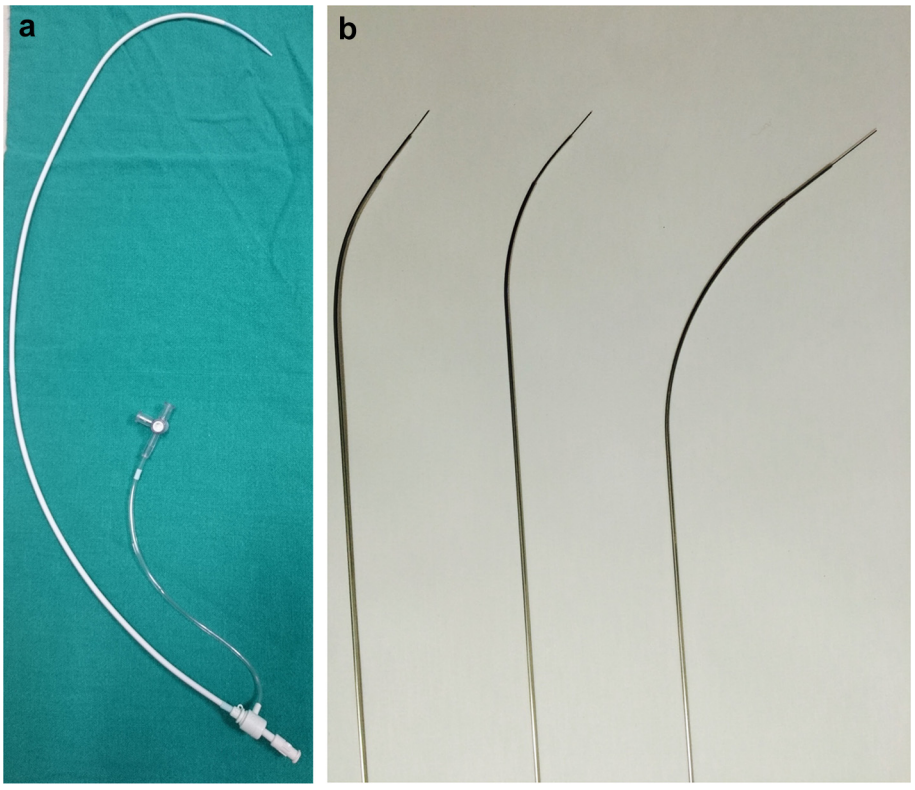

Fig. 1 – a: Mullins sheath with dilator. b: Transeptal needles: The needle on the left is the Brockenbrough needle. The one in the middle is BRK needle from St Jude Medical while the needle on the right is the BRK1 needle.

Care is taken that the patient is supine without any rotation of the spine because this distorts the orientation of the atrial septum.

Supplementary video related to this article can be found at http://dx.doi.org/10.1016/j.ihj.2015.02.024.

The entire assembly of the Mullins sheath with the needle is then gradually withdrawn in the AP projection on fluoroscopy into the right atrium, taking care that the Brockenbrough needle points at 3 o' clock position. The assembly first descends from the superior vena cava into the right atrium and then along the thick part of the interatrial septum. The entire assembly is withdrawn slowly in one smooth maneuver until it reaches the level of the aortic valve (Fig. 4; Video 2). During this entire maneuver, care is taken that needle continues to point at 3 o' clock position. Then it is gradually withdrawn further below the level of the aortic valve, usually by 1–3 cms (half to one vertebral space), to lie along the interatrial septum at the expected position of the fossa ovalis (Fig. 5; Video 3). The needle is then rotated in a clockwise manner to around 4–5 o' clock position. At this point one can generally feel good transmitted pulsations on the entire assembly.

Supplementary video related to this article can be found at http://dx.doi.org/10.1016/j.ihj.2015.02.024.

The position of the needle is then confirmed in at least two additional views – RAO and dead lateral. In 30° RAO the interatrial septum is generally seen en face. Therefore, the needle should look away from the operator (Fig. 6; Video 4) and not point to the left (posterior) or right (anterior). Additionally, it should be confirmed that the needle is lying posterior and inferior to the plane of the aorta. In the lateral view the needle should be facing posteriorly towards the spine (Fig. 7; Video 5)

Table 1 – Step by step guide to septal puncture.

Step 1: Mullins sheath with Brockenbrough needle positioned in SVC. Pigtail catheter positioned in aorta at the level of the aortic valve
Step 2: Mullins sheath with needle withdrawn into the right atrium to lie 1–3 cm (half to one vertebra) below the level of the aortic catheter in the AP projection.
Step 3: Brockenbrough needle rotated to 4–5 o'clock position. Optimal position confirmed in AP, RAO and lateral/LAO projection.
Step 4: Left atrial entry by probing at fossa ovalis site or septal puncture performed by protruding the Brockenbrough needle through the Mullins sheath. Left atrial access confirmed by contrast injection and pressure monitoring.