TECHNICAL NOTE / Cardiovascular imaging

Percutaneous brachial venous access: Tips and tricks

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The insertion of implantable catheter ports (IP) is constantly increasing in France, with more than 150,000 inserted each year. Originally described by Starkhammar for insertion via the brachial veins [1], insertion of an IP must meet the following three criteria:

- the subcutaneous port must be inserted in a stable region of the body—very often the subclavian region—little exposed to trauma and risk of infection, with easy access for the nurse;
- the tunnel for the path of the extra-venous catheter between the port and point of venous access should be short and straight;
- the route for the catheter from its entry into the vein to the atrioventricular junction must be harmonious. This article describes the brachial technique, often overlooked, together with its indications.

Technique

A venous Doppler ultrasound examination eliminates asymptomatic subclavian vein or superior vena cava stenosis or occlusion [2]. It also shows the type of anatomical venous distribution to the arm. Examination of the M-shaped venous system in the bend of the elbow looks for dominance of the median cubital vein and then of the basilic vein in the arm. In the case of small calibre veins, the middle third/upper third of the arm is punctured, preferably at a valve dilatation (Figs. 1 and 2). If two attempts at basilic access have failed,
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Figure 1. Procedure: a: local anaesthesia (asterisk) and 25 mm long vertical skin incision, in the middle third of the medial surface of the arm; b: mono-parietal non-transfixing venepuncture (modified Seldinger), preferably within a valve of the basilic vein using an axillary tourniquet; c: implantation of the peelable introducer (7 French); d: the 22 × 10 mm port is connected to the catheter before subcutaneous insertion and skin closure. The port, once in place, is about three finger-widths above the bend of the elbow (dotted line).

The third attempt should be on the brachial vein, which frequently has anatomical variants: fusion with the basilic vein in the lower third of the arm (17%), absence of duplication (17%), retro-arterial position (8%) [3,4]. The cephalic vein remains superficial but rolls considerably and is fragile; thrombosis occurs here four times more often than in the basilic vein [4]. For these reasons, it is used as a last resort. In the operating theatre, the patient’s checklist is completed [5]. The skin is marked with a felt-tip at the brachial middle third of the basilic vein before standard four-step betadine asepsis of the operative field. The 2% lidocaine local anaesthetic is buffered with a solution of molar bicarbonates at 3.2% (1/3–2/3) to limit the pain of the injection. It is given as follows: 5 mL at the future skin incision and 15 mL directed inwards and downwards, having curved the 25G anaesthesia needle to 90° to produce gentle hydrodissection of the future site of the brachial port (Fig. 1a). The 20 to 25 mm skin incision is vertical along the axis of the arm, 2 mm outside the basilic axis. The venepuncture needle (Fig. 1b) is introduced here providing a straight path for the extravascular part of the subcutaneous catheter, thus reducing the risk of fissuring through bending/unbending. For the venepuncture, a modified 30-degree oblique Seldinger technique is used, with real-time ultrasound guidance (Fig. 2). Once the anterior wall of the vein has been breached (blood flashback), controlling venous return allows the guide to be introduced, then the peelable introducer on the guide (Fig. 1c). The axillary tourniquet is released before withdrawing the needle on the guide, to reduce the risk of haematoma. In order to prevent kinking of the peelable catheter during its introduction, it is advanced (at an angle relative to the vein <30°) in the axis of the target vein, by rotating it. The appearance of otalgia in the patient suggests that the catheterisation has taken a wrong jugular route. Partial withdrawal of the guide, deep inspiration, or contra-lateral rotation of the neck and the use of a hydrophilic guide overcome venous loops or curves, especially in atheromatous and obese patients. On the left side accidental catheterisation of the azygos arch is frequent because the end of the innominate vein faces the opening of the azygos arch. A compress temporarily left in the site of the future port controls local haemostasis (Fig. 1d). The thickness of the skin over the port should be between 10 and 15 mm to limit the risk of skin exposure. The length of the 5 to 7F gauge catheter is 30 to 35 cm on the right, and 35 to 40 cm on the left. Left anterior oblique
thoracic incidence of 20° peroperatively shows the superior vena cava end of the catheter best (Fig. 2). Brachial abdusion lowers the catheter by 10 to 15 mm so it is advisable to check the length of adjustment of the catheter by X-rays, with the arm in abduction then in adduction, before skin closure [6]. Since the reserve of elasticity of the silicone or polyurethane catheter is greater on the left (greater length), the distal end of the catheter is positioned 10 mm lower than on the right. The wound is sutured in two planes, deep and subcuticular, using absorbable sutures. The port is not sutured, since collagen fibrosis sets in rapidly. The system is tested by rinsing with physiological saline. A transparent dressing is applied allowing the nurse to inspect the wound and skin. The patient may shower three days later.

Discussion

In the consultation prior to the insertion of an IP the patient should be examined and informed about the procedure, the body mass index (BMI) calculated, pendulous breasts [7] and the possibility of a supine position investigated, and the side for insertion of the IP determined. As regards the side for insertion, the asymptomatic side is the side opposite a breast tumour, axillary lymph node dissection, radiodermatitis, local tumour permeation (breast cancer), a catheter (or previous catheter) or pacemaker, and finally, the dominant hand of the subject. Specific indications for the brachial route include the timid, anxious patient who wants the venous access to be “away from her body”, discretion (professional reasons), obesity (superficial basilic vein, orthostatic insertion), ENT neoplasia (thoracic port contraindicated, cervical irradiation, tracheotomy), respiratory insufficiency (orthostatism) and breast cancer (procedure away from the thoraco-mammary area, discretion, aesthetic neckline). Indications for venographic guidance are obese arms (ultrasound more difficult), previous homolateral catheterisation and venous spasm (young anxious patient). As far as the size of the port is concerned, we prefer to use a medium sized device (20 x 10 mm in height) that is more stable than the brachial mini-port and has a larger puncture septum. It is nevertheless useful to consider a mini chamber in paediatrics and in emaciated patients with a high risk of skin dehiscence. The skin incision is vertical because the mechanical tension of the edges is less than with a horizontal incision (underlying biceps muscle), and wound healing occurs more quickly. Since mechanical stress on the port is more frequent in the arm (an anatomically mobile area) than in the thorax, we advise against its implantation in agitated and confused patients, for any infusion exceeding twelve hours, and in haemodialysis patients. Finally, review of the literature concerning retrospective series comparing a brachial IP with a thoracic IP [8,9] diverges on the more thrombogenic character of brachial access. The only randomised prospective comparative study found a comparable rate of venous thrombosis but a greater number of mechanical (suture dehiscence, fissuring, maladjustment) and septic complications [10]. This is the reason for our opinion that brachial access should only be used by trained operators (those inserting PICC lines) and for the above indications.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References
