Vascular Access under Ultrasound Control

Where available, the transducer is placed in a paramedian transverse position at the junction of the neck and superior thoracic aperture (Fig. 107.1) to identify the internal jugular vein (IJV) directly anterolateral to the common carotid artery (CCA, Fig. 107.2). The lumen of the internal jugular vein appears anechoic (black) and in the head-down position is usually thicker than the adjacent common carotid artery posteromedial to it. When in doubt, the vessels can be compressed with the transducer: When compressed, the internal jugular vein appears flatter (⇩⇩), whereas the common carotid artery retains its shape due to its higher pressure (Fig. 107.3).

Fig. 107.1 Position transducer

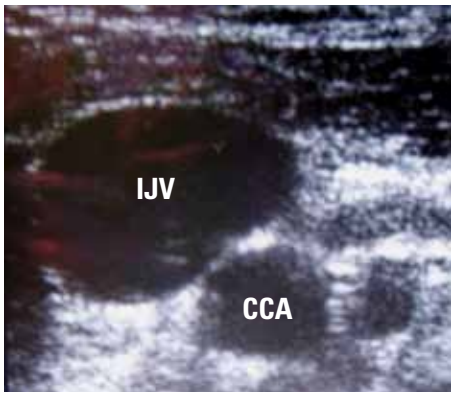

Fig. 107.2 Vessels in cross section.

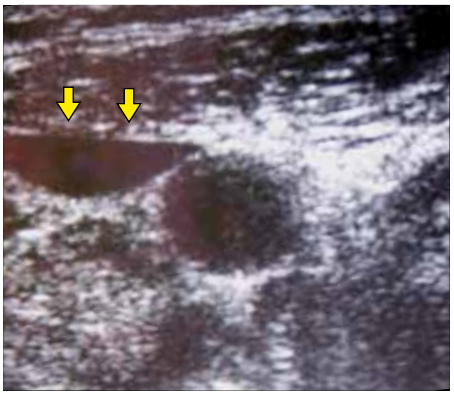

Fig. 107.3 Under compression

Righthanders perform the puncture (↘) with their right hand immediately lateral to common carotid artery palpated with the left hand toward the ipsilateral nipple (Fig. 107.4). The position of the tip of the needle can be identified by the typical acoustic shadow (↑) of the metal needle and corrected if necessary (here laterally, Fig. 107.5).

Fig. 107.4 Insert needle

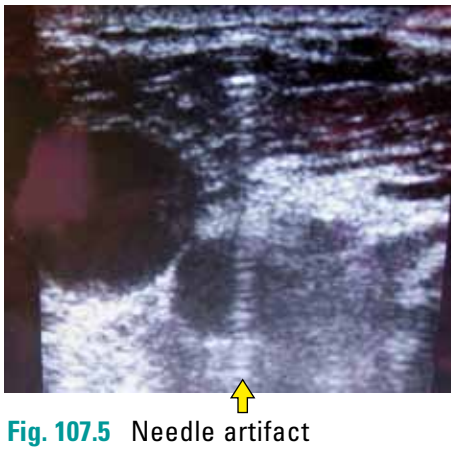

Fig. 107.5 Needle artifact

Fig. 107.6 Aspiration of blood.

Often the needle is inadvertently advanced all the way through the vein and blood can only be aspirated by partially withdrawing (↖) the needle (Fig. 107.6). Now the flexible guide wire is quickly connected to the puncture needle (Fig. 107.7) and advanced (↷) through its lumen into the internal jugular vein, insofar as this can be done **easily and without resistance** (Fig. 107.8).

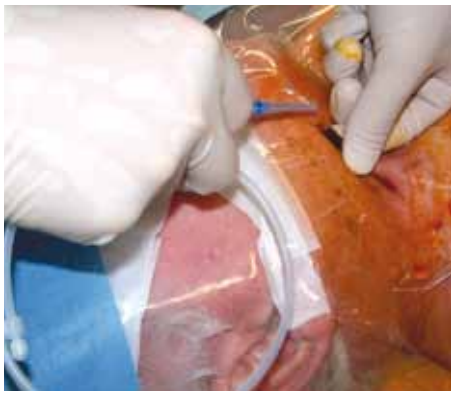

Fig. 107.7 Guide wire

Fig. 107.8 Advance

After withdrawing the mandrin (in Fig. 134.1), connect the bled infusion line with a three-way valve and a short hose segment. Bleed this as well and load the larger syringe with sterile saline solution for subsequent aspiration and test flushing (in Fig. 134.2). Remove the angled connection set ( ) from its sterile packaging (Fig. 134.3), connect the two hose segments by turning them clockwise (, Fig. 134.4) and open ( ) the clamp (Fig. 134.5). Bleed this connection fitting too as you close it and remove ( ) the protective cover (Fig. 134.6).

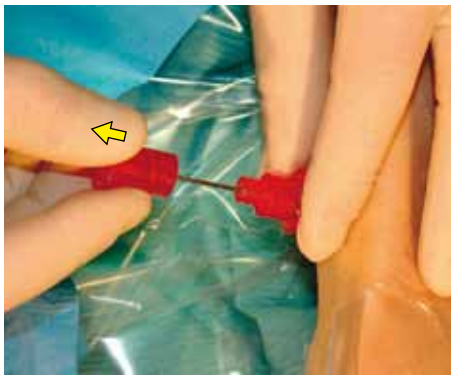

Fig. 134.1 Remove mandrin,

Fig. 134.2 … bleed, and … load saline.

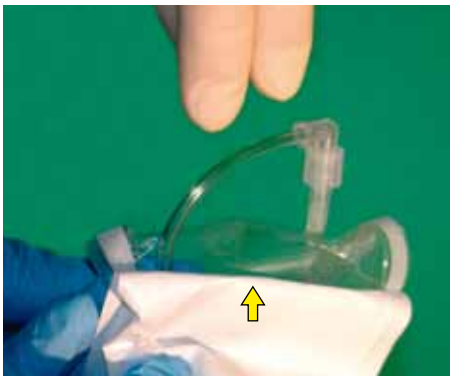

Fig. 134.3 Take out connection set.

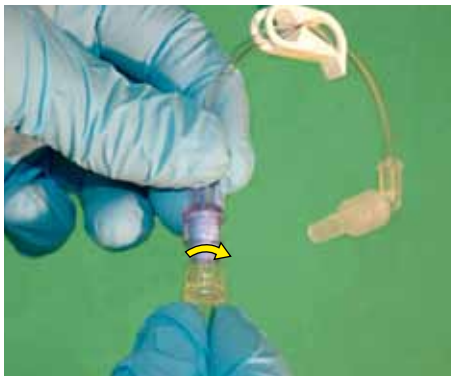

Fig. 134.4 Connect hoses …

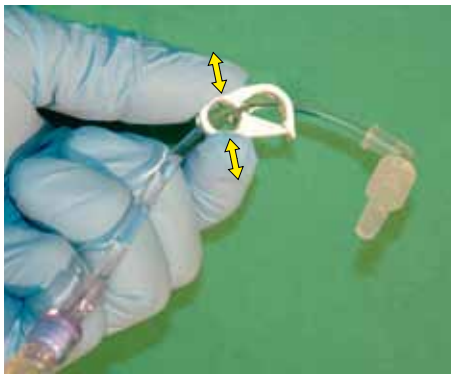

Fig. 134.5 … open clamp …

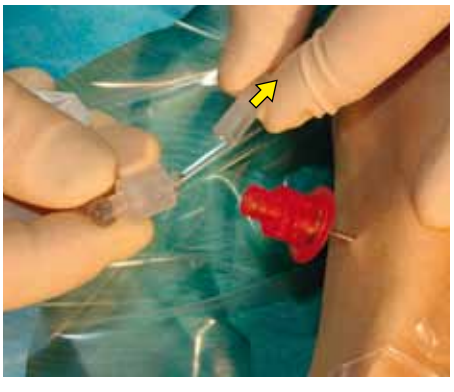

Fig. 134.6 … and remove cap.

Now screw the connector clockwise onto the threading of the intraosseous cannula (in Fig. 134.7) and check whether you can aspirate ( ) bone marrow (, Fig. 134.8). As this will not necessarily be the case, some clinicians dispense with this test aspiration to avoid unnecessarily plugging the cannula with bone marrow. Then it is recommended to first flush ( ) the medullary canal under pressure with a bolus of 5-10 mL. This also excludes a malpositioned needle (indicated by extravasation and subcutaneous swelling , Fig. 134.9).

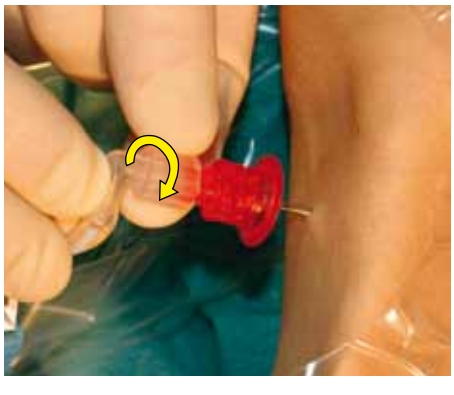

Fig. 134.7 Connect

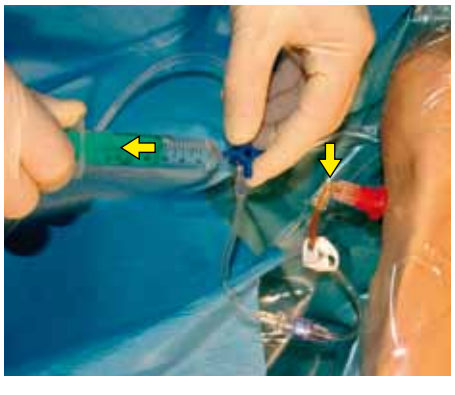

Fig. 134.8 Optional test aspiration.

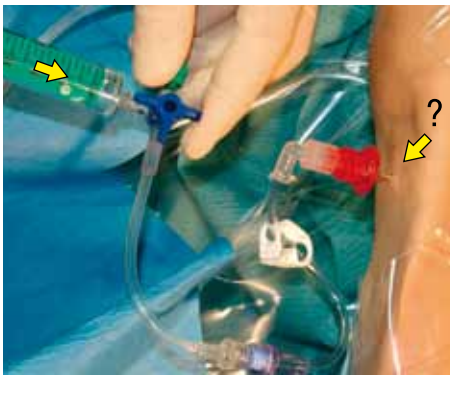

Fig. 134.9 Flush: extravasation?

When in doubt as to whether you have advanced the cannula far enough to obtain a sufficiently large biopsy core, insert the obturator and gently advance it (⇦) within the cannula as far as it will go. The depth of the obturator will show you whether your core already has the minimum length of 15-20 mm (Fig. 173.1). Usually it is best to rotate the cannula (↶↷) several times (Fig. 173.2) to cleanly separate the biopsy core from the surrounding tissue and prevent it from breaking off as you withdraw (⇨) the cannula.

Next you will want to push the biopsy tissue out of the cannula: Grasp the handle (⇧) of the blunt-ended wire included in most biopsy sets and use it to push (↙) the biopsy core out of the cannula not in an antegrade manner from behind (Fig. 173.3), but in a retrograde manner (Fig. 173.4) to avoid excessive compression of the core (see below).

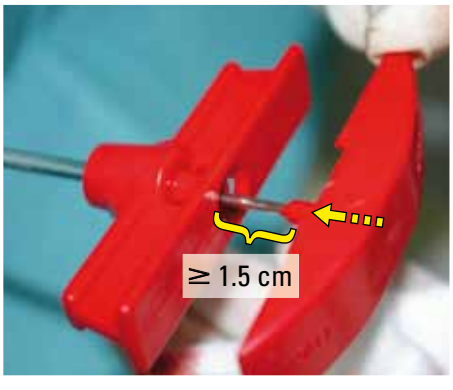

Fig. 173.1 Verify core length.

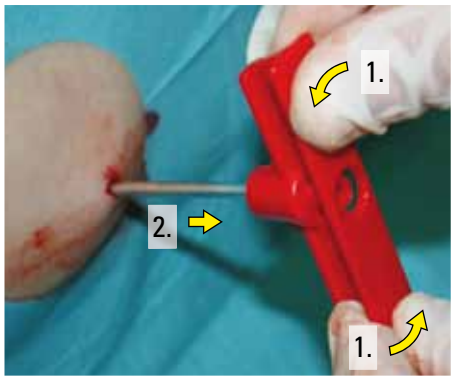

Fig. 173.2 Rotate to separate.

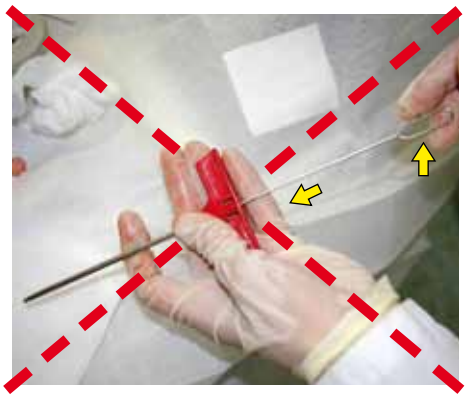

Fig. 173.3 Not antegrade …

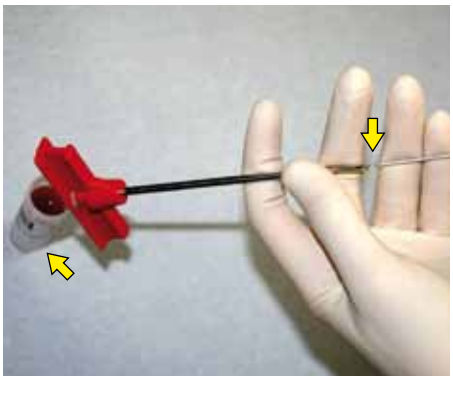

Fig. 173.4 … but retrograde removal.

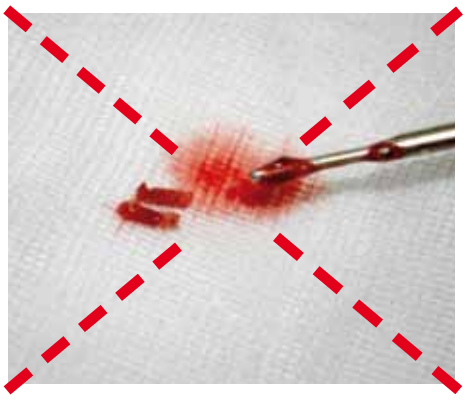

Fig. 173.5 Do not put down first.

Fig. 173.6 Core often breaks.

Take care to compress the core as little as possible. As most biopsy needles are tapered at their tip, it is recommended to carefully insert the wire at the tip of the cannula (⇩) and gently push out the core in a retrograde manner (Fig. 173.4).
It is best to push the core out of the Jamshidi needle directly into the flask (↖) with formaldehyde solution instead of onto a compress where it can often kink or break apart (Fig. 173.5). The biopsy core can also break apart when it is later placed in a flask (Fig. 173.6). Most histopathologists prefer a biopsy core at least 15-20 mm in length in order to have a representative quantity of bone marrow tissue to evaluate. These medullary spaces lie among the trabeculae. Where an insufficient quantity is harvested for evaluation, the presence of processes such a lymphoma cannot be excluded.