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The jugular approach

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Peripheral IV placement of the jugular vein is one of the most commonly used methods and allows for longer survival of the catheter in patients under haemodialysis, using both temporary and permanent or tunnelled catheters. The **jugular vein** takes up intracranial blood and exits at the base of the cranium through the jugular foramen located at the middle of the mastoid process (Figure 1). It goes down the neck taking blood from the face and neck, and at the thorax it connects to the **subclavial vein** to form the **brachiocephalic trunk**, which then drains into the **superior vena cava**. It descends parallel to the **carotid artery**, within the same sheath, by the most external and anterior zone, given that there are several cranial nerves and the vagus nerve between them. In the anterior zone it is covered by the **sternocleidomastoid muscle** and rests on the scalene muscles in the posterior zone. It enters the thorax just behind the clavicle near the joint with the sternum. The sternocleidomastoid muscle inserts into the clavicle via two fascicles, the main or sternal (mid) and clavicular (external fascicles. Between them and the clavicle, **Sedillot's triangle** is formed, which serves as a reference point for IV placement

Anatomical variants

As regards normal size and localisation, we distinguish the variants of small vein, partially or completely overriding and the reversal of the norm (figure 2).

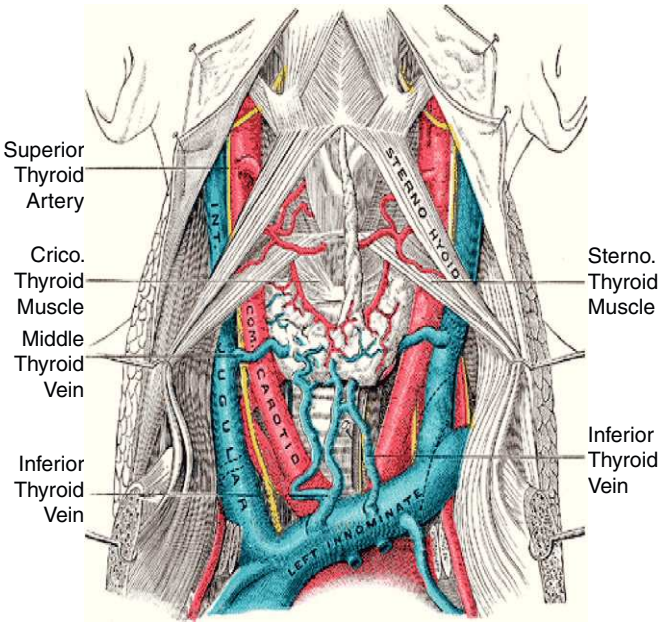

Figure 1 Anatomy of jugular vein.

Catheterisation routes

Depending on the position with respect to the sternocleidomastoid muscle and the height where it is performed, different approaches are available:

Anterior: At the height of the cricoid cartilage, just on the medial edge of the sternocleidomastoid and in the direction of the ipsilateral nipple, at approximately 30-45° elevation with respect to the skin.
Anterior: In a slightly more cranial zone, feeling the carotid the puncture is made in the direction of the flow between the carotid and the sternocleidomastoid muscle.
Medial: in the upper area of the triangle, in the direction of the breast and the needle at an angle of 45-50°.
Medial: in the lower area of the triangle, in the direction of the flow and at an angle of 50-60° with respect to the skin.
Posterior: At two fingers from the clavicle and next to the posterior edge of the external fascicle of the sternocleidomastoid muscle, in the direction of the sternal cross and at an angle of 10-20° with respect to the skin.

Considerations prior to puncture

1. **PATIENT POSITION**: In supine position, arms stretched and close to the body, in the Trendelenburg tilt position (a pillow can be placed below the shoulders to put the neck in hyperextension) and with the head in neutral position or slightly turned contra-laterally. Patient **monitoring** is appropriate: SO2, BP, heart rate, etc.
2. **HEAD POSITION**. Although the tendency is to turn the head 90° in a contra-lateral direction, doing this creates the risk of placing the carotid artery below the jugular vein with the danger of going through it and creating an arteriovenous fistula.
3. **PUNCTURE ANGLE.** The most common one was between 50 and 60°, although recent articles comment that it should be greater.

Types of catheterisation

Catheterisation can be guided by anatomical references and also by ultrasound scan and fluoroscopy.

1. Puncture guided by anatomical references
2. Ultrasound-guided puncture
3. Puncture with fluoroscopic control

Injections guided by anatomical references

The classical method, which uses anatomical references to catheterise the vein.

Although nowadays it is not the method of choice the anatomical references should be known to enable the puncture point and the needle direction to be localised.

It is based on the anatomical description and physical examination of the patient. Carried out in a room with aseptic conditions. PERSONNEL: doctor (trained at 50 catheterisations), nurse and nursing auxiliary.

Ultrasound-guided injections

Punctures guided by ultrasound are used with growing frequency for their safety and efficacy and is the recommended technique in many guides. It offers more safety and efficacy and should be habitually used. Before commencing, an **examination** should be made to check that the vein is permeable and clearly visible in terms of the track of the vein and the location of the artery to avoid it interposing in the posterior trajectory of the needle. The vein is distinguished from the artery because it can easily be compressed with the transducer to the left or right. After examining the neck, the transducer is protected with a sterile system and the vein is then catheterised. The transducer can be placed in a **transversal** position (allows the depth at which the vein is and its position with regard to the artery to be assessed) or a **longitudinal** one (allows insertion of the needle to be seen). However, this is difficult to achieve in a low puncture because of the interposition of the clavicle. After examining the neck and establishing the track of the vein, it is important to avoid errors by not modifying the position of the patient in any way so as not to lose the references that were taken. On some occasions, either because the puncture zone is very low or due to preference, direct vision ultrasound is not used in real time, a blind puncture is made instead, following the references taken beforehand. With this type of puncture, although the location and morphology of the vein is known, complications at the moment of the puncture are not discounted. When catheterising, the most common thing is to manage the transducer with one hand and use the other to guide the needle under direct ultrasound control. Once the vein is catheterised, the transducer is released and the procedure continues as per normal.

Fluoroscopy-guided injections

Habitually used by vascular radiologists. The vain and artery can be seen and the injection point modified if access is different because of a variation of normality or anatomical anomaly.

The insertion of the guide, catheter, etc, can be seen. It also facilitates localisation in cses where the anatomical references are poorly visible (obese patients, thick necks, operated patients, etc). 4 or 5 F Micropuncture needles are used that cause less injury if the carotid artery is accidentally punctured.

Considerations after injection

For temporary catheters, insertion of guide, dilator and then catheter and support. For permanent catheters, insertion of guide, tunnelling, dilator and then catheter via the dilator-peeler and support.

A control X-ray should be carried out. May require immediate use. Assess use of a prophylactic antibiotic. Aseptic measures are necessary from the beginning along with use of an additional restraining device.

Severe complications from jugular approach in haemodialysis.

- Dysfunction from incorrect position
- Haemorrhage
- Arterial puncture
- Dissection and/or occlusion of carotid artery
- Gas embolism
- Arrhythmia
- Pneumothorax
- Haemothorax
- Hemomediastinum
- Atrial perforation and/or cardiac tamponade

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110.3

The Femoral approach

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Vascular access with femoral catheter is one of the most commonly used temporary accesses in haemodialysis.

The placement of a femoral catheter for haemodialysis is indicated when there is an urgent and temporary need for treatment, when other approaches cannot be used (for example jugular catheter), when no radiological control is available, or when the patient's situation means that he or she cannot be placed in prone position (for example, patients with acute lung oedema or with a compromised thoracic situation). The placement of a femoral catheter is, therefore, adequate in situations of acute renal insufficiency that require continuous or intermittent haemodialysis techniques, or in patients with chronic renal insufficiency without vascular access (failure of the fistula, transplanted patients or with peritoneal dialysis) in critical situation. This access is also indicated in patients who immediately require light chains in the myeloma in the plasmapheresis or in the dialysis. It is considered that the femoral catheter must not be maintained for more than one week because the risk of infection is high due to its location.

There are very few counter-indications for the femoral catheter: active infection in the skin of the femoral area, and thrombosis of the inferior vena cava, iliac artery or femoral artery.

The catheter to be used must be longer than 20 cm (the most commonly used measures 24 cm), and in the majority of the cases, it will have to be dual-lumen. Femoral approach technique. The asepsis measures recommended for all central catheters must be used (sterile field, surgical hand wash, mask, gown and sterile gloves).

The patient must be placed correctly and a precise anatomical knowledge of the puncture area is essential in femoral approach. The patient is firstly placed in supine position with the lower extremity in abduction and external rotation. The femoral artery is located by feeling its pulse at the union of the middle third and two side thirds of the inguinal ligament (figure 1). The femoral vein is situated medially to the femoral artery and is channelled at 1-1.5 cm medial to the place where the pulse is felt and 2-3 cm below the inguinal ligament (figure 2).

We use the Seldinger technique to channel the femoral vein and place the catheter.The following complications may arise in the femoral vein approach:

- Pierce both walls of the vein. When the vein is punctured, it may collapse and be pierced; to locate the lumen of the femoral vein, the needle must be removed slowly, suctioning with the piston of the syringe, until we return to the lumen of the vessel.
- Difficulty to enter the guide. This complication may be due to several causes. At times, the guide does not enter the vein because, when the syringe is removed, the needle moves outside the lumen. It is also possible, when inserting the guide, for this to channel a collateral one, thus making its free movement difficult. Inserting the guide into the lumbar vein is frequent.
- Channelling of the femoral artery. If we insert the needle into the artery, the blood gushes out pulsating and its colour is a lighter red. If this occurs, we must compress the puncture area for several minutes before trying the approach again.
- Haematomas. One of the most frequent complications is the formation of a visible haematoma on the skin of the puncture area. Important retroperitoneal haematomas have also been described, which we must bear in mind in a situation of haemodynamic instability of the patient following the femoral artery approach.

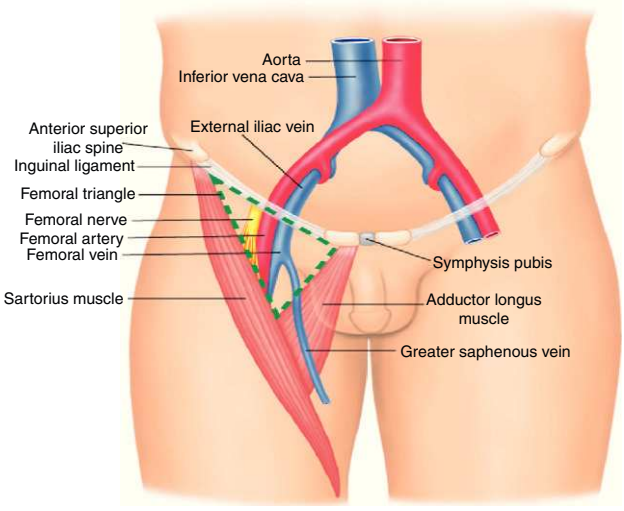

Figure 1 Anatomic memory.

Figure 2 Location of the femoral vein.