

# Central vein cannulation (pediatrics)

There is a basic WikiLectures article on this topic at [Central venous access](#)

A **central venous catheter** is a catheter whose distal end lies in the vena cava. Normal central venous pressure (CVP) values are 1 to 10 mmHg.

Decreased CVP values are found in hypovolemia, increased CVP values in hypervolemia, right heart failure, pulmonary embolism, superior vena cava obstruction, cardiac tamponade.

Catheters for long-term insertion are equipped with a surface with antibacterial action. Currently, all catheters are radiocontrast. To eliminate the risks, the latest catheters are equipped with a one-way valve to prevent air embolism.

When choosing an approach to the superior vena cava, the following factors must be respected in particular: the doctor's experience with a particular method, the accessibility of veins suitable for puncture, the risks of individual approaches for a particular patient and the expected time of catheter insertion.

For long-term cannulation, we prefer a central approach (v. jugularis interna, v. subclavia, ev. v. femoralis), because catheters introduced in this way have a lower risk of infectious and thrombotic complications than catheters introduced from the periphery (swimming catheters). We never insert catheters through an infected injection site. We perform X-ray and EKG to check the position of the catheter.

## Indication

- long-term intravenous therapy
- parenteral nutrition
- administration of blood derivatives and large volumes of fluids
- infusion of vasoactive drugs and drugs that irritate the venous wall (e.g. phenytoin)
- CVP monitoring
- elimination methods
- insertion of a pulmonary catheter
- "consumed" peripheral venous system

## Contraindications

- inability to solve acute complications arising from cannulation
- ignorance of the cannulation technique
- failure to meet technical conditions
- catheterization of the femoral vein in abdominal trauma
- catheterization of the internal jugular vein for intracranial hypertension
- undrained pneumothorax on the opposite side during catheterization of the subclavian vein or jugular vein
- infection site at the injection site

## Vascular approaches

- v. jugularis externa
- v. axillaris
- v. jugularis interna (entrance to v. cava superior)
- subclavian vein (entry into the superior vena cava)
- v. femoralis (entry into v. cava inferior)
- v. umbilicalis in newborns

## Central cannulation aids

Disinfection, perforated drape, local anesthetic, sterile gauze squares, central cannulation set, fixation aids (sutures), saline, syringes, needles.

## General Policy



Central line equipment



Inserted central venous catheter



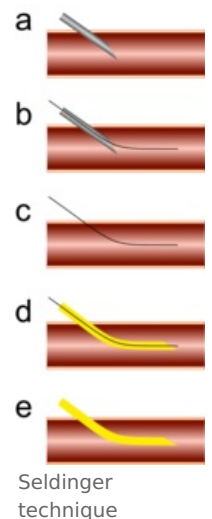
Skiagraphic control of catheter insertion into the subclavian vein

We observe strict aseptic conditions, i.e. disinfection of the injection site, covering the injection site with a sterile perforated mask. We perform the procedure in sterile gloves, a sterile gown and a mask. The technique according to Seldinger is the most suitable. After inserting the catheter, we disinfect the injection site again, fix the catheter well and cover it sterily (we consider it most suitable to fix the CVK to the skin with at least 3 stitches). Catheter position should be checked routinely. We perform the procedure in pediatric patients under general anesthesia, in extreme cases under adequate analgesia. During the use of the CVK, we ensure the prophylaxis of infectious complications (infusion sets and solutions are changed every 24 hours, we change the sterile cover of the catheter 3 times a week, antiseptic treatment before each disconnection of the system). For repeated cannulations of the central venous system, we use the so-called rotational principle with gradual use of all central veins. We measure central venous pressure (CVP) by including a pressure sensor in the infusion line.

## Procedure according to Seldinger

First, we select an adequate CVK according to the required length and clearance. We disinfect the injection site. Then, with a needle attached to a syringe 1/3 filled with physiological solution, we lead the injection with constant aspiration until we reach the lumen of the vessel (the return of blood into the syringe will convince us of this). In the case that we did not suck blood, but we assume that the depth of the injection is sufficient, we carefully pull out the needle with constant suction and the moment we detect the return of blood to the syringe, we are in the lumen of the vein. On the contrary, if we did not draw blood even when pulling out the needle and we pulled out the needle, the attempt was unsuccessful. In this case, we change the direction of the injection and repeat the attempt.

If the blood return is good, we remove the syringe and introduce a flexible introducer = conductor (wire) through the needle to approximately 1/4 to 1/3 of its length. If it is properly in the lumen of the vessel, it is inserted very easily. If the wire encounters resistance as it passes through the needle, the insertion is not continued and the wire is pulled out of the needle. Attention, it is necessary to fix the needle so as not to pull it out of the vein! Sometimes even minimal movement of the needle in the lumen of the vein will prevent successful wire insertion. After correct insertion of the wire, we subsequently remove the needle, while holding the wire firmly so that it does not pull out. We widen the injection site with a small incision, and at the same time we can also use a dilator, which we thread onto the wire and dilate the structures up to the blood vessel. The vascular catheter flushed with physiological solution is inserted into the vessel by a circular motion once to the right and once to the left along the wire (for even easier insertion, it is advisable to moisten the catheter with 1/1 FR). Once the catheter is inserted at the desired length, we pull out the wire. We then connect the catheter to a syringe with heparin and try aspiration for each lumen separately (blood should appear) and then instill approx. 2 ml of heparin, then fix the catheter usually by suturing. Sterily cover the injection site.



We check the correct position of the catheter with an X-ray image, which simultaneously excludes PNO. We can also determine the position of the catheter by sonography or by using the shape of the ECG curve, if we use a special auxiliary device and CVK, with the help of which it is possible to connect and transfer the electrical potential to the monitor or ECG.

## Complications of central venous catheterization

- local and systemic infections
- air embolism
- vessel perforation
- perforation of the heart
- wrong position of the catheter
- catheter detachment/dislocation/occlusion
- pneumothorax
- hemothorax
- fluidothorax (with paravenous application of solutions)
- air embolism
- arteriovenous fistula
- hematoma
- thrombosis (with possible subsequent embolization)
- dysrhythmia
- infection

 For more information see *Central Venous Catheter*.

## Links

### External links

- Invasive management of the critically ill 2019 — interactive algorithm + test (<https://www.akutne.cz/algorithm/cs/391--/>)

## Source

- HAVRÁNEK, Jiří: *Catheterization of central veins*. (edited)

## Related Articles

- Central venous catheter
- Seldinger Technique