



16. Insertion of central venous haemodialysis catheters

Draft CARI Guidelines

- a. Insertion of temporary haemodialysis central venous catheters should be performed by, or under the supervision of, experienced personnel, in sterile conditions. (Level B evidence)
- b. The procedure should be performed under direct vision, either surgical or ultrasound-guided. (Level A evidence)
- c. The jugular (long-term) or femoral (short-term) veins are the preferred sites for cannulation. Use of the subclavian vein is associated with a significantly higher risk of venous stenosis and insertion-related complications.

Practice tips

- The right jugular vein is the preferred approach. Elective insertion is usually via the central veins. Blind insertion for elective procedures should be discouraged but if performed should be followed by chest X-ray. Under urgent circumstances direct cannulation of the femoral vein provides the quickest access for haemodialysis. The infraclavicular subclavian approach is not considered a suitable access site, due to the higher short- and long-term complication rate; however, in urgent cases or where other access sites are unavailable, its use may occasionally be required.
- Catheters with an anticipated duration of less than 2 weeks are usually non-cuffed, non-tunnelled catheters often inserted at the bedside. Routine post-insertion chest X-rays for internal jugular lines have not been shown to be necessary, provided operator insertion is uncomplicated and guided by real time ultrasound. (Farrell J, Walshe J, Gellens M et al. 1997. Complications associated with insertion of jugular venous catheters for haemodialysis: the value of postprocedural radiograph. Am J Kidney Dis 30: 690-92. No benefit in post-procedural X-rays for internal jugular cannulation when operator noted no difficulties using real-time ultrasound, retrospective study > 400 cases.)
- Where the intended use of the catheter will be greater than 2 weeks, ultrasound-guided cannulation in radiology departments using tunnelled catheters positioned with the tip into the right atrium using fluoroscopy is advised.
- Surgical (open) placement of tunnelled catheters in the operating suite can also be used to access the external or internal jugular veins.



What is the evidence?

Randolph AG, Cook DJ, Gonzales CA et al. 1996. Ultrasound guidance for placement of central venous catheters. A meta-analysis of the literature. *Crit Care Med* 24: 2053-58.

A meta-analysis of 8 RCTs studying internal jugular and subclavian punctures using real-time ultrasound guidance. 68% reduction in failure rate, 78% reduction in complication rate, 40% reduction in number of attempts.

Denys BG, Uretsky BF, Sudhakar R. 1993. Ultrasound-assisted cannulation of the internal jugular vein. A prospective comparison to the external landmark-guided technique. *Circulation* 87:1557-62.

Large prospective study in non-dialysis patients showed a clear reduction in complications and time for the ultrasound guided approach.

Farrell J, Geilens M. 1997. Ultrasound guided cannulation versus the landmark-guided technique for acute haemodialysis access. *Nephrol Dial Transplant* 12: 1234-37.

Lin BS, Kong CW, Tarng DC et al. 1998. Anatomical variation of the internal jugular vein and its impact on temporary haemodialysis vascular access: an ultrasonographic survey in uraemic patients. *Nephrol Dial Transplant* 13: 134-38.

Nadig C, Leidig M, Schmiedke T et al. 1998. The use of ultrasound for the placement of dialysis catheters. *Nephrol Dial Transplant* 13: 978-81.

Gualtieri E, Deppe SA, Sipperly MA et al. 1995. Subclavian venous catheterization. Greater success rate for less experienced operators using ultrasound guidance. *Crit Care Med* 23: 692-97.

RCT where junior doctors were supervised to subclavian vein catheter insertion in an ICU setting, using landmark technique, ultrasound-guided or ultrasound salvage. No major complications in either group, but clear advantage to number of attempts, number of kits used and success rate in ultrasound-guided group in operators with inexperience at central venous catheterisation.

What do the other guidelines say?

DOQI: Tunnelled cuffed venous catheters are the method of choice for temporary access of longer than 3 weeks' duration (but are acceptable for access of shorter duration as well.) In addition, some patients who have exhausted all other access options require permanent access via tunnelled cuffed catheters. For patients who have a primary AV fistula maturing but need immediate haemodialysis, tunnelled cuffed catheters are the access of choice. (Evidence/Opinion)

The preferred insertion site for tunnelled cuffed venous dialysis catheters is the right internal jugular vein. Other options include: the right external jugular vein, the left internal and external jugular veins, subclavian veins, femoral veins, or translumbar access to the inferior vena cava. Subclavian access should be used only when jugular options are not available. Tunnelled cuffed catheters should not be placed on the same side as a maturing AV access, if possible. (Evidence)

Fluoroscopy is mandatory for insertion of all cuffed dialysis catheters. The catheter tip must be adjusted to the level of the caval atrial junction or beyond to ensure optimal blood flow. (Opinion)



Real-time ultrasound-guided insertion is recommended to reduce insertion-related complications. (Evidence/Opinion)

There is currently no proven advantage of one cuffed catheter design over another. Catheter choice should be based on local experience, goals for use and cost. (Evidence/Opinion)

Haemodialysis access of less than 3 weeks' duration should be obtained using a non-cuffed or a cuffed double-lumen percutaneously inserted catheter. (Evidence/Opinion)

These catheters are suitable for immediate use and should not be inserted before needed. (Evidence)

Non-cuffed catheters can be inserted at the bedside in the femoral, internal jugular or subclavian position. (Evidence)

The subclavian insertion site should not be used in a patient who may need permanent vascular access. (Evidence)

Chest X-ray is mandatory after subclavian and internal jugular insertion prior to catheter use to confirm catheter tip position at the caval atrial junction or the superior vena cava and to exclude complications prior to starting haemodialysis. (Evidence/Opinion)

Where available, ultrasound should be used to direct insertion of these catheters into the internal jugular position to minimise insertion-related complications. (Evidence/Opinion)

Femoral catheters should be at least 19 cm long to minimise recirculation. Non-cuffed femoral catheters should not be left in place longer than 5 days and should be left in place only in bed-bound patients. (Evidence/Opinion)

Nonfunctional non-cuffed catheters can be exchanged over a guidewire or treated with urokinase as long as the exit site and tunnel are not infected. (See protocols in Table III-2.) (Evidence)

Exit site, tunnel tract or systemic infections should prompt the removal of non-cuffed catheters. Treatment guidelines for catheter infection are discussed in Catheter Care and Accessing the Patient's Circulation (see page xx/Guideline xx). (Evidence/Opinion)

BRA: No guidelines available.

CSN: No guidelines available.

Implementation and audit

The following rates using ultrasound cannulation should be targeted:

1. pneumothorax < 0.1%.
2. carotid puncture < 1%.
3. early malfunction < 10%.



Suggestions for future research

1. Sites of puncture low versus high jugular punctures and complication rates.
2. Catheter designs.

OUT OF DATE