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The occasional central vein catheter

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There are at least 3 conditions that make central vein catheters occasionally useful in rural areas:

1. When infusing dopamine for shock: Dopamine can, in a pinch, be given peripherally via a secure large bore catheter. However, extravasation is an outright disaster causing extensive tissue necrosis even with instant local administration of vasodilators (usually not stocked in hospitals). Central vein catheters avoid this disastrous, if rare, complication. Central vein catheters can also become extravascular and produce hemohydrothorax and/or pneumothorax.

2. When needing to infuse large volumes of fluid in an unstable patient with known heart failure or with a fresh myocardial infarction: Although central vein pressure is sometimes not a reliable indicator of impending heart failure and despite the fact that one can monitor for overload clinically, the technique is still valuable in many situations. It would be used more often if doctors would learn to master it.

3. When no other veins can be found peripherally, either because of collapse or because of thrombosis: It is a particularly quick way of gaining access close to the heart in arrest or trauma situations, and unlike saphenous cutdowns, it is above the liver and inferior vena cava, which might be lacerated and/or obstructed.

Central venous catheters, especially the so-called introducer set, or Cordis, also allow any variety

of single, double, triple lumen catheters, Swan-Ganz catheters or pacing catheters to be used interchangeably through the introducer port, while allowing rapid fluid infusion through the side port (Fig. 1).

Fig 1. CVP catheter with introducer port and side port.



Central venous access

Central veins can be accessed peripherally (through the basilic vein in the arm) or through the femoral vein. Usually the subclavian or jugular veins are used. The jugular veins afford an easy and direct path to the superior vena cava, but the approach is psychologically more upsetting to the patient and the inexperienced doctor. I suggest you start with the subclavian approach.

Use the right subclavian vein because threading of catheters through the left subclavian needs more fiddling and can sometimes go awry.

The worst complication is a pneumothorax. If you do not know how to put in a small chest tube (See CJRM 1996;1(1):20-3 [full text]) make sure there is someone around who knows how to do it before proceeding. A pneumothorax is rare and usually will not occur at all if you are careful. Puncture of the subclavian artery requires no special measures other than compression supraclavicularly. You must be extremely aggressive or uncoordinated to cause any major damage. First year surgery or internal medicine residents often do this procedure unsupervised. I assume you know proper aseptic techniques, including the fact that povidone-iodine takes a few minutes (almost to drying) to have a full antiseptic effect.

Many companies sell kits with drapes, antiseptics, anesthetics and all the needles and catheters in 1 carton. Get these -- they are more expensive, but you will not be doing these procedures that often in your rural hospital (Fig. 2).

Fig. 2. CVP kit.



After prepping and draping, ask the patient to bring his or her shoulders as flat as possible to the table in order to straighten the subclavian vein. A little roll of towel between the shoulder blades helps. Put the patient in mild Trendelenberg position to distend the vein and help prevent air embolism.

Study your anatomy and make sure you know the path the vein takes before performing the procedure. Using a 10 mL syringe filled with xylocaine 2%, raise a weal under the skin at the junction of the middle and distal thirds of the clavicle, approximately where there is a natural infraclavicular hollow. Raise the weal 1 to 2 finger breadths under the clavicle or you will bend the needle as it goes under the bone. Advance the needle, injecting xylocaine and withdrawing as you go. You will actually scrape the undersurface of the clavicle with the tip of the needle, which will be pointing toward the sternal notch. It helps to keep 1 finger of your other hand in the sternal notch of the patient for direction (Fig. 3). As with starting an IV, keep your mind on the point of the needle: Where is it? How far in is it?

Fig. 3. Aim for the sternal notch.

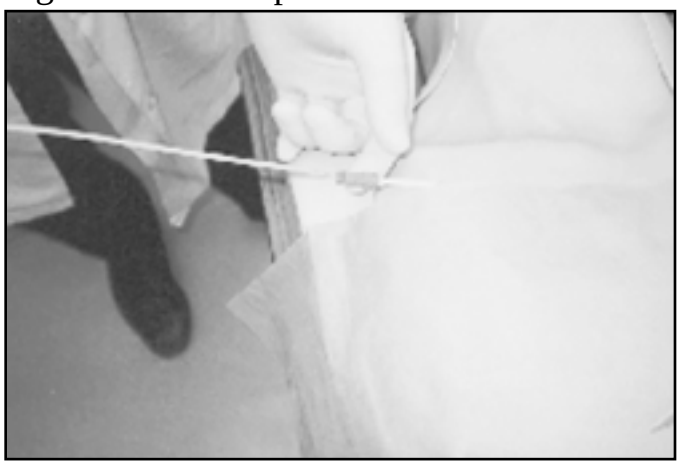


If you use a standard 1 1½-inch 22-gauge needle for this procedure, you may not reach the subclavian vein, but you will freeze most of the area. Most kits have longer needles which will reach the vein, letting you know the track to take. Follow the same procedure as above with the kit needle attached to an empty 10 mL syringe. Enter with the needle bevel side up, rub against the underside of the clavicle and aim for the sternal notch while aspirating. Do not change the direction of the needle once you start inserting it under the clavicle. If necessary, withdraw the needle and start again at a new angle. If your original angle is not successful at maximal penetration, you can try pointing the needle more medial to the sternal notch, but remember that this will lead you more toward the dome of the lung (especially in patients with emphysema). When the needle enters the vein, turn the syringe and needle 90° so that the bevel faces the notch. Ask the patient to stop breathing, detach the syringe, put your thumb over the hub and then thread the guidewire or catheter (depending on the kit) through the needle into the vein (Fig. 4). It should go in easily. If it does not, withdraw the needle and wire together and repeat the attempt. When inserting the wire, monitor the patient's ECG for PVCs, and if they occur, retract the wire. Once a guidewire is in the vein, remove the needle and use the kit's progressively larger dilators to widen the path (Fig. 5). Then thread the catheter over the guidewire and remove the guidewire. Hook up the catheter to an IV after you are sure all the air has been removed from the system.

Fig 4. Thread the guide wire through the needle.



Fig. 5. Widen the path with dilators.



Conclusions

This is 1 way of gaining central venous access. It is relatively easy to learn, and once learned, it will stick with you. The care you can offer your sicker patients, with or without transport will be much safer and better. A week in any ICU will teach you to use the technique wisely. And yes, if someone like me can do it, so can you.

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