Clinical Workshop

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Use of Cephalic and Basilic Veins for Introduction of Central Venous Catheters

DONALD RAY WEBRE, M.D., AND JAMES F. ARENS, M.D.

The use of central venous catheters is well established. In some instances, it is difficult to insert these catheters through the cephalic vein because of obstruction at various levels, notably in the area of the shoulder. Therefore, a study was made to compare the results of the use of the cephalic and the basilic veins as the carriers for central venous catheters.

METHODS AND MATERIALS

One hundred consecutive patients, each of whom had a central venous catheter inserted through an antecubital vein and also had a chest x-ray, were studied. The catheters were inserted by members of the anesthesia and surgical staffs. The catheter tip was located and recorded as being in the right atrium or superior vena cava, in the internal jugular vein, or in a peripheral vein or unusual location. The site of catheter insertion was recorded as right or left antecubital fossa and basilic or cephalic vein.

RESULTS

The results of the study are shown in table 1. The catheter in either the right atrium or the superior vena cava was considered satisfactory, and thus satisfactory placement was obtained in 59 per cent of the patients studied. As can be seen, the most common unsatisfactory placements were in peripheral veins (fig. 1) and the second most common were cephalic, lying in the internal jugular vein (fig. 2). Unusual locations included two lateral thoracic veins, one right cephalic vein, and one left basilic vein (fig. 3); one catheter inserted through the right cephalic vein was coiled in the axilla, and one inserted through the right basilic vein passed from the right subclavian vein into the left subclavian vein (fig. 4).

Of the catheters inserted through the basilic vein, 35 per cent were in unsatisfactory locations. Most of these were in the internal jugular vein and could be manipulated into

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<th>Table 1. Roentgenographic Location of Catheter Tips</th>
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* Catheter passed from right to left subclavian vein in one case.
† Catheter passed down lateral thoracic vein in two cases.
‡ Catheter coiled in axilla in one case.
Instances in which the catheter could be passed only a few inches up the arm vein and was therefore removed are not included. From personal experience and discussion with other members of the staff, this occurred much more often when the cephalic vein was used. Including these attempts in our results would greatly increase the percentage of unsatisfactory placements using the cephalic vein.

**DISCUSSION**

Figure 5 shows the venous drainage of the arm and axilla. The veins of the arm are extremely variable, especially the cephalic vein. Normally, the cephalic vein turns sharply as it pierces the clavipectoral fascia and passes beneath the clavicle. It usually terminates in the axillary vein, but it may terminate, or be greatly decreased in size, just a few inches above the antecubital fossa. Also, it may pass above or through the clavicle. Near its termination, it may bifurcate into two very small veins, one joining the external jugular vein and one joining the axillary vein, or it may join the external jugular vein only. Valves are located throughout its course, especially near its termination. Another important anatomic consideration is the right angle at which the cephalic vein joins the axillary vein. These numerous anatomic variations account for the frequent obstruction to catheter advancement.1,2

Abducting the arm is a help in allowing the catheter to enter the axillary vein, and turning the patient’s head toward the same side.

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**Fig. 1.** Catheter in a peripheral vein.

**Fig. 2.** Catheter in the internal jugular vein.
Fig. 3. Catheter in a lateral thoracic vein.

Fig. 4. Catheter crossing the midline into the opposite subclavian vein.

likewise keeps the catheter from entering the internal jugular vein.

The rigidity of the central venous catheter seems to have been responsible for many of the unsatisfactory placements. Recently, the soft balloon-tipped flow-directed pulmonary-artery catheter (Swan-Ganz) has been used, and none has passed into the neck or down the lateral thoracic vein or crossed the midline. Schneider has introduced a soft silicone elastomer catheter which would greatly facilitate proper placement and maintain more sterile conditions.\(^8\) With continued use of the present central venous catheter, radiographic confirmation of the site of the catheter tip must be obtained. This is especially important when the tip must be in the right atrium, as in certain neurosurgical procedures.

Our result of 41 per cent of the catheters in unsatisfactory positions is slightly higher than figures reported by Deitel and McIntyre (28.98 per cent),\(^4\) Gilday and Downs (33 per cent),\(^5\) and Kellner and Smart (24.6 per cent).\(^6\) Deitel and McIntyre\(^4\) used the cephalic vein for seven introductions, with only one success. They were unsuccessful using the basilic vein in only 23 per cent of their cases. Some authors\(^7\) mention that they have had little success using the cephalic vein but do not give statistics. Interestingly, Kellner and Smart\(^6\) state that their success rate using the cephalic vein was high, but they do not give statistics. They did note difficulty advancing the catheter past the cephalosubclavian junction.

The introduction of the pulmonary-artery catheter into clinical practice has greatly enhanced our knowledge of cardiac dynamics, such as the realization that central venous pressure and left atrial pressure in some patients do not correlate.\(^8\)\(^-\)\(^12\) For simplicity, the percutaneous basilic central venous catheter is
very useful. There are complications of puncture of the infraclavicular and supraclavicular subclavian vein and the internal jugular vein. Catheterization of an antecubital vein is still, and probably will remain, the most commonly used technique. Knowledge of the anatomy of the cephalic vein around the area of the axilla should aid in placing the catheters centrally when the basilic vein cannot be used.

REFERENCES

Fig. 5. The anatomy of the venous plexus around the shoulder.