Technic for Non-Surgical Insertion of Large Polyethylene Tubing into Blood Vessels

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Quite independently of each other, the authors of this brief report developed a simple technic which, without the use of special equipment, allows the percutaneous insertion of large bore polyethylene tubing into blood vessels. Certain features have been used by others.1-14

It is self-evident that the rigid point of a hypodermic needle, though desirable for percutaneous insertion into blood vessels, constitutes an undesirable source of continuing vascular trauma thereafter. In our technic, the needle serves only to effect entry and guide the tubing into the vessel's lumen. An important difference from the usual approach is that here the tubing is inserted around rather than through the needle.

Method

Preliminary Preparation

The bore of the polyethylene tubing to be used determines the gage of the guide needle, since the latter must fit smoothly into the tubing. Polyethylene tubing is available in sizes suitable for use with all needle gages including the 12-gage Robb-Steinberg angiocardiology needle.

A 1-mm lengthwise slit is made through one wall of the tubing 4 to 8 inches from one end. The tip of the needle is introduced through this slit, pointing toward the end of the tubing and the needle shaft advanced until the butt of the needle bears upon the tubing. At this juncture, there will be approximately 4 to 6 inches of tubing projecting beyond the tip of the needle. This is grasped by a hemostat and countertraction applied at the base of the needle shaft so as forcibly to stretch or draw out the tubing. This results in thinning of the wall of the tubing at and close to the tip of the needle. The stretched tubing beyond the needle is then cut off so as to leave the needle tip projecting slightly beyond the site of severance. A few trials will show that the foregoing preparations are simpler than their description. The needle and tubing may be prepared before or after sterilization; in either case, gloves will be necessary for the actual insertion into a blood vessel.

Insertion into Blood Vessel

Insertion is facilitated if, after procaine, a small (1-2 mm.) nick is made in the patient's skin over the desired vessel. If this is a vein, it should be distended through application of a tourniquet. When blood issuing from the needle indicates an intraluminal position of its tip, the needle and its surrounding jacket of tubing are advanced as far as possible within the lumen. The sensation of a resistance giving way may signify entry of the tubing into the vessel. Thereafter, the needle (alone) is removed, care being taken not to retract or otherwise dislodge the tubing in the process. Once the needle is out, the tubing is advanced as far as purpose dictates, and taped in place on the forearm. Arterial cannulation by this or any other method demands a higher degree of competence than venipuncture.

Advantages of Technic

This technic possesses several real advantages in addition to being fairly simple to perform. In eliminating the need for surgical exposure of the vessel to be cannulated, time is saved and the possibility of wound infection or vascular damage is reduced. Several other approaches to the problem have been reported, but these have been limited in one of 3 respects: 1. The widely used method15 of threading a small tube through the lumen of a needle suffers in that the needle cannot be removed easily and a severe limitation is imposed on the size of tubing that can be used. Though in many instances small bore tubing suffices for the purpose of the intubation, larger caliber tubing is more durable and perhaps less apt to be the site of thrombus formation. 2. Certain reported procedures6-12 though feasible require the use of

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special needles or sounds, not generally available. 3. Seldinger in a recent report has used a method similar in many respects to ours, but limited in scope to lengths of tubing shorter than the shaft of the needle employed.

Our technic was developed to meet needs...
encountered in connection with angiocardiography and special cardiopulmonary procedures, and here it has been of particular value. Angiocardiographic success demands the rapid delivery of a large volume of fluid into the right atrium, e.g., 50 ml. in 1.5 seconds in average adults.\footnote{15, 16} By advancing the tubing until its tip lies in the superior vena cava, the dose may be delivered rapidly to the right place and in an intact fluid bolus. This avoids the occasional failure of angiocardiography that results when a sustained Valsalva maneuver by the patient forces contrast agent up into the neck veins, thereby diluting and delaying the arrival of the contrast agent. If injection is made through tubing into the superior vena cava, the Valsalva maneuver is capable of producing an improvement in radiographic contrast by reducing temporarily the nonopaque blood reaching the right atrium. Knowledge of the length of tubing passed and localizing sensations felt by the patient during the rapid trial injection of cool saline eliminate the need for fluoroscopic localization. Unless pressure injection apparatus is used, the small bore of the usual cardiac catheter makes it useless for selective angiocardiography save where small doses suffice. Finally, when injection is carried out through tubing rather than a needle, the likelihood of painful extravasation is virtually eliminated.

In the realm of cardiopulmonary procedures, this technic is especially valuable in performing cardiac output studies by the dye-dilution technic. It is possible to obtain more complete and more central injection of the indicator agent, hence improving the technic,\footnote{17} without the necessity of a venous cut down.

SUMMARY

A simple technic is presented for the non-surgical insertion into blood vessels of large bore polyethylene tubing.

ACKNOWLEDGMENT

In addition to those covered in references 1 through 14, acknowledgment is given for helpful suggestions to one of us (J. R. S.) made by Dr. Giles G. Bole, Jr., of the Department of Medicine, University of Michigan.

ADDENDUM

After this article was accepted for publication, a report\footnote{18} describing a similar technic was brought to our attention. The latter technic differs from ours in that the needle is not inserted through the wall of the polyethylene tubing. This means that the length of tubing cannot exceed the longest needle available, thus somewhat restricting the usefulness of the method. In other respects the two technics are essentially identical.

SUMARIO IN INTERLINGUA

Es presente un simple technica pro le insertion nonchirurgic, a un les vasos de sanguine, de tubos de polyethylene a grande calibre.

REFERENCES

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