METHOD OF INTRODUCING A CATHETER INTO A BODY VESSEL

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This invention relates in general to methods of introduction of catheters through the integument and a blood vessel for injection of therapeutic fluids such as whole blood, plasma, blood cells, hydroelectrolytic solutions, etc., into the circulatory flow; or for extraction of blood; and in particular to the use of a catheter—mandrel combination and a method for catheterizing a blood vessel or any internal portion of the body.

With some of the present day methods a patient may be limited in his mobility because of the danger of interfering with the operation of the catheter. With a rigid needle left in place during the fluid injecting process, movement of the body adjacent the needle may very likely cause puncturing of the blood vessel, or the separation of the needle from its applied position. Where certain fluids must, of necessity be injected slowly or over a long period of time this immobility is very annoying and difficult for the patient.

It is one object of my invention to provide a catheter tube and internally positioned mandrel and method of use in which the catheter tube is introduced either through a surgical opening or through the interior bore of a hypodermic needle and through the integument and blood vessel with the aid of the mandrel which retains the tube in a more rigid condition until the desired position is attained within the blood vessel at which time the mandrel may be removed or prior to removal may be used for introduction of an adapter to the end of the catheter tube leaving only the flexible tube and external connection to the conduit from a source of fluid for injection, or for connection to a syringe or other receptacle for blood.

Other objects and advantages, as well as the construction and manner of use of my invention will be better understood by reference to the following specification in connection with the accompanying drawings in which:

FIG. 1 is an enlarged elevational view, partly in cross-section, showing the integument and blood vessel punctured by the hypodermic needle and the catheter tube and mandrel preparatory to introduction of the catheter tube into the blood vessel.

FIG. 2 is a similar view with the catheter tube partially introduced into the blood vessel and the mandrel partially withdrawn preparatory to further introduction of the catheter tube.

FIG. 3 is also a similar view with the puncturing needle withdrawn, and an adapter for reception of a syringe, etc., guided by the mandrel into position on the end of the catheter tube, the initial position of the adapter when being introduced to the catheter being shown in dotted lines.

FIG. 4 shows one manner of securing the exposed portion of the catheter to provide complete ambulation, if necessary, for the patient.

FIG. 5 illustrates use of the catheter and mandrel for insertion of the catheter directly into the blood vessel through a surgical opening without use of a needle.

In the drawings, the relative angles of the hypodermic needle and catheter with the integument and blood vessel are for illustrative purposes only. In actual practice the hypodermic needle is inserted as nearly as possible in the direction of the blood vessel.

Referring now to the drawing by numerals of reference, 1 designates a tube or catheter preferably made of a suitably pliable material in the plastics or the like. The catheter 1 is adapted to receive a mandrel or rod 2 of suitable material which may be substantially rigid such as stainless steel or like material, or it may be of any other material which will impart some degree of rigidity to the catheter during its application to the blood vessel, said mandrel or rod being of a diameter suitable for easy insertion and sliding relation to said catheter.

The catheter 1 is adapted to fit the bore 3 of the hypodermic needle 4, the point 5 of which penetrates the integument 6 and blood vessel 7. The catheter 1 and mandrel 2 may be introduced after the hypodermic needle 4 is in place in the blood vessel, or together with the hypodermic needle depending on the technique preferred. When the hypodermic needle is properly positioned in the blood vessel, the catheter 1 with mandrel 2 are inserted in the bore 3 of the hypodermic needle 4 with the mandrel portion 2 extending from the catheter. The catheter and mandrel may then be gently urged through the hypodermic needle and into the blood vessel.

The flexibility of the catheter facilitates its introduction into the blood vessel without pain or annoyance to the patient and without causing injury to the internal wall of the blood vessel. The catheter is inserted in the blood vessel a desired distance leaving a sufficient length of the catheter and mandrel remaining exposed.

If the length of the catheter and length of the mandrel may vary according to the catheterization situation involved. On insertion in a straight blood vessel the mandrel may enter a considerable distance if necessary. In other situations the mandrel may enter only a very short distance. Also, a mandrel which has some degree of flexibility, although aiding the entry of the catheter may adjust itself to any curvature in the blood vessel and may enter a considerable distance with the catheter.

Depending also on the situation, the catheter and mandrel may be inserted with one definite complete stroke to the desired position, or it may be inserted in small increments by partial withdrawal of the mandrel after each application of the mandrel and catheter into the blood vessel.

A short adapter 9 similar in form to a hypodermic needle is applied to the external end of the catheter. An important function of the mandrel is to aid in this operation as the mandrel guides the adapter 9 and keeps the catheter aligned for easier entry of the adapter into the end of the catheter. The end of the catheter tube is expanded by the adapter and the tensile strength of the catheter tube keeps it snugly in position on the end of the adapter which is forced into the bore of the tube with the aid of the mandrel.

The adapter 9 is connected to any desirable instrument such as a syringe, or through connecting means 11 to a source of fluid to be injected into the blood vessel, or to any receptacle for blood being withdrawn from the blood vessel.

Another important feature of my invention is the use of the mandrel with an adapter having a bore no less than the bore of the catheter tube, said adapter, by means of the mandrel, being forced into and expanding the end of the catheter tube and thereby providing unrestricted flow of fluid through the tube and the adapter.

In FIG. 5 the catheter 1 is shown partly in place through a surgical opening 12 for use in the same manner as herein-before described. In this manner of use a hypodermic needle is not employed, the mandrel 2 being used in the same manner as with the hypodermic needle and making it easier to urge the flexible catheter into the blood vessel through a surgical opening.

My invention makes it possible for almost any nonspecialist to apply the catheter. The use of the mandrel, in
effect, decreases the flexibility of the nonrigid tube or catheter rendering it temporarily more rigid and making its introduction into the blood vessel a relatively simple task. Further, the combination of the tube and mandrel makes it quite easy to force the short adapter 9 over the mandrel and into the end of the catheter, said mandrel, while remaining in the catheter preventing discharge of blood from the catheter and formation of blood clots in the catheter. The mandrel is easily slid out of the catheter preparatory to making suitable connection of a syringe, tube or other connection to the adapter 9. This arrangement makes it possible to use an adapter with an aperture of the same diameter as the interior bore of the catheter.

It is obvious that changes in form, proportion, and details of construction may be resorted to without departing from the principles of my invention and I reserve all rights to such changes as come within the terms of these specifications and the claims which follow.

What I claim as new and desire to secure by Letters Patent is:

1. A method of catheterization comprising the application through the integument and into a blood vessel of a hypodermic needle, the application of an internally bored catheter tube having proximal and distal ends through the hypodermic needle until the distal end of the catheter tube enters the blood vessel, the application of a mandrel having proximal and distal ends to the catheter tube leaving the proximal end of the mandrel exposed from the proximal end of the catheter tube, and leaving the distal end of the catheter tube in fully flexible condition, including complete withdrawal of the hypodermic needle from the catheter tube, application of an adapter to the tube, and application to the adapter of means for injection or withdrawal of fluid.

2. A method of catheterization comprising the application through the integument and into a blood vessel of a hypodermic needle, the application of an internally bored catheter tube having proximal and distal ends through the hypodermic needle until the distal end of the catheter tube enters the blood vessel, the application of a mandrel having proximal and distal ends to the catheter tube leaving the proximal end of the mandrel exposed from the proximal end of the catheter tube, and leaving the distal end of the catheter tube in fully flexible condition, including complete withdrawal of the hypodermic needle from the catheter tube, application of an adapter to the proximal ends of the mandrel and flexible tube for reception of fluid injecting or withdrawing means prior to removal of the mandrel from the flexible tube, and application to said adapter of the fluid injection or withdrawing means.

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