ABSTRACT: A cannula is disposed about a stylet with a sharp forward end for incising the wall of an organ having a lumen for receiving the cannula from which, thereafter, the stylet is removable. The cannula may be collapsible for preventing fluid flow relative to the organ upon stylet removal, and thereafter defines a path, for inserting the catheter into the lumen. A slit extending longitudinally of the cannula may be provided to enable rapid stripping of the latter from the catheter which is longer than the cannula.
FLEXIBLE CATHETER AND INSERTING APPARATUS

The present invention relates to translocation of fluids relative to the lumen of a body organ having a wall-requiring breach for access to said lumen. Particularly, the invention relates to a flexible catheter and apparatus for inserting such a catheter into the lumen of an organ such as a blood vessel. The art with which the present invention is concerned is characterized by U.S. Pat. Nos. 3,094,122 and 3,225,762.

In accordance with the teaching of the former, a hollow hypodermic needle having an incising end is adapted to gain access to the lumen of a vessel. A catheter (referred to in said patent as a cannula) is mounted over the needle and is insertable into the lumen along a path defined by the needle. The needle is positioned to project from both ends of the catheter to enable needle insertion into the lumen and removal from the catheter following catheter insertion in the lumen. Such limitation of catheter length to less than that of the needles severely restricts facility with which the catheter is usable.

This shortcoming is solved by an assembly according to the latter patent which provides a slit in the wall of a catheter (also referred to in said last patent as a cannula) medially of its ends from which an organ-incising instrument can be removed following catheter insertion into the lumen. Although the latter assembly enables employment of a catheter of any length which is desired to prevent undesirable leakage through the slit are absent. That hazard limits use of the catheter to a condition in which it will not be bent at or near the slit.

Moreover, because in each of the heretofore known assemblies the catheter is disposed over an incising instrument, a filter, which is desirable for removing particulate from translocated fluid, cannot be installed in the catheter.

It is an object of the present invention to provide an improved combination of a flexible catheter and apparatus for insertion thereof into a body lumen such as the lumen of a blood vessel.

It is a further object of the invention to provide a catheter of any length into such body lumen, regardless of the length of the inserting apparatus.

It is another object of the invention to facilitate removal of catheter-inserting apparatus following insertion of a catheter of any selected length into a body organ.

To effect the foregoing objects, an assembly for translocating fluids relative the lumen of a body organ having a wall-requiring breach for access to the lumen includes a rigid stylet. A shank of the stylet at its forward end is fashioned for incising the wall to gain entry to the lumen. A cannula is movably disposed intimately about the shank for insertion into the lumen through the incised wall, and for removing the stylet from the cannula after the stylet has been removed. In one aspect of the invention, the cannula has an axial slit extending its length for removal from the catheter after catheter insertion into the lumen.

How to further effect the foregoing and other objects, features and advantages of the invention will become more apparent upon consideration of the following description and appended claims, when considered in conjunction with the accompanying drawings wherein the same reference character or numeral refers to like or corresponding parts throughout the several views.

On the drawings:

FIG. 1 is a longitudinal sectional view of the cannula, catheter, and apparatus according to the present invention for inserting a catheter into the lumen of a body organ.

FIG. 2 is a longitudinal sectional view of the cannula and apparatus according to the present invention for inserting a catheter through the lumen of a body organ.

FIG. 3 is a longitudinal sectional view of the cannula associated in the lumen according to the invention.

FIG. 4 is a longitudinal sectional view of the catheter and illustrating removal of the cannula following catheter insertion into said lumen.

FIG. 5 is a view according to section line 5-5 of FIG. 4.

Referring more particularly to the drawings, a stylet 10, which may be a solid rod has a forward or downstream end portion 12 fashioned with a tapered cutting edge for incising the wall of a body organ, herein shown as a blood vessel 16, for access to its lumen 18. An upstream end portion 14 is arranged to receive an upstream portion 16 of said stylet. Upstream end portion 14 here is shown as a disc-shaped handle. However, said end portion may be fashioned as a receptacle (not shown), to accommodate the male luer tip of a syringe (not shown) for easier insertion of the stylet into a lumen 18.

A preferably transparent collapsible cannula 22 is disposed intimately about shank 20 but is adapted for sliding movement and on removal from the stylet 10 longitudinally thereof. The cannula has a tapered forward end portion and is adapted for insertion about said stylet into lumen 18 through the incised wall of blood vessel 16 by sliding said cannula from its position of FIG. 1 to its position of FIG. 2 while the stylet is in the blood vessel. The cannula, which is adapted to remain in the lumen while the stylet is withdrawn through the upstream end portion 24 of said cannula. An intermediate condition of stylet withdrawal is shown in FIG. 2.

The wall of the cannula is of a collapsible fabrication, the rigidity of which is such that upon removal of styllet 10 the tension of tissue 26 (FIG. 2) about vessel 16 as well as the tension of the walls of the vessel itself about the incision will collapse cannula 24. Thereby, upon stylet removal, flow from the lumen 18 through the cannula is prevented.

The length of stylet 10 is such that its forward end portion 12 and handle 14 are simultaneously projectable from opposed ends of cannula 22. Moreover, the stylet may have a longitudinal groove 34 which extends from its incising end for a short distance up the surface of shank 20 where said groove tapers into the fabric of the surface. Thereby blood flowing from lumen 18 into groove 34 can be observed through the cannula to indicate penetration of the stylet 10 through the wall of vessel 16. The collapsible character of the cannula prevents blood flow from lumen 18 about the stylet beyond the upstream end of groove 34.

A flexible catheter 28 preferably of plastic fabrication, and which is longer than cannula 22 5 adapted for fluid translocation into and out of lumen 18. The catheter is proportioned for withdrawal insertion into said lumen through the cannula after stylet removal to effect a cannula over catheter arrangement. The stiffness of the catheter is adequate to overcome tissue pressure holding the cannula in a collapsed condition whereby the catheter can be inserted into lumen 18 through the cannula. To facilitate such insertion the catheter has a smooth surfaced forward end portion 30 which may be stiffer than the remainder thereof and is fashioned for passing fluids relative the lumen. Moreover, the forward end portion may have means for filtering fluid herein defined by a plurality of small apertures 31 in said forward end portion in consequence of which particulate delivered through the catheter may be prevented from entering blood vessel 16.

The foregoing arrangement enables insertion of a cannula of considerable length which is not limited by the length of the cannula. The latter member merely provides means enabling insertion of the cannula into lumen 18 through the incised wall of vessel 16. But once access to the vessel has been gained by the catheter, it is desirable to remove the cannula as its purpose has been fulfilled and further maintenance within vessel 16 needlessly strains tissues. Frequently removal of the cannula is not indicated until after the upstream end of the catheter has been connected to a receptacle such as a solution bottle (not shown). In practice, the upstream end of the catheter may be connected even prior to insertion of the catheter into the lumen of the vessel. In such circumstances it is impossible to remove the cannula from the catheter by passing it over the upstream end of the catheter.

In accordance with one aspect of the present invention the cannula has an axial slit 32 which extends its entire length and facilitates removal of the cannula from about the inserted
catheter. To effect such result the cannula is withdrawn from lumen 18 (FIG. 4) and stripped from the catheter, said catheter passing through the axial slit as the cannula and catheter are separated, leaving only the catheter in the vessel.

As many substitutions or changes could be made in the above described construction, and as many apparently widely different embodiments of the invention within the scope of the claims could be constructed without departing from the scope and spirit thereof, it is intended that all matter contained in the accompanying specification shall be interpreted as being illustrative and not in a limiting sense.

I claim:

1. In an assembly for inserting a catheter into a lumen of a body organ having a wall-requiring breach for access to said lumen, the combination comprising:
   a rigid stylet having a shank and a forward end fashioned for incising said wall to gain entry to said lumen;
   a flexible cannula disposed intimately about said shank, said cannula being tapered at one end for insertion about said stylet into said lumen through said incised wall and to remain in said lumen after stylet removal; and
   said cannula defining a longitudinal slit along its entire length to permit the transverse removal of said cannula from a catheter after emplacement by withdrawal of the cannula from the body organ and passing said catheter through said slit.

2. A combination according to claim 1 in which said cannula is defined by a collapsible wall for cutting off flow therethrough from said lumen after removal of said stylet.

3. A combination according to claim 2 in which the cannula is light transmissive and defines a channel on the outer surface of said shank for receiving fluid upon entrance of said cannula into the lumen.

4. A method of inserting a catheter into a living body which comprises inserting a rigid incising stylet having a flexible cannula disposed about it into said living body; withdrawing said stylet from said cannula without withdrawing said cannula from the body; passing a flexible cannula into said body through the cannula; and thereafter withdrawing said cannula from the body without withdrawing the catheter and separating the catheter from the cannula by pulling the cannula transversely relative to the catheter through a longitudinal slit defined in said cannula, and extending for the entire length thereof, to separate said cannula and catheter.

5. The method of claim 4 which comprises collapsing a portion of said cannula after withdrawing said stylet to prevent flow therethrough.