APPARATUS FOR USE IN CENTRAL VEIN CANNULATION

FIELD OF INVENTION

This invention relates generally to the field of medicine and more particularly to a valved Y-connector for use in blood vessel cannulation.

BACKGROUND OF INVENTION

Central venous catheters are used extensively in the care of critically ill patients. Insertion of these various forms of catheters is not risk free. The main problems with this procedure are inadvertent arterial puncture, air embolism, contamination with introduction of infection and spilling of blood onto the patient and/or medic. Arterial puncture (inadvertent and/or accidental) can result in significant morbidity; particularly if this is not recognized before large-bore catheters are introduced or infusion of solutions started. The incidence of arterial puncture in central vein cannulation procedures is reported to be about 2–15% confirming venous placement of the catheter is therefore important. A study has indicated there is a decrease in frequency of progression of inadvertent arterial puncture to arterial cannulation from 11.6% to 0% when a small-bore scouting needle is pressure transduced to confirm a venous pressure. It is thus important for the medic, especially in the operating room to have a reliable, quick and easy means of observing blood pressure of the vessel punctured. Conventionally X-ray confirmation of catheter placement is only done in the recovery room after the operation.

Two common systems currently available and in use for wiring are manufactured respectively by Arrow International Inc. and Baxter Healthcare Corporation. Neither system provides PVC tubing connection to allow hydrostatic manometry of the introducer needle. The 'Arrow Raulerson* Spring Wire Introduction Syringe' simplifies the technique of wiring the central vein but the benefits are only realised if manometry is not done. Disconnecting the syringe to attach an open-ended PVC manometer tube automatically negates the benefit of direct wiring through the attached syringe.

*Trade-Mark

To optimize the central vein cannulation technique the equipment should allow pressure transduction and wiring of the introducer needle without having to remove the syringe and open the system. Current techniques and methods do not allow the operator using the Seldinger technique of gaining venous access to pressure check the vessel and pass a guide wire into the vessel without removing the syringe and opening the introducer needle to the air. This results in blood loss onto the patient and hands of the operator thus contaminating the working area with blood. If the vessel has a negative pressure relative to atmospheric pressure air could be entrained into the needle into the vessel resulting in air embolism, which can be fatal.

Once the system is opened and in contact with the operator's hands, the risk of contamination is increased; this being more of a problem in the emergency situation where strict aseptic technique is difficult to achieve.

U.S. Pat. No. 4,935,008 issued Jun. 19, 1990 to R. L. Lewis Jr. discloses inserting a wire through one branch while leaving the syringe connected to another branch of a branched passage introducer needle. The patentee discloses an introducer needle for medical use consisting of a needle mounted in a hub and both of which are of special design. The needle has two lumens or passages one of which extends the entire length of the needle and hub and the other one of which extends

along a major portion thereof but branches into an arm that has a valved passageway for introduction of a guide wire. The end of the syringe fits into the tapered cavity with a passage therefrom aligned with the first lumen or passage through the needle. The passageway is not valved in a manner to permit insertion of a tube for blood pressure measurement.

A separate Y-connector piece is disclosed in U.S. Pat. No. 4,998,977 issued Mar. 12, 1991 to D. Preise et al. The Y-connector piece detachably connects at one end to the hub of a puncturing cannula. A wire is fed into a blood vessel or artery through the main passage of the Y-connector and the branch passage detachably connects to a pressure measuring device.

U.S. Pat. No. 5,108,375 issued Apr. 28, 1992 to S. W. Harrison et al is directed to a closed system cannulating device and disclosed therein is a guide wire known as a J-wire commonly used in a cannulation procedure.

A Y-adaptor with a check valve is disclosed in U.S. Pat. No. 5,073,168 issued Dec. 17, 1991 to J. W. Danforth. A connector with a one way valve is disclosed in U.S. Pat. No. 4,842,591 issued Jun. 27, 1989 to R. B. Luther. A valved adaptor is also disclosed in U.S. Pat. No. 4,096,860 issued Jun. 27, 1978 to W. F. McLaughlin. A J-wire wire advancement system is disclosed in U.S. Pat. No. 4,917,094 issued Apr. 17, 1990 to A. S. Lynch and a modified adaptor is disclosed in U.S. Pat. No. 5,125,905 issued Jun. 30, 1992 to L. A. Wright et al.

The present invention is directed to an improvement over the teachings of the aforementioned U.S. Pat. Nos. 4,998,977 and 4,935,008. The latter patented structure is an integrated needle and hub with a complicated multiple passage needle structure in which the passages branch all of which contributes to high manufacturing cost. The teachings of U.S. Pat. No. 4,998,977 fails to provide a simplified pressure measuring system and wherein the pressure measurement and wire insertion utilize the same passageway leaving the other free for remaining attached to the syringe.

SUMMARY OF INVENTION

The disadvantages of the prior devices are overcome by the present invention wherein an individual valved connector piece is provided for use between a conventional introducer needle and a conventional syringe with a branch off the main passage being valved for alternate simple pressure measurement and guide wire insertion. The angle of the branch is such as to allow easy J-wire introduction using one hand while the other hand stabilizes the syringe.

The branched off passage is in a side arm of the device and the proximal end of such side arm is fitted with the valve. The valve is a latex one-way fish-mouth valve, or equivalent, that prevents backflow of blood while at the same time allows inserting thereinto an end portion of a length of PVC tubing. The PVC tubing through a vertical disposition thereof during use can visually indicate blood pressure or it can be connected or be connectable to a pressure gauge. The end of the tubing can be connected to the device before the needle is inserted into the vein or after blood has been aspirated.

Once a venous placement is confirmed the manometer tubing (aforementioned PVC tubing) is removed and the J-wire introduced through the same valved branch of the passage using a suitable guide wire advancement system as for example that disclosed in the aforementioned U.S. Pat. No. 4,917,094 or the equivalent. The