

## SYRINGE AND NEEDLE WITH GUIDE WIRE FOR CANNULATION OF CENTRAL VEINS

### BACKGROUND OF THE INVENTION

The present invention is directed toward a combined syringe and needle and, more particularly, to such a combination which further combines a guide wire therewith for introducing the guide wire into human blood vessels.

The arrangement of the present invention is particularly designed for the easier cannulation of central veins such as the internal jugular, subclavian and femoral veins. Cannulation is done to provide a reliable portal for the administration of intravenous drugs and fluids to patients with poor peripheral veins, those requiring potential caustic drugs or those so ill that their illness requires a very reliable portal for drugs such as in the case with patients requiring vasopressor drips to maintain blood pressure.

Central veins may also be cannulated for the placement of pulmonary artery catheters for the continuous monitoring of cardiac output and pulmonary artery pressures. Irrespective of the ultimate reason for the cannulation of central veins, the veins are all currently cannulated by essentially the same procedure which is generally referred to as the J-Wire internal jugular catheterization technique.

For all central line placements, the patient is placed in a supine position and the area of skin overlying the vein to be cannulated is sterilized with an antiseptic solution. Multiple sterile drapes are placed around the chosen site to prevent bacteria from non-sterilized areas from coming into the sterile field and to provide a sterile surface to place some of the instruments that will be used. The site of the central vein is approximated by skin surface landmarks and a large bore needle with attached syringe is used to empirically aspirate around this site until the vein is found.

As is well known in the art, the physician aspirates by drawing back on the plunger of the syringe and feels the force needed to do so. If a large force is required to withdraw the syringe, a vein has not been found even though one may be present in the vicinity. The physician knows that he has penetrated the vein when blood flows easily into the syringe as he aspirates. Obviously, this procedure requires that the needle and syringe be an airtight system which is not open to the atmosphere or the syringe plunger could always be easily withdrawn whether or not the needle has penetrated a vein. It would, therefore, be extremely difficult, if not impossible, for the physician to locate the vein.

Once the vein is found, the physician must disengage and remove the syringe barrel from the needle. This process necessarily involves pulling, twisting and/or turning the syringe barrel in relation to the needle which may cause substantial manipulation of the needle while it is in place within the vein. This can often result in trauma to the vein and unnecessary discomfort to the patient. Moreover, this manipulation of the needle may result in its movement from the initial puncture site. That is, the needle can be pulled back out of the vein or it may accidentally be advanced too far causing it to exit the backside of the vein. Accordingly, it is necessary for the physician to manually and steadily hold or "freeze" the needle while removing the syringe from the hub of

the needle. This must be done very carefully in order to avoid any movement of the needle itself.

After the syringe is removed, an elongated flexible guide wire is then inserted into the now open hub of the needle and is threaded through the needle into the vein. These guide wires are usually and conventionally comprised of a wound metal wire having its forward end bent back slightly in the form of a "J."

With the flexible guide wire in place, the needle is then slid out of the vein and over the length of the guide wire and discarded. This is done while the wire remains lodged with one end in the vein and the other end protruding from the vein and outside the skin. An elongated tubular catheter made of a soft rubber or plastic is then slid over the protruding end of the guide wire into the vein and the wire is then removed. Intravenous tubing is connected to the catheter and central venous access has then been obtained.

Difficulty in this conventional procedure arises in several distinct but related areas. The first, as suggested above, is when removing the syringe from the hub of the needle which can cause dislodgment of the needle. The second is in holding the needle absolutely still while placing the syringe down on the sterile surface and grasping the end of the guide wire. A guide wire must then be inserted into the open hub of the needle and through the needle toward the vein. During these procedures, it is not unusual to dislodge the needle from the vein. If this happens, the guide wire will not be able to slide into the vein and the physician will feel resistance as he tries to slide the wire through the needle. Upon such an occurrence, the wire must be removed from the needle, the syringe reattached to the needle and an attempt must be made to "find" the vein again. Once the vein has again been located, the process of trying to thread the wire into the vein is repeated.

The foregoing is a problem which is well known and recognized when using this conventional catheterization technique. Attempts have been proposed in the past to provide improved syringes in order to overcome the problem of dislodging the needle. While these devices may offer partial solutions, to Applicant's knowledge, they have not entirely solved the problem.

One such proposed solution is illustrated in U.S. Pat. No. 4,813,938 which describes a syringe sold under the trademark Safety Syringe by Arrow International, Inc., of Reading, Pa. The Safety Syringe includes a continuous passageway which extends entirely through the center of the needle and through the entire syringe including the plunger and plunger handle. With the use of the Safety Syringe, it is not necessary to remove the syringe barrel from the needle. Rather, once the vein is found, the safety wire is introduced into the rear of the syringe plunger handle and entirely through the central passageway, through the needle and into the vein.

While the Safety Syringe would appear to obviate the problem of dislodging the needle since the syringe barrel need not be removed, in practice it apparently does not do so. This results from the fact that the doctor must attempt to maintain the entire needle and syringe combination absolutely still while locating the guide wire and forcing it entirely through the center of the syringe and needle. Because of the length of the syringe body and plunger and the fact that the physician must manipulate the guide wire at the very end thereof, it is difficult to maintain the entire arrangement absolutely still. The physician loses his "feel" for the location of the needle