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DISPOSABLE INDWELLING PLASTIC CANNULA ASSEMBLY

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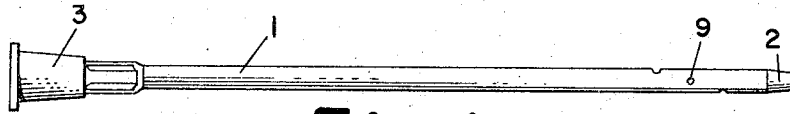


Fig. 1

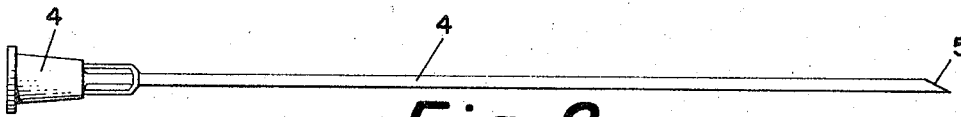


Fig. 2



Fig. 3

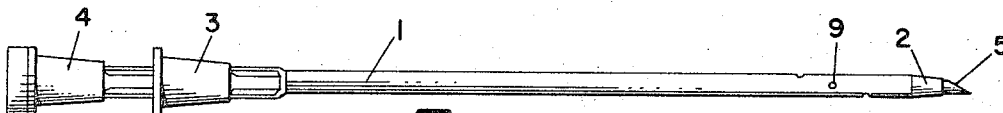


Fig. 4

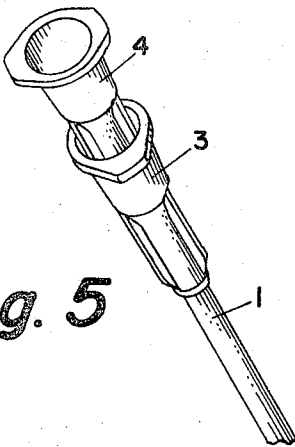


Fig. 5

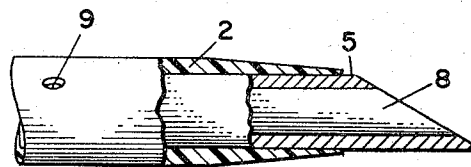


Fig. 6

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DISPOSABLE INDWELLING PLASTIC CANNULA ASSEMBLY

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1 Claim. (Cl. 128—214.4)

This invention relates to surgical devices and more particularly to a disposable plastic and steel cannula assembly.

In surgical procedures such as intravenous fluid therapy, diagnostic body cavity probing and therapeutic body cavity drainage, it is conventional practice to insert a hollow needle into the body. Steel needles have conventionally been used for this purpose. Steel needles have the disadvantage in intravenous fluid therapy, that the patient's arm must be immobilized to prevent the point of the needle from inflicting damage to the vessel. In probing of a body cavity, either for instillation of pharmacologic agents or for drainage of undesirable fluid collections, a steel needle may cause trauma to organs with which it comes in contact. Steel needles have the further disadvantage that they are expensive and must be reused. Reuse requires complete sterilization and offers the further disadvantage of transmitting bacterial or viral infections with a potentially contaminated instrument.

To overcome some of these difficulties plastic cannulae have been developed. A flexible plastic cannula can be inserted into the body, or into vessels, minimizing the risk of soft tissue and internal organ injury. Furthermore, plastic cannulae are inexpensive to manufacture, can be pre-sterilized and pre-packaged prior to use, and are disposable after use.

Prior art plastic cannulae have not been uniformly successful for all uses. Most prior art plastic cannulae are designed to be introduced into the body or vessel through a steel needle or trochar. The steel needle is first inserted into the vessel or body cavity and the plastic cannula is threaded through the hollow center. After a proper placement of the cannula the outer steel needle is removed leaving the plastic device within the body. Such a technique for introduction of plastic cannulae has the disadvantage that the maximal diameter of the cannula is limited to the inside diameter of the steel needle. An additional disadvantage is that the opening in the body wall or tissues through which the device is passed is significantly larger than the plastic cannula itself and the practice is frequently complicated by leakage around the cannula.

The cannula-over-needle technique has been utilized in the prior art. However, these prior art cannulae have not gained wide-spread acceptance. These prior art cannulae are adapted to be fitted with a steel hub which receives intravenous fluid equipment or syringes. The use of such a steel hub requires disassembly and reassembly for reuse. The use of a steel hub with a connected plastic cannula has further disadvantages in the possibility of disengagement of the component parts during use, the necessity for reuse of a potentially contaminated hub, the misplacement and loss of the steel hub, and a relatively high initial investment in the procurement and manufacture of steel hubs.

Most prior art cannula assemblies have other disadvantages in that they do not have means for rendering the cannula assembly air-tight when it is being inserted. This is particularly important in thoracentesis, or drainage of the chest cavity, where a completely air-tight system must be maintained to prevent foreign air from entering the pleural cavity of the chest.

The above and other disadvantages of prior art cannula

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assemblies are obviated by the invention described in this application. In accordance with one embodiment of this invention, a plastic cannula is provided which is designed to allow introduction over a steel needle. This makes most efficient use of the opening made in the body wall or the vessel, and allows a maximal diameter of the cannula. The assembly completely fills the entry opening and tract through which it passes, and essentially eliminates the problem of leakage around the cannula. Following insertion of the plastic cannula the steel needle is withdrawn. The properties of the cannula are such that it is sufficiently soft and blunt to prevent trauma to organs with which it may come in contact, yet flexible enough to yield without kinking or flattening. The plastic cannula has a blunt tapered point at the leading end which allows easy introduction through resistant tissues. The tapered end of the cannula is perforated with accessory drainage holes to forestall plugging should the tip of the cannula come in contact with a tissue surface or become plugged with proteinaceous material.

The proximal end of the cannula is provided with a plastic hub which is fused to, or is one piece with, the shaft of the cannula. This plastic hub is of the lock type and of standard size to accept currently used intravenous equipment and syringes. These hubs are so constructed as to allow easy disengagement from each other without fear of binding or locking.

The entire cannula assembly is provided with two disposable plastic stylets, one of which may be inserted into the steel needle prior to insertion of the device into the body, and the other, larger, can be inserted into the plastic cannula after its placement. The stylet within the steel needle facilitates introduction of the cannula through the dermis and other resistant tissues. After removal of the steel needle a stylet may be placed within the plastic cannula to allow the cannula to be left in situ for indeterminate periods of time without fear of drainage through the hollow center or plugging of the tip.

The entire cannula assembly is inexpensive to manufacture, can be pre-sterilized and pre-packaged, and is entirely disposable.

Accordingly, it is an important object of the present invention to provide an improved plastic cannula suitably adapted to be inserted over a steel trochar.

It is a further object of the present invention to provide an improved plastic over needle cannula assembly having a plastic lock type hub fused on one end thereof and a blunt tapered point having a plurality of accessory drainage perforations at the other end thereof.

It is a further object of the present invention to provide an improved cannula assembly including a steel needle disposed within a plastic cannula, and a pair of plastic stylets disposed either within the trochar to render the assembly air-tight for insertion, or within the plastic cannula itself to allow prolonged periods of indwelling with safety.

The above and other objects, features, and advantages of the present invention may be better understood from the following more detailed description and appended claims in conjunction with the drawings in which:

FIGURE 1 shows the plastic cannula;

FIGURE 2 shows the steel needle;

FIGURE 3 shows the plastic stylet for insertion within

the steel needle;

FIGURE 4 shows the complete cannula assembly;

FIGURE 5 shows an end view of the assembly showing the lock-type hub in more detail; and

FIGURE 6 shows a magnified cutaway view of the cannula assembly tip.

With reference to the drawings: FIGURE 1 demonstrates the plastic cannula. The cannula is a flexible,

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plastic tube 1 having a blunt, tapered tip 2 at the leading end thereof and a plastic hub 3 at the other end thereof. The plastic hub 3 is of the lock-type and is fused to, or is one piece with, the plastic cannula tube 1. The cannula may be constructed of polypropylene plastic, nylon, tetrafluoroethylene material, commonly available under the trademark Teflon, or any other suitable flexible material. The tapered blunt tip 2 is provided with a plurality of accessory drainage holes 9 to prevent blockage.

FIGURE 2 demonstrates the steel needle 4. The steel needle is provided to facilitate insertion of the cannula into the body. The steel needle is inserted into the cannula and the tip 5 of the needle projects a short distance from the tip 2 of the cannula.

FIGURE 3 demonstrates the plastic stylet 6 which is placed within the steel needle during insertion of the cannula into the body. The plastic stylet 6 is provided with a fused-on plastic head 7. The close fit of the plastic stylet and plastic head insures that the cannula assembly will be air-tight during insertion.

FIGURE 4 demonstrates the assembled cannula components. The plastic stylet 6 is inserted within the steel needle 4 which is, in turn, inserted in the plastic cannula 1.

The assembled plastic cannula components, FIG. 4, are used in the following manner: a 3 mm. incision is made in the skin of the back or abdominal wall. With the operator applying gentle traction around the incision with the fingers of the left hand, the tip 5 of the cannula assembly is inserted into the incision with gentle pressure. The entire cannula assembly is then advanced the desired depth either into a blood vessel or into a body cavity. The plastic stylet may then be removed and a syringe may be placed on the hub of the steel needle 4 and air or fluid may be withdrawn to insure proper placement of the cannula. Once the operator is assured that the tip of the cannula assembly is in the desired location, the sharp steel needle may then be removed and discarded. The plastic cannula may then be left in situ or may be further advanced for probing purposes with minimal risk in injury to internal soft tissues. Intravenous fluid equipment, syringes, or other standardized devices may then be attached to the plastic hub 3, or pharmacologic agents may be instilled through the plastic catheter. If the operator desires to leave the plastic catheter in situ during intervals between therapy or drainage procedures, the second stylet (not shown) may be inserted within the cannula and will prevent plugging or drainage of fluid.

FIGURE 5 is a partial end view of the cannula assembly. The plastic lock-type hub 3 is shown in detail. The steel needle 4 is shown in position within the cannula.

FIGURE 6 shows a cutaway of the cannula assembly tip. This demonstrates the manner in which the tip 8 of the plastic stylet 6 blends with the tip 5 of the steel needle and the tapered tip 2 of the cannula to provide an assembly which allows easy penetration of the body wall. One of the auxiliary drainage perforations 9 is shown in this figure.

While a particular embodiment of the invention has been shown and described, it will, of course, be under-

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stood that various changes may be made without departing from the principles of the invention. The appended claim is, therefore, intended to cover any such modifications within the true spirit and scope of the invention.

What is claimed is:

A cannula assembly for insertion through tissue of the body and to remain therein with tight contact between it and the body tissue comprising:

- a hollow, flexible plastic tube having a uniform inside diameter and a uniform outside diameter throughout the major portion of its length, said outside diameter being suitable for intravenous therapy and entrance into body cavities,
- a steel trochar disposed within said plastic tube, said steel trochar being of uniform outside diameter and of a diameter which facilitates easy insertion and removal of said trochar from said plastic tube, said trochar having a pointed tip at the distal end thereof extending beyond the distal end of said flexible plastic tube,
- said flexible plastic tube having a tapered blunt tip at the distal end thereof, said tapered blunt tip being of gradually reduced outside diameter to provide a close fit with said trochar and of diameter approaching the outside diameter of said trochar, said tube having a plurality of auxiliary drainage perforations at the distal end thereof,
- a lock-type hub integral with said plastic tube and at the proximal end of said tube, said lock-type hub being of the same material as said flexible plastic tube, said tube and said hub being constructed of a synthetic plastic material which is sufficiently soft to prevent trauma to organs with which said tube comes in contact but flexible enough to yield without flattening, said material being selected from the group consisting of polypropylene plastic, nylon and tetrafluoroethylene plastic, and
- a plastic stylet, said stylet having a head on one end thereof and a tip on the other end thereof, said stylet being disposed within said trochar, with said stylet head being disposed against the proximal end of said trochar.

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