ABSTRACT: A combination connector and channel closure system for multilumen catheters comprises two connector members, each having a female portion connected to a catheter channel and a male portion on the opposite end, the male portions being joined by a short section of flexible plastic tubing forming a releasable seal for the plural channels of the catheter.
COMBINATION CONNECTOR AND CHANNEL CLOSURE SYSTEM FOR CATHETERS

BACKGROUND OF THE INVENTION

The invention relates to multilumen catheters and to connector means affixed to the proximal end portions of such catheters which serve both to form releasable seals of closures for the plural channels in the multilumen catheters and also as connector devices for joining the principal and secondary channels of the catheter to other elements, e.g., suction tubes, inflation syringes or the like.

A variety of multilumen catheters have been developed for use in clinical and surgical procedures. One class of multilumen catheters are sump drain tubes of double lumen design for nasogastric suction procedures. Another is the replegole suction catheters such as used in relieving esophageal atresia in premature infants. Yet another type are Foley catheters which involve a principal lumen and a small secondary or inflation lumen through which the balloon cuff of the distal end can be inflated. A recent development is the Dennis triple-lumen sump gastrointestinal tube used for intestinal suction siphonage procedures (see "Surgery," Vol. 66, 309-312, Aug. 1969). The improved combination connector and channel closure systems of this invention are contemplated for use with any such multilumen medico-surgical tubes.

Multilumen catheters generally have a principal channel which serves to transport body fluids, medicinal preparations, treating liquids, gases or other fluids into or out of the body of a patient into which the catheter has been inserted as part of a clinical or surgical procedure. The remaining lumens of such catheters constitute secondary channels designed to serve a variety of purposes, e.g., to permit inflation of a balloon cuff at the proximal end, to permit ingress of air for the sump purpose in sump drain tubes or the like. Generally, it is necessary to connect both the principal and secondary channels during the clinical or surgical procedure to auxiliary equipment, e.g., an inflation syringe, an underwater trap and suction pump, a drain bag, or the like. On the other hand, when originally packaged in sterile condition for storage and handling before use and, in some cases, during the operative procedure involved with the catheter use, it is desirable to seal the principal and secondary channels of the catheter against entrance of any material into the channels. Accordingly, it would be advantageous in the use of multilumen catheters to have them provided with connector members which enable the channels of the catheter to be quickly and easily connected or disconnected from auxiliary devices and conversely, to permit the channels of the catheter to be sealed against entrance of material into them whenever this would be required prior, during and after the catheter use procedure as an aid in maintaining sterile conditions in the catheter channels.

OBJECTS

A principal object of this invention is the provision of new forms of multilumen catheters provided with a combination connector and channel closure system for the channels of the catheter. Further objects include the provision of:

1. Releasable seals for primary and secondary channels of multilumen catheters to prevent entrance of material into the catheter channels or leakage out of these channels.
2. Channel connectors for multilumen catheters adapted for connection to both Luer tip syringes and for Asepto syringes.
3. New methods for forming multilumen catheters with channel connector and closure units.
4. Information relative to the construction and use of multilumen catheters and means for connecting and closing the catheter channels during use, storage, handling or the like.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description, while indicating preferred embodiments of the invention, is given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description. It should also be understood the foregoing abstract of the disclosure is for the purpose of providing a nonlegal statement to serve as a searching-abstractive tool for scientists, engineers and researchers and is not intended to limit the scope of the invention as disclosed herein nor is it intended it should be used in interpreting or in any way limiting the scope or fair meaning of the appended claims.

SUMMARY OF THE INVENTION

These objects are accomplished according to the present invention by the improvement in multilumen catheters which comprises a combination connector and channel closure system having a first connector member with an enlarged central body portion, a male connector portion on one end and a female portion on the opposite end into which the proximal end of the catheter is fixed, a second connector member of similar configuration to the first connector member fixed at the female end portion thereof to the free end of a connector tube extending from a main channel of the catheter and a short section of flexible plastic tubing fitted at one end over the male connector portion of the first connector member and fitted at the other end over the male connector portion of the second connector member. This combination of short tubing and connector members forms a releasable seal against entrance of materials into the channels of the catheter. Removal of the short section of flexible tubing from one or both of the male connector portions of the first and second connector members immediately presents the connector members for attachment to a suction line or any other piece of auxiliary equipment or device required in the procedure involving the catheter.

Advantageously, the connector members are molded of plastic material in required shape to provide the enlarged central body portion, male connector portion and female portion and are attached by cementing to the proximal end of the catheter or connector tubes extending from the catheter.

BRIEF DESCRIPTION OF DRAWINGS

A more complete understanding of the new medico-surgical tube constructions of the invention may be had by reference to the accompanying drawings in which:

FIG. 1 is a fragmentary perspective view of a sump drain catheter in accordance with the invention showing the proximal end equipped with combination connector and channel closure system of the invention.

FIG. 2 is a fragmentary side view of the proximal end of the catheter of FIG. 1 showing the main channel of the catheter attached to a suction tube and the secondary channel of the catheter attached to a syringe.

FIG. 3 is an enlarged fragmentary sectional view of the connector member attached to the proximal end of the catheter.

FIG. 4 is an enlarged sectional view taken on the line 4-4 of FIG. 1.

FIG. 6 is an enlarged sectional view of a triple-lumen catheter to which the improved connector and channel closure systems of the invention can be applied.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring in detail to the drawing, the multilumen catheter 2 comprises a proximal end 4, a distal end 6 adapted for insertion in the body of the patient and a central portion 8. A principal channel 10 extends substantially throughout the length of the catheter and connects the distal end 6 with the proximal end 4 for transport of fluid therebetween. A secondary channel 12 terminates at one end 14 close to the closed tip 15 of the distal end 6 of the catheter and terminates at the other end 16 by being sealed off with a portion of plastic material 18 of which the body 20 of the catheter is formed.
A connector tube 22 of smaller outside diameter than the catheter 2 is fixed at one end 24 to an opening 26 through the sidewall 28. The tube end 24 is cemented or otherwise joined into the opening 26 in a manner to permit fluid to flow through the connector tube 22 and into the secondary channel 12 of the catheter.

The structure of multilumen catheters as described up to this point is old in the art. Accordingly, those familiar with this type of article and its manufacture will understand that such catheter structures may be made by any procedures and with any construction materials known to be useful in the art for this purpose. Advantageously, and particularly for disposable type single use catheters, they are formed by plastic extrusion from plasticized vinyl chloride polymers although they may be made of any other suitable plastic material or rubber by other methods such as dip coating, injection molding or the like.

The combination connector and channel closure system for the multilumen catheters which constitutes the improvement of this invention comprises a first connector member 30, a second connector member 32 and a short section of flexible plastic tubing 34.

The first connector member has an enlarged central portion 36 and a male connector port 38 formed with a tip 40 and a tapering which joins the tip 40 to the central body portion 36. A bore 44 extends from the tip 40 to the central portion 36.

The opposite end of the connector member 30 comprises a female portion 46 which tapers inwardly to the tip 48 from the center body portion 36. A bore 50 having a circumference substantially equal to the periphery of the tip 52 of the proximal end 4 of the catheter extends from the female portion tip 48 back into the central body portion 36 of the connector member. The connector member is attached as shown in FIG. 3 to the tip 52 of the catheter such as with cement, heat fusion of the plastic of which the catheter wall 20 is formed or in any other suitable manner.

The second connector member 32 that is of similar configuration to the first connector member 30 is fixed at the female portion 46a thereof to the connector tube 22. The second connector member comprises a male connector portion 38a on one end of the central body portion 36a and a female portion 46a at the other end. The second connector member will, of course, have a bore similar to the bore 44 of the first connector member 30 and also a bore in the female portion 46a analogous to the bore 50 in the first connector member 30 although, in this case, the female portion bore will have a circumference substantially identical to the periphery of the free end 4 of the connector tube 22. Also, the second connector 32 will be fixed to the connector tube 22 such as by cementing, heat fusing or the like as described in connection with the first connector member 30.

When the catheter is not in use, such as when packaged for storage or delivery to a point of use, the short section of flexible tubing 34 is fitted as shown in FIG. 1. At one end 56 over the male connector port 38 of the connector member 30 and at the other end 58 over the male connector portion 38a of the connector member 32. This forms a releasable seal against entrance of material into the principal channel 10 of the catheter or into the connector tube 22.

When it is desired to connect the catheter with auxiliary devices required in the procedure being applied to a patient after insertion of the catheter in the body of the patient, the improved end system of the catheter may be converted from a closure unit as shown in FIG. 1 into a connector unit as illustrated in FIG. 2. This shows the short section of flexible tubing 34 removed from the male connector portion 38 of the connector member 30 and a suction hose 60 connected to this male portion 38. The other connector member 32 has the short section of plastic tubing 34 still attached to the male connector portion 38a as an adapter for attachment to an Aspeyo syringe. Such syringes are well known to the medical profession and used for handling large volumes of fluid. A syringe of this type is illustrated, for example, in U.S. design Pat. No. 216,169.

It will be understood by physicians, surgeons and others who are familiar with the use of multilumen catheters that the precise arrangement illustrated in FIG. 2 may not necessarily occur in clinical or surgical procedures so that FIG. 2 is to be understood as being presented primarily to illustrate the flexibility of the new combination connector and channel closure systems of the invention. Obviously, alternative arrangements are readily possible. For example, the Aspeyo syringe could be connected to the principal channel of the catheter by use of the short tube 34 with the first connector member 30 in place of the suction tube 60. Also, the connector member 32 could be left unattached to any auxiliary unit such as where it would be desired to use this lumen to permit ingress of air for the sump principle in procedures involving a sump drain catheter. As a further alternative, a small syringe with a Luer tip can be immediately connected to either the principal channel of the catheter or to the connector tube 22 by inserting the tip of the Luer syringe into the bore 44 of the connector tip, this bore 44 being purposely designed to accommodate the standard size Luer syringe tips.

FIG. 5 illustrates a triple-lumen catheter such as the Dennis gastrointestinal sump tube. Such a medical-surgical tube 62 could comprise a principal channel 64, a secondary channel 66 and a tertiary channel 68. The principal channel 64 is used for suction, the secondary channel 66 serves the sump and the tertiary channel 68 is employed for inflation of a balloon cuff. The channels 66 and 68 are each provided adjacent the proximal end of the catheter with connector tubes and these in turn with connector members such as connector member 32 shown in FIG. 2. With this arrangement, closure of the catheter and the connector tubes could be accomplished by joining all three connector members at the male portion thereof by a small plastic T-member. As an alternative, one of the connector tubes and the catheter could be arranged in a releasable seal as shown in FIG. 1 while the second connector tube and its connector member could be closed by placing a cap or short section of plastic tube with one closed end over the male portion of the connector member.

The new constructions for medical-surgical tubes of the invention are suitable for use with disposable catheters and the like designed for a single patient single use end. Such disposable catheters are advantageously formed by extrusion of flexible nonfibrous plastic material such as plasticized polyvinyl chloride, polyethylene, polypropylene, etc. in like manner of suitable formulation to give the desired flexibility, wall strength required for the particular shape or style of medical-surgical tube involved, non-toxic and capable of sterilization such as by exposure to ethylene oxide vapors, gamma ray radiation or similar techniques used in the manufacture of these devices. Transparent plastic material can be used to permit visual observation of the lumen of the catheter external of the patient during the clinical procedure. Alternatively, however, pigmented plastic material which is opaque to visible light, x-ray radiation or both, may be used and the catheters may be formed with an x-ray opaque longitudinal line or other markings in accordance with known practice in the art. The new catheters can be sterilized, handled, packaged, manipulated or stored under the same conditions and handling procedures familiar to physicians, surgeons and other personnel accustomed to working with the disposable plastic type catheters. Moreover, the catheters can be formed to include bubbles, tapered sections, O-ring additions or any other auxiliary elements with which catheters are now produced or may be required to be formed in the future. Similarly, the catheters may be made to have substantially uniform wall thickness throughout their length or, where special application or professional preference dictates, tapered portions or wall sections of varied thickness may be provided in the catheters by air blowing, vacuum drawing or other techniques known to the plastics art.

The embodiments of the invention is which an exclusive property or right I claim is defined as follows:
1. In a multilumen catheter having a proximal end, a distal end adapted for insertion in the body of a patient, a principal channel connecting said distal end with said proximal end for transport of fluid therebetween, a secondary channel of smaller size than the principal channel, an opening through the sidewall of the catheter adjacent the proximal end providing fluid flow access to said secondary channel and a connector tube of smaller outside diameter than said catheter fixed at one end to said opening, the improvement of a combination connector-channel closure system for the catheter which comprises a first connector member having an enlarged central body portion, a male connector portion on one end and a female portion at the opposite end into which the proximal end of the catheter is fixed, a second connector member of similar configuration to said first connector member fixed at the female portion thereof to the free end of said connector tube and a short section of flexible plastic tubing fitted at one end over the male connector portion of said first connector member and fitted at the other end over the male connector portion of the second connector member, said combination of short tubing and connector members forming a releasable seal against entrance of material into the catheter and the connector tube.

2. A catheter as claimed in claim 1 wherein said connector members are injection molded of rigid or semirigid plastic material.