FINGER PRESSURE POINTS

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This invention relates to improvements in catheters, and more particularly, to an improved urethral catheter incorporating built-in features which greatly increase the number of functions which the catheter of the invention is capable of serving, as compared to existing catheters.

For example, although basically a urethral catheter incorporating built-in retention means, as distinguished from separate and distinct equipment such as a syringe which requires attachment procedure and must further be individually held, a catheter according to the invention may perform further desirable functions such as that of "clearing" debris, blood clots, and other substances from the catheter proper, which existing catheters can perform only through the aid of additional apparatus. Another function which is capable of performance by the catheter of the invention is that of obtaining sterile samples of urine from the bladder without the necessity of using extraneous sterile appliances and without danger of obtaining contaminated specimens. Again, a catheter employing the retention means of the invention may be employed either without any change or by simple substitution of greater capacity pump means, in prostatic surgery to produce pressure in the prostatic fossa and thereby arrest bleeding.

Still broadly, therefore, a major object of the invention is the provision of an improved retention-type urethral catheter capable of performing useful functions over and above those of drainage and/or treatment of the urinary tract, which are not possible of attainment by existing catheters.

More particularly, it is an object of the invention to provide a catheter incorporating built-in retention means, wherein such retention means is employed conjointly and/or coactively with supplemental built-in means to perform desirable functions in addition to that of drainage and/or treatment of the urinary bladder, such as that of "clearing" the catheter of blood clots, debris and the like acting to clog the same, of obtaining sterile samples of urine directly from the bladder and without the necessity of extraneous sterile appliances, and of arresting bleeding during prostatic surgery through use of the retention means to produce pressure on the prostatic fossa.

It is a further object of the invention to provide a multi-purpose catheter as aforesaid, which is further characterized by simple and inexpensive construction and which is largely automatic in its operation, and which requires the attention of but a single person for its insertion to a position of use and during subsequent manipulation for the purpose or purposes which it is capable of performing.

The above and other objects and features of advantage of an improved catheter according to the present invention will be seen from or become apparent from the following detailed description and accompanying illustrative drawings thereof, in which—

FIG. 1 is a broken-away part-sectional view of an improved catheter according to the invention which illustrates the nature and construction of the built-in means associated therewith for extending the functions capable of being performed by said catheter as compared to those performable by existing catheters;

FIG. 2 is a broken-away sectional view illustrating structural features of one of the two built-in valving mechanisms associated with the also built-in pump means of a catheter according to the invention;

FIG. 3 is a view similar to FIG. 1 but illustrating the catheter retention means in its distended or working position;

FIGS. 4 and 5 are sections taken along lines 4—4 of FIG. 2 and 5—5 of FIG. 1, respectively;

FIGS. 6 and 7 are fragmentary views which illustrate the manner of manipulating a catheter incorporating the built-in means according to the invention to produce a negative pressure in the drain passage of the catheter proper, for the purpose of dislodging blood clots, debris, etc., likely to find their way into said passage during use of the catheter;

FIGS. 8 and 9 are views similar to FIGS. 6 and 7 but illustrating the manner of manipulating the catheter and its associated built-in means to produce a positive pressure in the catheter passage; and

FIG. 10 illustrates the manner of operating the built-in means to effect release of the retention means in the event that the pump bulb should happen to be already distended when release of the retention means is desired.

Referring to the aforesaid drawings in greater detail, a catheter according to the invention is basically a retention catheter, i.e. a catheter provided with means for retaining the same in place during use, of the general type disclosed and claimed in copending patent application Serial No. 152,518, filed November 15, 1961, by myself and Enzo Krahl, M.D., (of which I am now the sole owner) in that it comprises an elongated soft rubber or plastic tube 10 having appropriate outside diameter for its intended purpose, and which is provided with a longitudinal drain passage 12 which extends from its closed distal end 14, which latter is provided with one or more liquid-entry openings 16, to its usually open discharge or proximal end 18; and catheter retention means comprising an outwardly distensible rubber or like material annulus 20 which is disposed in edge secured, encircling relation about the catheter tube proper a small distance rearwardly of its liquid-entry opening or openings 16 and which is distensible radially to the form of an annular retaining collar when distended by a suitable medium such as distilled water forcibly introduced into its interior through a fluid passage 22 separate from the main catheter passage 12 and which is preferably formed in an auxiliary tube 24 integral with and extending along the catheter tube to a point short of the proximal end of the latter, from which it branches away from said catheter tube and connects with a built-in pump means generally designated P, via a valving mechanism V₁, which latter controls communication between said pump means and said retention collar 20.

Illustratively, the pump means P comprises a firm rubber bulb of size enabling it to serve as a reservoir for 5 cc.'s of a suitable non-compressible medium, such as sterile water, for effecting distention of the retention collar 20, said bulb discharging through a preferably integral, short-length outlet tube 28 whose outlet end is connected by means of a suitable union or coupling 30 to a short-length metal tube 32 forming a component of said valving mechanism V₁. In addition to said metal tube, the valving mechanism V₁ comprises a preferably cylindrical valve body 34 which is closed at its end adjacent the pump bulb by a hard rubber plug-form end closure 36, through which the free end of the metal tube 32 passes and relative to which it has limited reciprocating motion. The other end of the valve body 34 (which illustratively is tapered) is connected to the proximal end of the auxiliary tube 24 whose passage 22 provides the passage to the retention collar, as previously explained.

As best seen in FIG. 2, the end of the metal tube 32...
which extends into the valve body is suitably closed and is further provided with a radial end flange 38, and adjacent said flanged end with a side opening or port 46. The flange 38 prevents unintentional or accidental axial separation of metal tube from valve body, and the side opening 46 provides for the passage of the fluid medium coming from the pump bulb 16 to the interior space of the valve body and thence through fluid passage 22 to the retention collar, for the purpose of distending the latter. However, such assumes that the metal tube 32 is pushed axially inwardly relative to the valve body 34 a distance which brings the opening 46 clear of the end flange 38, since the normal position of said metal tube will respect to the valve body is that shown in full lines, in which position the opening 46 of the metal tube is closed by said end plug 36. It is intended that said metal tube 32 will have tight fit in the hole provided therefor in the rubber plug 36, thus to seal off any leakage of the sterile or other fluid medium along the tube as it passes through said plug. At the same time, the fit of the metal tube in the rubber end plug will be such as to provide for relative freedom of the axial movement of metal tube with respect to the end plug which is required to cover and uncover the fluid opening 46 thereof.

From above, it will be seen that the catheter so far described is basically a retention catheter incorporating built-in means for effecting distention and deflation (collapse) of the retention collar 26. Thus, in common with the retention catheter incorporating built-in retention means as disclosed and claimed in my aforesaid application Serial No. 152,518, the present catheter may be secured in a position in which its distal end 14 extends into the patient's bladder simply by manually pushing the metal tube 32 of the valving mechanism V1 inwardly with respect to the valve body 34 to its broken line position. In this position it of course assuming that during the operation of manipulating the catheter to its aforesaid position the metal tube 32 was in its normal or full-line position in which the opening 46 was covered), and then manually compressing the pump bulb P to force the c.c.'s of operating fluid contained therein to the inner side of the retention collar as effects its required distention. To now maintain the retention collar distended thereby to secure the distal end of the catheter in place for extended time periods, it is necessary only to retract the metal tube 32 of the valving mechanism V1 to its full-line position, whereas the operating fluid is held between the valving mechanism V1 and the retention collar, with the result that deflation or collapse of said collar cannot take place. When it is desired to release the catheter, the metal tube 32 is again pushed to its broken line position (FIG. 2) and the pump bulb P is permitted to distend, whereupon the operating fluid is drawn back into said bulb, as effects or permits collapse of the retention collar.

According to a further feature of the invention, there is provided a second valving mechanism V2 connected in a second fluid line extending between the pump bulb P and the catheter tube 10. More particularly, the pump bulb is provided with a second outlet tube 28' extending to said valving mechanism V2 and the latter is connected to the catheter tube adjacent its said proximal end through a branch tube 18a. Preferably, the first and second referred-to-valving mechanisms V1 and V2 are identical and accordingly the parts of the second valving mechanism are designated by the same numerals as those identifying corresponding parts of the said first valving mechanism, but said reference numerals are distinguished by use of the prime numerals applying to the parts of the second valving mechanism V2.

The advantage of using the second valving mechanism V2 conjointly or coactively with the first valving mechanism V1 to extend substantially the functions capable of performance by a catheter according to the invention will now be described.

Let it be assumed that after the catheter has been secured and is being maintained in place for purpose of drainage or treatment of the bladder, the need for clearing the main catheter passage 12 of a blood clot, debris and the like arises. As seen in FIG. 6, at this stage of the procedure both of the valving mechanism V1 to their respective off or fluid-line closing positions shown in full lines (FIG. 2), this by virtue of the fact that the normal position of the valving mechanism V2 is the off position and the valving mechanism V1 has been actuated to the off position to maintain the retention means distended following its initial desired. Consequently, the pump bulb is in the compressed state.

The doctor or technician in charge has two options to effect the desired clearing of the main catheter tube; that is, he may clear the catheter by producing either negative pressure or positive pressure in its main drainage passage 12. Should he elect to clear by negative pressure he applies finger pressure to the catheter tube adjacent its proximal end and rearwardly of the point of connection of branch tube 18a therewith sufficient to close off the main catheter passage 12, and then he manually pushes the metal rod 32 of the valving mechanism V1 to its open position. Thereupon he permits the pump bulb to distend or "inflate," which it does automatically in tending to return to its initial non-compressed state. Such creates a negative pressure in the tubing line controlled by the valving mechanism V2 and in the main catheter passage 12, which is usually sufficient to dislodge the blood clot or debris. Finally, if the blood tube is released, whereupon the so-released clot or debris will pass out the proximal end thereof, together with the liquid drainage from the bladder.

In the event that dislodgement of the blood clot or debris by positive pressure is decided upon, positive pressure to be increased pressure may be provided in the main catheter passage 12 by manipulation of the pump means and associated valving mechanisms as indicated in FIGS. 8 and 9. That is, valving mechanism V2 is in its normal off position and valving mechanism V1 is in its off position to which it has been actuated following distention or inflation of the retention collar to hold the collar in the distended state. Then finger pressure is applied to the catheter tube at a point therealong which may be just forwardly or distally of the point of connection of branch tube 18a thereby to close off the catheter tube passage 12 distally of said point of connection. Thereupon the pump bulb of the valving mechanism V2 is actuated to its broken-line position (FIG. 2), resulting in said valving position being now in the on position. The pump bulb is now released, whereupon it inflates and in so doing draws in fluid or air through the proximal end 18 of the catheter tube. Then the point of finger pressure on catheter tube is transferred to a point somewhat rearwardly or proximally of point of connection of the branch tube 18a therewith and finally the pump bulb P is squeezed, such forcing fluid (on air) from the bulb into the catheter passage 12 under positive pressure. The blood clot or debris is freed therefrom and thence injected into the bladder, whereupon urinary flow is reestablished.

For release and removal of the catheter under the usual condition of the pump bulb B being in the compressed state, it is required simply to manually actuate valving mechanism V1 at the on position, whereupon fluid from the retention collar either will be drawn into the bulb as it distends or will be forced from said collar by pressure of the body part or parts acting to deflate same. Should the pump bulb be already distended, it will be necessary also to actuate valving mechanism V2 to its on or line opening position, whereupon fluid from the bulb retention collar will have free exit through the proximal discharge end 18 of the catheter.

Since a direct suction-passage connection between the catheter passage proper and the interior of a pump bulb is possible during the period that its distal end is secured within the bladder, a catheter according to the
invention may also be employed as a means for obtaining sterile samples of urine from the bladder without the necessity of extraneous sterile appliances and without danger of obtaining contaminated specimens. For example, by following the technique described above in providing a negative pressure within the main catheter passage 12, urine may be pumped from the bladder into the pump bulb, from whence it can readily be removed in sterile condition with a hypodermic syringe and tested as desired. Such operation of course depends on a pump bulb fashioned from a firm rubber or equivalent material such as a so-called memory plastic to shape assuring that the bulb after it has been collapsed as by manual squeezing will distend automatically to its original non-stressed shape.

Another potential use of a catheter and built-in apparatuses according to the invention is in prostatic surgery wherein the distended retention balloon 20 may be utilized to produce pressure on the prostatic fossa and thereby arrest bleeding. Since such may require the introduction of up to 50 cc.'s of fluid into the retention collar to achieve the high degree of distention and corresponding high pressure on the fossa requisite to arrest bleeding, a pump bulb or syringe type mechanism of the larger capacity will usually be substituted for the 5 cc. capacity pump bulb required in normal catheter use. However, such substitution poses no problem since the couplings or unions 30, 39 are as equally effective in coupling the larger capacity pump bulb or syringe to the metal rods 32 and/or 32' or thevalving mechanisms as they are in connecting the smaller capacity pump means normally used.

The advantages of a catheter incorporating the built-in features of the invention will, it is believed, be apparent from the above statement of the many added functions capable of being performed thereby, as compared to those performable by existing catheters. Also to be apparent is the fact that considered solely as a retention urethral catheter incorporating its own built-in retention means, the catheter of the invention represents improved constructional and operational features not present in any existing catheter incorporating built-in retention means with which I am presently familiar.

However, as many changes could be made in carrying out the above constructions without departure from the scope of the invention, it is intended that all matter contained in the above specification and/or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

The combination of a catheter comprising an elongated flexible tube having distal and proximal ends and a main fluid-drainage passage extending therebetween, the distal end being closed but having a drainage aperture leading to said main passage and said proximal end being open for discharge of fluid drainage therethrough, retention means including a distensible and collapsible annular collar extending about said tube adjacent its distal end proximally of said drainage aperture, pump means connected to and being interposed between first and second outlet tubes separate from said elongate flexible tube and which are connected, respectively, to said distal retention collar and to said elongated flexible tube and to the latter at a point adjacent to but distally of its open proximal end, and first and second manually operable valving mechanisms connected in said first and second outlet tubes, respectively, said valving mechanisms normally closing off communication between said pump means and both the annular retention collar and the fluid-drainage passageway of said elongated flexible tube but being selectively operable to control distention and collapse of said retention collar upon operation of said pump means and further to enable said pump means to produce either a positive or negative pressure as desired in the main fluid drainage passage while said retention collar is distended, thereby to clear the main drainage passage of debris, at least one of said valving mechanisms comprising a cylindrical valve body closed at its end adjacent the pump means by an end plug and a rigid tube included in one said outlet tube and having one end extending into said valve body through said end plug and its other end projecting outwardly therefrom, said rigid tube being mounted for limited axial movement with respect to said end plug by a push or pull force applied manually to its said outwardly projecting end and having an opening in the side wall of its said one end which is adapted to be covered and uncover by said end plug depending on the axial position of said tube end with respect thereto.

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