GASTROINTESTINAL SUMP TUBE
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This application is a continuation-in-part of my application Serial No. 200,804, filed June 7, 1962, now Patent No. 3,114,373 issued December 17, 1963.

This invention relates to a gastrointestinal sump tube for continuous aspiration of secretions, and the method of using the same, with particular emphasis upon the weighted director tip or capsule that leads or draws the tube into the intestines under the influence of the natural peristaltic waves, and has for an object improvement in the tip or capsule per se as well as in the manner of its attachment to the tube proper and its operation in practice.

Another object consists in the provision of a flexible connection of the tip or capsule with the distal aspirating end of the tube which permits the former to be grasped by the peristaltic waves and be drawn and tumbled along, even lying at times in a transverse plane within the bowel, while constantly leading the tube more deeply into the intestines and maintaining its distal aspirating end in functionally correct longitudinal position with respect to the adjacent intestinal wall.

Another object is the provision of such a tip or capsule which may be molded at low cost and consists integrally of a butt end adapted for telescopic union with the tube, a hollow opposite end adapted to contain a weight such as mercury, and an intervening reduced connecting portion that embodies the high degree of flexibility above indicated.

Another object is the provision of such a tube that bears a series of marks indicating to the attending physician the extent of penetration of the distal aspirating end of the tube into the organs of the patient, i.e., stomach, duodenum, jejunum, ileum and even further into the intestinal tract.

Another object resides in certain steps of the method or procedure followed in the use of the tube, whereby its particular effectiveness in any specific disease indication may be controlled and attained.

A further object lies in the provision of certain improvements in the form, construction, arrangement and materials of the tube, whereby the above-recited objects and others inherent in the invention may be effectively achieved.

A practical embodiment of the invention is illustrated in the accompanying drawings, in which:

FIG. 1 represents a view in elevation of the complete tube assembly, an intermediate section being broken away; FIG. 2 represents, on an enlarged scale, a longitudinal section of the distal aspirating end of the tube with the weighted director tip attached thereto; FIG. 3 represents, on a reduced scale, a longitudinal transparent showing of a portion of the human body extending from the nasal passage to the duodenum with the tube inserted and the director tip and aspirating end of the tube extending into the stomach; FIG. 4 represents similarly, and on a slightly larger scale, the lower portion of FIG. 3, with the stomach collapsed and the director tip approaching the pylorus; FIG. 5 represents a similar view but showing the director tip and part of the aspirating end of the tube through the pylorus and entering the duodenum; FIG. 6 represents another similar view showing the tip and tube further advanced with the duodenum collapsed and the tip lying transversely in the intestines while the aspirating end of the tube maintains its correct functional alignment with the adjacent wall of the intestine owing to the extreme flexibility of the interconnection of these parts; and FIG. 7 in like manner represents a still further extension of the tube into the small intestine again depicting the permissible tumbling or transverse motion of the tip without disturbing the proper functional alignment of the aspirating end of the tube.

In brief summary, this invention contemplates a sump tube as disclosed in my above Patent No. 3,114,373, but which is characterized by an improved director tip that has the qualities recited in the above stated objects, the tube itself bearing marks which inform the attending physician of the location of the aspirating end of the tube as it is progressively inserted into the stomach and succeeding portions of the intestinal tract.

In its manufacture, the tube proper composed of a transparent non-toxic vinyl substance is extruded from a well known type of machine provided with a suitable die, in the form of a pair of diametrically larger and smaller tubes, the larger, denoted by 1, being continuously joined to the smaller, marked 2, along a narrow section 3, as is well shown in FIGS. 1 and 4, of said Patent No. 3,114,373. Sections of this double tube of the desired length (e.g. 250 cm.) are cut and the two tubes are mechanically separated for a distance of about 2 cm. at the distal aspirating end 4 and about 4 to 7 cm. at the proximal end 5. Adjacent the point of separation at the end 4 a hole 6 is cut in the wall of the tube 1, the hole being large enough to permit the free end of the smaller tube 2 to be inserted, as shown in FIG. 1, and several, e.g. six, aspirating holes, two being indicated by 7, are cut or punched all the way through the tube at intervals of, say 1 cm. or less, for a suitable distance, e.g. 7 cm., back from the distal end 4 of the tube 1 and above the hole 6, the diameter of the holes 7 being less than the diameter of the lumen of the larger tube 1.

Both ends of the smaller tube 2 are cut to be short of the ends of the larger tube 1, the distal end of tube 2 being shortened sufficiently so that it is slightly spaced from the corresponding end of the tube 1 when passed through the hole 6, as shown in FIG. 2, while the proximal end of tube 2 is substantially shorter than the corresponding end of tube 1, as illustrated in FIG. 1. On this end of tube 1 is fitted a tubular adapter 8, preferably composed of latex rubber and about 5 to 7 cm. in length, which may be telescoped into position and cemented in place; and a vinyl adapter 9 having a flared mouth, is similarly secured on the proximal end of tube 2. A metal ferrule 10 may be added further to reinforce the connection of adapter 8 with tube 1.

Turning now to the director tip which is characteristic of this invention in its form, arrangement and functioning, the same is denoted generally by the reference numeral 11. It is composed of a suitable non-toxic flexible plastic, the same substance as the tube 1 being entirely satisfactory. The distal extremity consists of a hollow capsule 12, the upper end of which is open and indicated at 13, while the lower end 14 is rounded and closed. In production the capsules may be cut at desirably lengths, e.g. 7 cm., from an extruded tube, after which one end is melted and sealed by a blast of hot air (500° F.). This capsule is loaded with, say, 5 cc. of mercury and its open end is telescoped over the reduced lower portion 15 of a solid connector 16 that preferably consists of the same substance and is formed with a very narrow waist 17 to
furnish the wanted high degree of flexibility with respect to the aspirating end 4 of tube 1. The upper or butt end of the connector 16 is also reduced in diameter, as indicated at 18, for telescopic insertion within the tube 1, leaving a space between this end of the connector and the distal end of tube 2. The capsule 12 and connector 16 are both cemented in place.

The tube 1 is marked at 65, 75, 100, 125, 150, 175, 200 and 225 cm. from its distal aspirating end for the purpose of enabling the attending physician to see at a glance just where aspirating is taking place along the intestinal canal and aiding him in determining the most desirable extent of insertion of the tube. Only three of these markers are shown in the drawings due to the fact that FIG. 1 is broken, the three shown being the 65, 75 and 225 cm. which are so marked with no intention of strict accuracy as no more is deemed necessary for an understanding of this feature.

In use, the assembly of tubes 1, 2 and director tip 12 is passed transversely to the optimum extent according to the previous diagnosis, the extent of penetrating being gauged by observation of the series of marks on the tube 1. The adapter 8 on tube 1 is then connected to a high volume, low vacuum aspirator (not shown) while the adapter 7 on tube 2 is left open to draw in ambient air, or is connected to a hypodermic or other source of irrigation or medication, including a saline irrigation bottle, not shown but illustrated and described in my said Patent No. 3,114,373. This arrangement will, as described in said patent, supply air and/or saline in any desired ratios depending on the rate of supply of saline from the bottle and the rate of aspiration through tube 1. The air and/or saline flows constantly from the distal end of tube 2 into the space at the distal end of tube 1, mixing with the fluids that are drawn in through the holes 7, thus helping to prevent clogging and eliminating the possibility of mucosal surfaces being damaged by motion, while the director tip prevents the vacuum from drawing the gastric mucosa into the lumen of tube 1. No additional irrigation is needed because the air supplied through the tube 2 constantly and automatically provides this with or without the saline.

Constant bubbling of the contents of the aspirating tube 1, which is plainly visible through its transparent wall, assures the attendant that the device is functioning properly; which bubbling also reduces the surface area of the aspirant in contact with the tube wall, thus allowing viscid material to pass readily.

The fact that the aspirating holes 7 are smaller in diameter than the lumen of tube 1 prevents the drawing in of large particles and consequent obstruction of the tube.

The adult administration of the gastrointestinal sump tube instrument herein described should adopt the following procedure:

Insert the sump tube transversally to the 65 cm. mark which will place the director tip 12 in the antrum of the stomach, as shown in FIG. 4. Turn the patient on the right side with the right shoulder, arm and hand behind the body. Connect the adapter 8 to any suitable high volume, low vacuum aspirator which will empty the stomach and cause it to collapse around the tube thus better aligning it for passage through the pylorus into the small bowel. Advance the tube to the 75 cm. mark and test the aspirator with litmus paper. If the showing is acid the attendant may know that the aspirating end of the tube with its holes 7 is still within the stomach because the duodenal contents are alkaline. See FIG. 5 in which only the director tip has passed through the pylorus as the tube has been slowly advanced from the 65 cm. mark to the 75. As soon as the aspirant tests alkaline which means that the holes 7 have reached the duodenum, turn the patient onto the back and bring to a sitting position. Then advance the tube slowly in stages of 5 cm. while the contents of the duodenum are evacuated causing its walls to collapse, as depicted in FIG. 6, around the distal end of the tube. Waves of peristalsis now grasp the director tip and move it along thus progressing the entire tube further into the intestinal tract. FIG. 6 also shows the tubed position of the director tip herebefore mentioned. The tube will continue its inward movement, propelled by peristalsis as just explained, its progression being assisted by the highly flexible connection of the director tip, above described, which permits the latter to take any position while the aspirating end of the tube remains longitudinally in the bowel (see FIG. 7); the extent of penetration into the intestines being observed and controlled by the attendant through observation of the cm. marks on the tube 1.

This invention thus provides an instrument for the purpose above set forth which may be caused to penetrate the intestinal tract to the extent considered most desirable for the treatment of the particular ailment involved, without danger of injury to any part of the organs, and effectively attaining all the objects hereinabove recited.

It will be understood that various changes may be made in the form, construction and arrangement of the several parts and the steps of the method of use without departing from the spirit and scope of the invention, and hence I do not intend to be limited to the detail shown or described herein except as the same are included in the claims or may be required by disclosures of the prior art.

What I claim is:

1. A gastrointestinal sump tube instrument which embodies an aspirating tube and an air bleed tube with the latter exteriorly connected to the former in parallel relation for most of their length and the former having a plurality of spaced holes in its wall near the distal end through one of which the distal end of the latter projects inwardly, said instrument including a hollow weighted director tip capsule and a connector uniting the capsule to the aspirating tube, the said connector being composed of a solid flexible substance and having a narrow waist for imparting added flexibility of motion to the capsule with respect to the aspirating tube for promoting the adaptability and capacity of the capsule to lie at any angle to said tube dictated by the intestinal formations while maintaining the distal end of the aspirating tube in correct longitudinal functional position with respect to the adjacent intestinal wall.

2. An instrument as defined in claim 1, in which the connector is telescopically attached to both the distal end of the aspirating tube and the capsule by reduced end portions.

3. An instrument as defined in claim 1, in which the capsule is composed of the same substance as the aspirating tube.

4. An instrument as defined in claim 1, in which the narrow waist of the connector is less than half the diameter of its widest portions adjacent the ends thereof.

5. An instrument as defined in claim 1, in which the proximal end of the aspirating tube is fitted with a tubular adapter composed of latex or the like designed for connection to a vacuum device and the proximal end of the air bleed tube is fitted with an adapter composed of the same material as its tube and provided with a flared mouth for the intake of air or connection to a source of irrigation or medication.

6. An instrument as defined in claim 1, in which the aspirating tube bears a series of marks enabling observation and control of its extent of penetration.

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