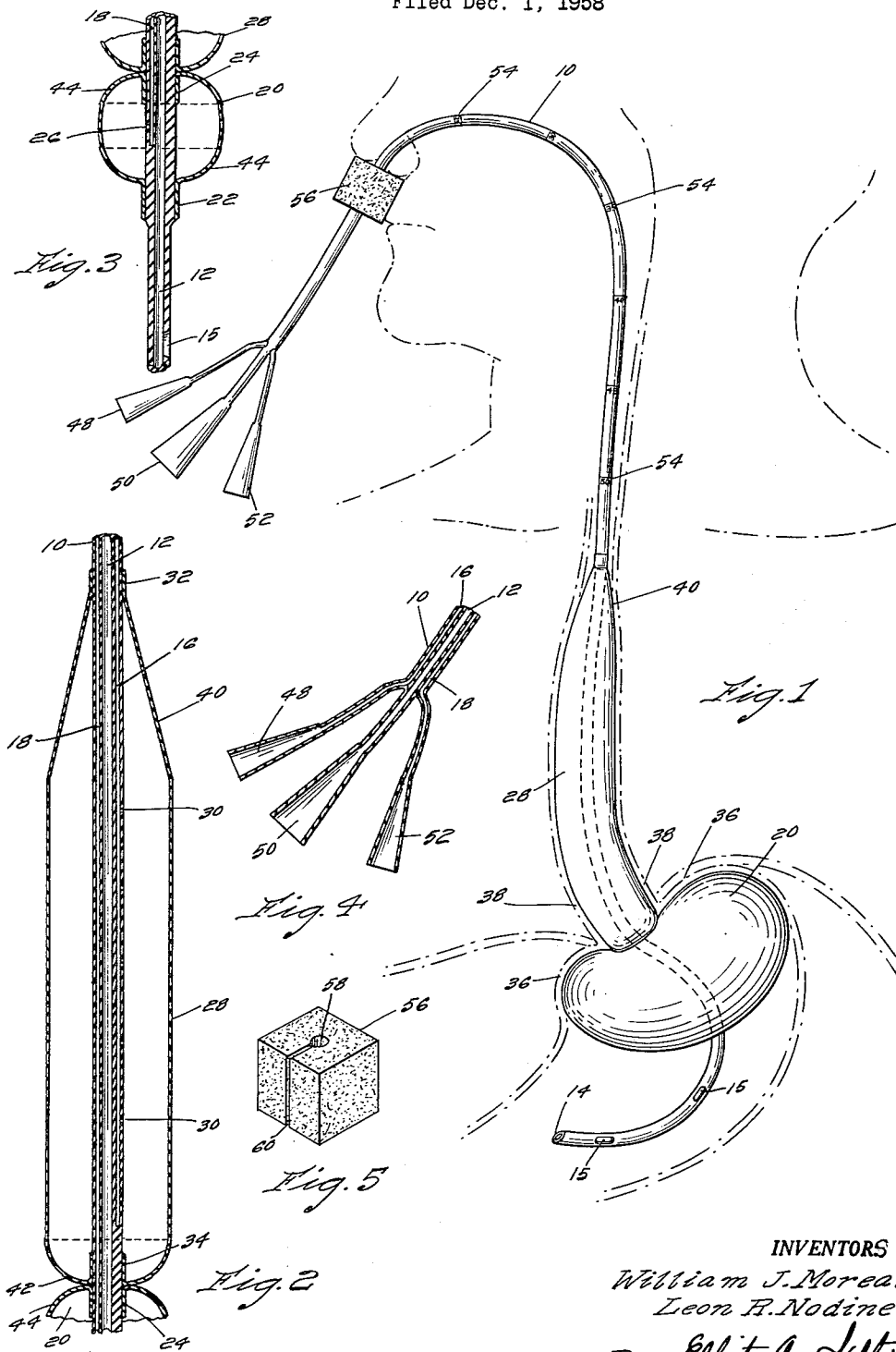


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ESOPHAGEAL NASOGASTRIC TUBE

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ESOPHAGEAL NASOGASTRIC TUBE

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The present invention relates generally to surgical apparatus and is more specifically concerned with the provision of a novel and improved esophageal nasogastric tube.

Esophageal nasogastric tubes hereinbefore in use have traditionally comprised an elongated flexible tube adapted to be passed through the esophagus into the stomach, there being a gastric balloon adapted to engage the cardia and fundus of the stomach when inflated and an elongated esophageal balloon in substantially abutting relation thereto adapted to engage the esophagus, said balloons cooperating to control hemorrhaging from the esophageal varices, as well as any hemorrhaging from a source in the stomach adjacent to the gastroesophageal junction.

It has been found, moreover, that prior art esophageal nasogastric tubes are not entirely effective nor satisfactory for various reasons. First of all, it has been found that, due largely to the unusual contour of the stomach, the gastric balloon, when inflated, does not engage a sufficient area of the fundus of the stomach to effectively control any hemorrhaging which may exist at this location.

Secondly, it has been found that upon properly positioning and anchoring a tube of this type within a patient by exerting an outward pull thereon after the balloons have been inflated, there is a tendency for the esophageal balloon to pull away from the gastric balloon leaving a space therebetween, at which point uncontrolled bleeding may take place. Still another disadvantage resides in the fact that the upper end of the esophageal balloon often causes a gagging reflex in the patient.

In order to overcome the above mentioned disadvantages, it is a primary object of the instant invention to provide an esophageal nasogastric tube having an improved gastric balloon whereby hemorrhaging in the fundus of the stomach and adjacent areas will be effectively controlled.

Another important object of our invention is the provision of an esophageal nasogastric tube having a redesigned esophageal balloon which will provide adequate hemostasis at bleeding sites, but which, nevertheless, will be unlikely to cause a gagging reflex in the patient.

A further object of the instant invention is the provision of a tube of the character described wherein means are provided for preventing the esophageal and gastric balloons from separating from each other, thereby insuring continuous pressure over the esophageal varices and the fundus of the stomach.

Another object is the provision of an esophageal nasogastric tube having improved position maintenance characteristics, including the use of a novel and improved nasal cuff.

Other objects, features and advantages of the invention will become apparent as the description thereof proceeds when considered in connection with the accompanying illustrative drawings.

In the drawings which illustrate the best mode presently contemplated by us for carrying out our invention:

FIG. 1 is a side elevational view showing our improved esophageal nasogastric tube in operative position within a patient;

FIG. 2 is a fragmentary sectional elevation, on an enlarged scale, illustrating the esophageal balloon;

FIG. 3 is a fragmentary elevational section, on an en-

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larged scale, illustrating the gastric balloon and the tube distal end;

FIG. 4 is a fragmentary sectional elevation, on an enlarged scale, illustrating the proximal end of the tube; and

FIG. 5 is a perspective detail, on an enlarged scale, of the nasal cuff which forms a part of our invention.

It has been found desirable to provide an improved esophageal nasogastric tube wherein effective control of hemorrhage from esophageal varices is obtained, as well as effective control over any hemorrhaging which may exist in the fundus or adjacent areas of the stomach. Thus, we have provided an elongated flexible tube or shaft 10 preferably of rubber, although it will be understood that any other suitable flexible material, such as plastic or the like, could be used. The tube 10 is provided with a main lumen 12 which extends completely through said tube, preferably terminating at the distal end of the tube in a so-called whistle tip 14. Adjacent the tip 14 there are provided a plurality of drainage eyes 15, and hence it will be understood that when reference is made to the fact that main lumen 12 extends completely through the tube 10, this language is to be broadly construed so as to cover the situation where tube 10 has a blunt, closed end, since in such a situation the eyes 15 will still be sufficient to enable effective drainage to take place through lumen 12. Also integrally formed within tube 10 are a pair of inflating lumens 16, 18, the function of which will hereinafter be made apparent. The method of manufacturing tube 10 with its integral lumens 12, 16 and 18 therein actually forms no part of the instant invention, and many different techniques may be employed, although we prefer to utilize a dipping form in latex, as is conventional in the manufacture of a wide range of catheters.

Adjacent to but spaced from the distal end of tube 10 there is provided an inflatable gastric balloon 20. As will be seen most clearly in FIG. 3, balloon 20 is provided with hub portions 22 and 24 which may be cemented or otherwise secured to the outer surface of the tube or shaft 10, it being specifically noted, however, that hub portion 24 is inverted toward the interior of the balloon 20 for reasons hereinafter to be made apparent. As will be clearly seen, and reference is still made to FIG. 3, inflating lumen 18 communicates with balloon 20 by means of eye or aperture 26 whereby introduction of a fluid, preferably air, under pressure through lumen 18 will cause distention of the balloon 20.

Referring now to FIG. 2, it will be seen that the tube 10 is provided with an elongated esophageal balloon 28 which is in communication with inflating lumen 16 by means of a plurality of eyes or apertures 30. Thus introduction of fluid under pressure through lumen 16 will cause inflation of the balloon 28. The esophageal balloon 28, like gastric balloon 20 above described, is preferably mounted to the outer surface of tube 10 by cementing or the like and is provided with mounting hubs 32, 34 for this purpose, it being noted that the lower hub 34 extends reversely into the interior of balloon 28 and hence is oppositely disposed with respect to mounting hub 24 of gastric balloon 20. By having the mounting hubs 24 and 34 extending in opposite directions as clearly illustrated in FIGS. 2 and 3, it is possible to have the balloons 20 and 28 in closely abutting relationship whereby it is virtually impossible for the balloons to be separated when the tube 10 is in use, as illustrated in FIG. 1. This insures that inflated balloons 20 and 28 will exert a continuous pressure over the fundus of the stomach, the adjacent areas, and the esophageal varices, illustrated at 36 and 38, respectively, in FIG. 1. This is of considerable importance since, if it were possible for the balloons to be pulled apart when the tube was being properly positioned and

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anchored within the patient by exerting an outward pull thereon, it will be obvious that there would be a small area at the lower end of the esophagus which would not be under pressure whereby bleeding would not be controlled at such a location.

Also of considerable importance is the fact that the esophageal balloon 28 is tapered at its upper extremity as at 40. This prevents upward expansion of the esophageal balloon during inflation and also prevents pressure from being exerted at a point where a gagging reflex would be likely to result. To further insure that these results are obtained, balloon 28 is reinforced at its tapered portion 40 by having a slightly thicker wall at this portion. Similarly, balloon 28 is reinforced at its lower or distal end as at 42 (FIG. 2), while balloon 20 is likewise reinforced at its opposite ends as at 44 (FIG. 3), the primary purpose of these reinforced portions being to insure maximum lateral expansion of the balloons so as to provide adequate hemostasis over as large an area as possible.

In order to insure that gastric balloon 20 will provide adequate hemostasis at the fundus of the stomach, the balloon is specifically shaped so as to conform to the configuration of the stomach, as will be clearly seen in FIG. 1. Thus, the balloon 20, when inflated, assumes an asymmetrical configuration as compared to prior art tubes of this type wherein the gastric balloons have always been symmetrical resulting in completely ineffective control of any hemorrhaging which exists in the fundus of the stomach. We prefer to provide our asymmetrical gastric balloon by a special dipping technique wherein the balloon is dipped at an angle so as to have a somewhat thinner wall on one side, although it is conceivable that other techniques could be employed to arrive at an asymmetrical balloon of our design. Thus, for the first time there has been provided a gastric balloon which will conform to the stomach contour thereby enabling continuous pressure to be exerted over a much greater area. This constitutes one of the basic concepts of the instant invention.

As will be seen most clearly in FIG. 1, tube 10 is provided at its proximal end with a plurality of integral funnel portions 48, 50 and 52. As illustrated most clearly in FIG. 4, the funnel portions 48, 50 and 52 communicate with lumens 16, 12 and 18, respectively, it being obvious that any suitable inflation means may be applied to the portions 48 and 52 when it is desired to inflate the balloons 20 and 28 after introduction of the tube into the patient.

In order to insure that the asymmetrical gastric balloon 20 is properly positioned within the stomach of the patient, graduating indicia 54 are provided on the tube 10, it being understood that these markings will be in a specific position as the tube is inserted into the patient if the balloon is properly positioned. At the same time, of course, the indicia will serve to indicate the degree of penetration of the tube into the patient.

Our invention additionally contemplates the use of a novel and improved nasal cuff 56, preferably constructed of a non-toxic, highly absorbent, non-irritating plastic sponge foam. The nasal cuff 56 is illustrated as being of substantially square configuration although it will be understood that this is not essential. The cuff is provided with a bore 58 extending therethrough and a communicating slot 60 which enables the cuff 56 to be slidably mounted onto the proximal end of tube 10 and then slid into snug engagement with the patient's nose in a manner thought to be obvious and clearly illustrated in FIG. 1. Thus, the nasal cuff 56 not only absorbs a large amount of irritating and annoying nasal secretions, as well as reducing trauma to the nostril, but it also provides some traction and anchors any in-dwelling tube. Even if traction is not applied, the nasal cuff will obviously aid in position maintenance of the tube 10.

It will be seen that our invention achieves all of the hereinbefore enumerated objects by providing (1) as

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asymmetrical gastric balloon which, when inflated, conforms with the shape of the stomach and provides adequate hemostasis for gastric wall varices that may exist in the upper end of the stomach; (2) a redesigned esophageal balloon which is tapered at its proximal end and reinforced at that area so as to prevent upward expansion of the balloon into the pharynx, thereby obviating the gagging reflex which so often resulted when the prior art nasogastric tube was used; (3) an esophageal balloon having a relatively thin wall at its side portions whereby when inflated it will immediately come in contact with the varices present in the lower end of the esophagus with a relatively low intra-balloon pressure which will still cause adequate hemostasis; (4) closely abutting gastric and esophageal balloons whereby the respective positions of said balloons are maintained more effectively—hence insuring continuous pressure over the bleeding area; and (5) a nasal cuff which will aid in position maintenance and at the same time will absorb a large amount of irritating and annoying nasal secretions, as well as reducing trauma to the nostril.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except in so far as indicated by the scope of the appended claims.

We claim:

1. An esophageal nasogastric tube comprising a flexible shaft having a proximal and a distal end, a first lumen extending completely through said shaft from end to end, a gastric balloon affixed to said shaft adjacent to but spaced from the shaft distal end, a separate and distinct elongated esophageal balloon affixed to said shaft in abutting relation to the proximal end of said gastric balloon, a second lumen extending through said shaft and in communication with said gastric balloon for inflation thereof, and a third lumen extending through said shaft and in communication with said esophageal balloon for inflation thereof, said gastric balloon normally having an asymmetrical configuration when inflated whereby to conform to the shape of the stomach.

2. An esophageal nasogastric tube comprising a flexible shaft having a proximal and a distal end, a first lumen extending completely through said shaft from end to end, a gastric balloon affixed to said shaft adjacent to but spaced from the shaft distal end, a separate and distinct elongated esophageal balloon affixed to said shaft in abutting relation to the proximal end of said gastric balloon, a second lumen extending through said shaft and in communication with said gastric balloon for inflation thereof, and a third lumen extending through said shaft and in communication with said esophageal balloon for inflation thereof, said esophageal balloon having a gradual taper at its proximal end when inflated.

3. An esophageal nasogastric tube comprising a flexible shaft having a proximal and a distal end, a first lumen extending completely through said shaft from end to end, a gastric balloon affixed to said shaft adjacent to but spaced from the shaft distal end, a separate and distinct elongated esophageal balloon affixed to said shaft in abutting relation to the proximal end of said gastric balloon, a second lumen extending through said shaft and in communication with said gastric balloon for inflation thereof, and a third lumen extending through said shaft and in communication with said esophageal balloon for inflation thereof, said gastric balloon normally having an asymmetrical configuration when inflated whereby to conform to the shape of the stomach, said esophageal balloon normally being tapered at its proximal end when inflated.

4. In the esophageal nasogastric tube of claim 3, said esophageal balloon being reinforced at its distal end and

said gastric balloon being reinforced at its opposite ends to resist longitudinal expansion.

5. In the esophageal nasogastric tube of claim 3, said esophageal balloon being reinforced throughout its tapered portion whereby to resist lateral expansion at said portion.

2,831,487
2,849,001
2,854,982
2,892,458
2,898,913
2,936,760

Tafilaw ----- Apr. 22, 1958
Oddo ----- Aug. 26, 1958
Pagano ----- Oct. 7, 1958
Auzin ----- June 30, 1959
Ritter et al. ----- Aug. 11, 1959
Gants ----- May 17, 1960

References Cited in the file of this patent

UNITED STATES PATENTS

1,920,006 Dozier ----- July 25, 1933
2,799,273 Oddo ----- July 16, 1957
2,813,531 Lee ----- Nov. 19, 1957

10 Surgery, Gynecology and Obstetrics, volume 77, No. 4,
page 422 required. (Copy in Division 55.)
Surgery, Gynecology and Obstetrics, Feb. 15, 1937,
page 15 required. (Division 55.)

OTHER REFERENCES