

## NASOGASTRIC DEVICE

### BACKGROUND OF THE INVENTION

This invention relates to improvements in nasogastric intubation devices adapted for feeding and/or removal of fluids from the stomach. As is well known, nasogastric devices are commonly employed in postoperative abdominal surgery for emptying the stomach of secretions and gas in order to prevent gastric dilation. They are also used for attaining adequate nutrition, e.g. feeding of high protein liquids, for patients unable to take oral nourishment. Nasogastric intubation may be prescribed, for example, when the normal digestive mechanism is impaired. Impairment may range from localized trauma to the digestive tract to loss for autonomic function, a common side effect for stroke victims.

Whether intubation be for aspiration or removal of fluids from the stomach or for feeding, intubation is accomplished by inserting the nasogastric tube into a nostril and directing it through the esophagus to the stomach and/or small intestine if the stomach is disfunctional.

In directing the tube, anatomical angulations as well as critical bifurcations of the pathway mandate a semi-rigid object. Misguiding a nasogastric tube into the trachea rather than the esophagus, at the oropharyngeal bifurcation can result in respiratory impairment, e.g. pneumothorax or puncturing of the lung. Consequently, some degree of rigidity is needed for proper guidance during intubation.

Paradoxically, however, a rigid intubation device can produce a different category of injuries, namely soft tissue injuries to the delicate mucosal lining as well as to the sinuses, epiglottis, uvula, larynx, etc. Direct impact or friction caused during intubation or removal may cause abrasions and/or hemorrhaging. Laryngitis and difficulty in swallowing are among the most frequently reported post-intubation complications, illustrating the inadequacy of the devices presently used.

It will therefore be seen that a nasogastric tube should be flexible to minimize impact and friction. On the other hand, accurate and safe guidance necessitates a rigid object, which rigidity can cause injury to soft tissues. While the prior art has addressed this paradox, it has not done so successfully.

Generally speaking, two nasogastric intubation procedures are presently dominant. The first method, which seeks to obviate the aforementioned paradox, but is less common, utilizes a flexible tube which is swallowed. This method relies upon a viable and functional swallowing mechanism, impairment of which is a reason for prescribing intubation in the first place. Accordingly, this technique has limited applicability.

The second and generally accepted procedure employs a stylet or wire guide to facilitate intubation. In this form of nasogastric intubation, the stylet is initially housed in the tube and is removed once proper positioning is obtained.

The present invention is directed to the latter device employing a stylet or stiffening wire guide to facilitate proper intubation, and, more particularly, to a novel coating for the stylet to facilitate removal without dislodgment or movement of the tube.

As will be appreciated, a nasogastric tube follows a rather tortuous path from insertion in the nasal passage and then down through the esophagus and eventually into the stomach. Because of the various angulations

and the frictional forces resulting therefrom when the stylet contacts the inner wall of the tube during removal, soft tissue injuries will frequently occur.

The prior art has attempted to address this problem by proposing various coatings and/or lubricants to decrease friction and thereby lessen the danger of injury. However, none has been entirely satisfactory.

While not intending to be an exhaustive survey of the prior literature pertaining thereto, the following patents are nevertheless considered to be fairly illustrative of the state of the art pertaining to tubes having guide wires intended to be removed once the tube is in place.

U.S.P 4,257,921 of Beal proposes the use of Teflon coated wires.

U.S. Pat. No. 4,534,363 issued to Gold teaches using copolymers of methyl siloxane and amino alkyl siloxane.

U.S. Pat. No. 4,589,873 of Schwartz discloses hydrophilic polymers and PVC tubing coated with PVP, polyethylene oxide, polyhydroxyethyl methacrylate, copolymers of PVP with vinyl sulfonic acid or other vinyl acids.

U.S. Pat. No. 4,664,657 of Willamitis teaches using polydimethyl siloxane.

U.S. Pat. No. 4,666,437 of Lambert discloses applying to an article made of vinyl polymers, polyesters or polyacrylates and rubber, a solution of an isocyanate monomer having at least two unreacted isocyanate groups per molecule, an isocyanate prepolymer, or a mixture thereof.

U.S. Pat. No. 4,668,224 issued to Lentz teaches the use of a cellulose powder, e.g. acid cellulose.

Finally, British Specification No.1,600,963 teaches using an interpolymer of PVP and polyurethane.

As previously mentioned, none of the coatings or lubricants heretofore suggested have been entirely satisfactory for use with nasogastric tubes.

Accordingly, the task of this invention, simply stated, is to provide lubricious coatings for stylets utilized for intubation, which coatings employ readily available and relatively inexpensive materials to provide the requisite lubriciousness for easy removal from the tube.

### BRIEF DESCRIPTION OF THE INVENTION

In accordance with the present invention, this task is solved by utilizing as the lubricating coating for the stylet a substantially homogeneous non-aqueous mixture consisting essentially of:

- (1) an alkaline earth metal salt of an unsaturated higher fatty acid having at least 16 carbon atoms; and
- (2) up to equal parts by weight of an alkaline earth metal salt of a saturated fatty acid having at least 16 carbon atoms.

Upon applying an aqueous medium, e.g. by flushing the stylet-containing nasogastric tube with water, a lubricious coating is provided on the stylet which materially enhances removal of the stylet following intubation along with a concomitant lessening of the danger of inadvertent or accidental movement or partial dislodgment of the tube from the stomach during stylet removal.

### BRIEF DESCRIPTION OF THE DRAWING

The FIGURE is a perspective view of a typical nasogastric tube to which this invention is directed with the stylet partially removed for purposes of illustration.