

TRACHEAL INTUBINATION

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved method and apparatus for use in tracheal intubation or other medical procedures.

Tracheal intubation has previously been utilized to provide an unobstructed air passage to a patient's lungs. Tracheal intubation is frequently done under emergency circumstances which are not optimal. It has previously been recognized that is necessary to have a tracheal tube bend around the patient's epiglottis and move from the patient's pharynx into the larynx at the upper end of the patient's trachea rather than into the patient's esophagus. However, it is difficult for a person inserting the tracheal tube to know where the leading end portion of the tracheal tube is located relative to the patient's larynx.

Various methods and devices for assisting in tracheal intubation are disclosed in U.S. Pat. Nos. 4,832,020; 4,865,586; 4,913,139; 5,353,787; 5,235,970; 5,560,351; and 5,694,929.

SUMMARY OF THE INVENTION

An improved method and apparatus for use in tracheal intubation or other medical procedure may include a positioning apparatus. When the positioning apparatus is used for tracheal intubation, the positioning apparatus is located relative to a patient's trachea by engaging a portion of the patient's body, such as the Adam's apple. A flexible guide rod may be moved relative to the positioning apparatus until a leading end portion of the guide rod has moved into the patient's trachea. A tracheal tube is slid along the guide rod into the patient's trachea.

During movement of the guide rod relative to the positioning apparatus, the guide rod may be moved through either a tubular guide member or a tracheal tube which extends through the patient's mouth into the patient's pharynx. Before beginning to move the guide rod, the distance which the guide rod is to be moved may advantageously be determined. This may be done as a function of spacing between locations on the positioning apparatus. If desired, indicia may be provided on the positioning apparatus and cooperating indicia may be provided on the guide rod.

A magnet may be utilized to attract a leading end portion of the guide rod. The magnet is disposed outside of the patient's body and may be positioned adjacent to an anterior side of the trachea. Magnetic attraction between the magnet and the leading end portion of the guide rod deflects the guide rod. This steers the leading end portion of the guide rod into the entrance to the patient's trachea. A magnet may be used to steer a member relative to a patient's body tissue during performance of operations other than tracheal intubation.

In order to locate the guide rod and/or tracheal tube relative to the patient's trachea, an image of body tissue adjacent to the leading end portion of the guide rod and/or tracheal tube may be transmitted to a location outside of the patient's body. Movement of the guide rod and/or tracheal tube into the patient's trachea is interrupted when the image transmitted from the leading end portion of the guide rod or tracheal tube indicates that the leading end portion of the guide rod or tracheal tube has been moved to a desired position relative to the patient's trachea.

It is believed that transmission of an image of body tissue adjacent to the leading end portion of the tracheal tube may

advantageously be performed when the tracheal tube is utilized without benefit of the positioning apparatus. However, the transmission of an image of body tissue adjacent to the leading end portion of the tracheal tube may be performed when the positioning apparatus is used in association with the tracheal tube. Positioning of the guide rod relative to the patient's trachea may also be facilitated by the transmitting of images of body tissue adjacent to a leading end portion of the guide rod.

Detectors and emitters may be utilized to detect the position of the leading end portion of the guide rod and/or the tracheal tube relative to the patient's trachea. When this is done, an emitter, such as a magnet or a light source, may be connected with a leading end portion of the guide rod and/or the tracheal tube. One or more detectors may be provided on the outside of the patient's neck to detect the output from the emitter when the guide rod and/or the tracheal tube are in a desired position relative to the patient's trachea. Alternatively, a detector may be connected with the leading end portion of a guide rod and/or tracheal tube and one or more emitters positioned relative to the outside of the patient's neck. The detector would provide an output indicating when the guide rod and/or tracheal tube is moved to a desired position relative to the patient's trachea.

During movement of the guide rod and/or tracheal tube along the patient's respiratory system and into the patient's trachea, force may be applied against the leading end portion of the guide rod and/or tracheal tube to steer the leading end portion of the guide rod and/or tracheal tube. The application of force against the leading end portion of the guide rod and/or tracheal tube may be accomplished by expanding an expandable element connected with the guide rod and/or the tracheal tube.

It should be understood that any one of the features of the present invention may be used separately or in combination with other features of the invention. It's believed that various combinations of the features, other than those disclosed herein, may advantageously be utilized and will be apparent to those skilled in the art from the description contained herein. In addition, it should be understood that features of the present invention may be used for purposes other than tracheal intubation.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other features of the present invention will become more apparent upon a consideration of the following description taken in connection with the accompanying drawings wherein:

FIG. 1 is a fragmentary schematic illustration depicting the use of a positioning apparatus to position a guide rod relative to the mouth and trachea of a patient;

FIG. 2 is a fragmentary schematic illustration depicting the manner in which a tracheal tube is moved along the guide rod of FIG. 1 into the trachea of the patient;

FIG. 3 is a fragmentary schematic illustration, similar to FIG. 1, illustrating the manner in which a laryngoscope may be combined with the positioning apparatus;

FIG. 4 is a fragmentary schematic illustration depicting the use of another embodiment of the positioning apparatus to position a guide rod relative to the mouth and trachea of a patient;

FIG. 5 is an enlarged schematic fragmentary sectional view of a portion of the apparatus of FIG. 4 and illustrating the relationship between a guide rod and a guide tube;

FIG. 6 is an enlarged schematic fragmentary sectional view of a portion of the apparatus of FIG. 4 and illustrating