



## Case Report

# A suction pipe segment as an alternative to a tube stop when carrying out tracheal intubation with a Trachway intubating stylet with a longer shaft



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## ABSTRACT

The Trachway video intubating (TVI) stylet has been widely investigated and is used for both normal and difficult intubations. Practitioners may use the longer 420 mm shaft stylet for orotracheal intubation. However, an endotracheal tube stop is needed to prevent displacement of the endotracheal tube during stylet advancement in the oral cavity. The original tube stop, which can be purchased from the manufacturer, is small and easy to lose. We designed a device derived from a 95 mm long segment of surgical drain pipe that is able to replace the original endotracheal tube stop and then explored the feasibility of using it on an airway management trainer manikin. A conventional #7.0 endotracheal tube was pre-loaded and its fixation tested by gentle upward and downward sliding. The TVI stylet was inserted via the oral opening. A chin lift (one-hand) or jaw thrust (two-hand) maneuver facilitated recognition of the laryngeal anatomy and locating the epiglottis. The TVI stylet was then further advanced through the glottis opening, in order to complete the tracheal intubation; this was done without difficulty. We conclude that the use of a 95 mm long surgical suction pipe is able to prevent displacement of an endotracheal tube during TVI advancement and this device can be used successfully to replace the original tube stop. This facilitates orotracheal intubation with a long stylet.

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## 1. Introduction

Since our first introduction of the Trachway video intubating (TVI) stylet for endotracheal intubation in 2009 [1], it has been widely investigated in order to compare it with other airway devices [2–4]. The TVI provides a better laryngeal view and has proved to be useful when carrying out difficult endotracheal intubations [5–7]; it is also used for diagnostic purposes [8]. A standard stylet is used for orotracheal intubation in most circumstances. However, when used with a longer shaft stylet, the TVI is also suitable for endotracheal intubation under special conditions when one-lung ventilation with a double-lumen endotracheal tube is required [9,10].

Conflicts of interest: Dr Shyr MH is co-inventor of the patented proprietary Trachway.

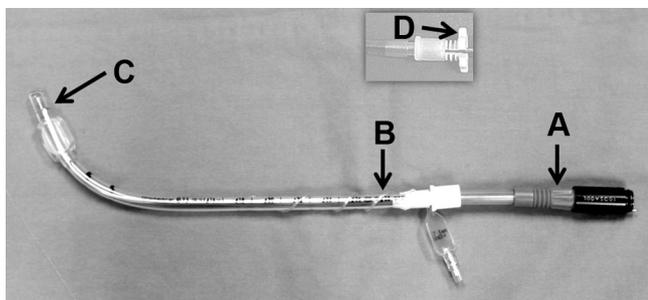
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Practitioners may also use the longer shaft stylet for orotracheal intubation when tackling a normal or difficult airway [4]. However, an endotracheal tube holder or stop is needed to prevent displacement of endotracheal tube during stylet advancement in the oral cavity [5]. We present here an alternative method that uses a short segment of disposable suction pipe as a tube stop, in order to prevent any unanticipated movement of the endotracheal tube when intubation is carried out with the longer shaft TVI stylet.

## 2. Case Report

We used an airway management trainer manikin (Laerdal Medical, Stavanger, Norway) in order to test the feasibility of our design. A surgical suction pipe (Lily connecting tube, Bioteq, Taipei, Taiwan; length 230 cm, internal diameter (ID) 7 mm, outer diameter (OD) 10 mm) was cut at 95 mm below the distal hose head (ID 7 mm, OD 15 mm). This segment of drain pipe was then fixed to the 15 mm ID hub of the longer shaft of the TVI (Biotronic Instrument Enterprise Ltd., Taichung, Taiwan; OD 5 mm, shaft length 420 mm; Fig. 1). A conventional #7.0 endotracheal tube (Unomedical, Kedah,



**Fig. 1.** Illustration of a segment of drain pipe installed on a Trachway video intubating (TVI) stylet. The hose head of the pipe (arrow A) is gently pressed and plugged into the 15-mm hub designed as an adaptor for the endotracheal tube. An endotracheal tube (arrow B) is restrained inside its 15-mm adaptor by the tube stop and this leaves the stylet some 5 mm distance from the opening of the endotracheal tube (arrow C). The original Biotronics tube stop is slid into an endotracheal tube is shown in the upper box (arrow D) for comparison.

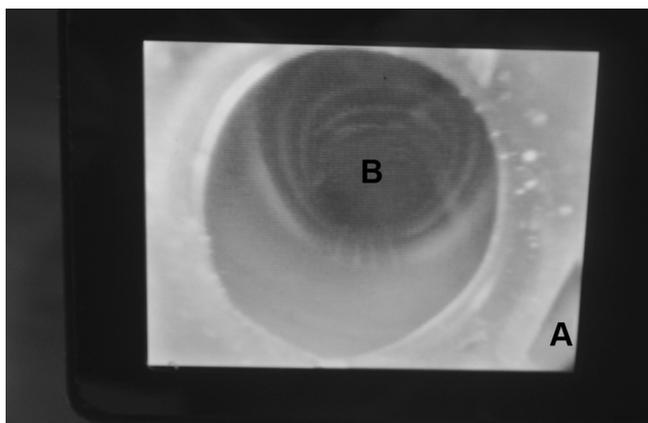
Malaysia ID 7.0 mm, total length of 325 mm to adaptor) was then preloaded and its fixation tested by sliding it upward and downward gently.

The focus range of the camera inside the end of stylet is known to range from 5 mm to 50 mm and based on this, we suggest that the endotracheal tube is preloaded and the tip of the stylet located some 5–10 mm away from the distal opening of the endotracheal tube. This is important in a clinical setting because secretions released by the patient may blur the camera during the tracheal intubation. At the same time, because the camera has a wide field of view, namely 83 degrees, a good laryngeal view is to be expected during TVI advancement (Fig. 2).

The TVI stylet was inserted via the oral opening. A chin lift (one-hand) or jaw thrust (two-hand) maneuver facilitated recognition of the laryngeal anatomy and allowed location of the epiglottis. The TVI stylet was further advanced through the glottis opening in order to visualize the tracheal rings on the monitor. The endotracheal tube was slid down to 21 cm from the incisors. Next, the endotracheal tube was held firmly using the operator's other hand and then the TVI stylet was withdrawn to complete the tracheal intubation.

### 3. Discussion

Using the standard shaft of an intubating stylet (shaft length 320 mm, unpublished data from the manufacturer), any



**Fig. 2.** Monitor view during Trachway video intubating (TVI) intubation of a manikin. It should be noted that both the distal opening and Murphy's eye (A) of the endotracheal tube are clearly visualized. Identification of the tracheal rings (B) means that the endotracheal tube is positioned inside the trachea.

conventional endotracheal tube with a size of either #7.0 or #7.5 can be easily plugged into the designed adaptor (ID 15 mm) of the TVI stylet and there is little or no need to adjust this further to get the best view. Using the 420 mm shaft, which was originally designed for double-lumen tube insertion, however, a tube stop is need to prevent upward displacement of the endotracheal tube during its advancement in the oral cavity. Surprisingly, the standard procedures for such TVI insertion have not been included in the operating manual provided by the manufacturer.

We designed a device to replace the original endotracheal tube stop provided by the TVI manufacturer, Biotronic Instrument Enterprise Ltd. The original tube stop is small and easy to lose. Furthermore, a surgical drain pipe is both cheap and easily available in the operating room; the result is the new tube stop that is both easy to produce and to replace. If wanted, this device can also be cleaned, sterilized, and reused.

In reality, there are two types of tube stop available from the manufacturer; these are optional and can be purchased separately. The first type of tube stop is made from resin by Clarus Medical (Minneapolis, MN, USA); it can be adjusted up and down to an appropriate position and then secured with a clamping screw [4]. The other benefit of using the Clarus tube stop is that it provides for the possibility of supplying oxygen via its oxygen port aside during intubation. The second type of tube stop is a 15 mm conical fitting and is made from silicon by Biotronic Instrument Enterprise Ltd. This type of stop is designed for use after the endotracheal tube has already been loaded; it blocks installation of the Clarus tube stop. The second type of tube stop is much cheaper, costing only about USD12 for one unit, which compares favorably with the Clarus tube stop, which is 10 times more expensive at about USD120.

The Biotronics tube stop may wear and become too loose to fix the endotracheal tube in place after long-term use. Ho [11] noticed this and used a homemade rubber spacer from a hardware store to replace it. However, the material to produce such a device is not available in operating theaters and does not come ready-to-use, because there is a need for disinfection in a clinical situation. Based on the above limitations, our device represents a better solution when carrying out TVI intubation with the longer shaft stylet.

In conclusion, we suggest that practitioners follow the TVI guides outlined in the manufacturer's manual and use a standard 320 mm stylet for orotracheal intubation and a 420 mm stylet for a double-lumen tube intubation. There is a need to use a tube stop together with the 420 mm stylet when carrying out orotracheal intubation. If a tube stop is not immediately available, the practitioner may cut a section of surgical suction pipe to 95 mm in length and use this to prevent displacement of an endotracheal tube during advancement, which will facilitate orotracheal intubation.

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