

Anesthesiology

1999; 91:592

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*In Reply:*—We thank Uda *et al.* for their comments. We would like to mention that we also read their study with interest.

First, our study was planned according to the studies in which the incidence of pain when propofol was injected at 4°C or 37°C was less than that of pain when propofol was injected at room temperature. So we kept the propofol at 4°C and 37°C, as described by McCirrick and Hunter<sup>1</sup> and Fletcher *et al.*,<sup>2</sup> respectively.

Second, whatever the cause of pain in veins, the perception of pain is the same because of the polymodal nociceptors that transmit their information *via* A $\delta$  fibers<sup>3</sup>; to abolish the injection pain of propofol, a method that can block A $\delta$  fibers must be used. Unfortunately, we do not think that propofol at 4°C or 37°C has such an effect. So we do not think that the effect of changes in the temperature of propofol are relevant.

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(Accepted for publication April 14, 1999.)

Anesthesiology

1999; 91:592-3

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## Fastrach Uses a Low-volume, High-pressure Cuff for the Endotracheal Tube System

*To the Editor:*—It has been our experience that the armored endotracheal tube (ILM endotracheal tube; Euromedical) that is provided with the intubating version of the laryngeal mask airway (LMA Fastrach; LMA North America, San Diego, CA) uses a low-volume, high-pressure cuff. This is not made clear in any of the literature that is provided with the Fastrach system. The use of an endotracheal tube with a low-volume, high-pressure cuff would be inappropriate for prolonged mechanical ventilation, which is the situation we encountered on two occasions with the same patient.

The patient was a 52-yr-old man who underwent a repeated operation to stabilize his cervical spine. He underwent general anesthesia for the procedure, and the airway management consisted of blinded endotracheal intubation using a #7.5 ILM endotracheal tube through a #5 Fastrach LMA. This was performed easily under general anesthesia with muscle relaxation. Placement of the endotracheal tube was verified by auscultation, and the cuff was inflated until no leak was heard using a minimal volume technique. The surgery consisted of both anterior and posterior fusions and proceeded without complication. The patient remained intubated and ventilated because of severe edema of the head and neck, but he was extubated on postoperative day 3 after an uneventful course in the intensive care unit. On postoperative day 6, he had an upper

airway obstruction and trouble clearing secretions. The surgeons requested endotracheal intubation, which was accomplished easily again using the #5 Fastrach LMA and #7.5 ILM endotracheal tube.

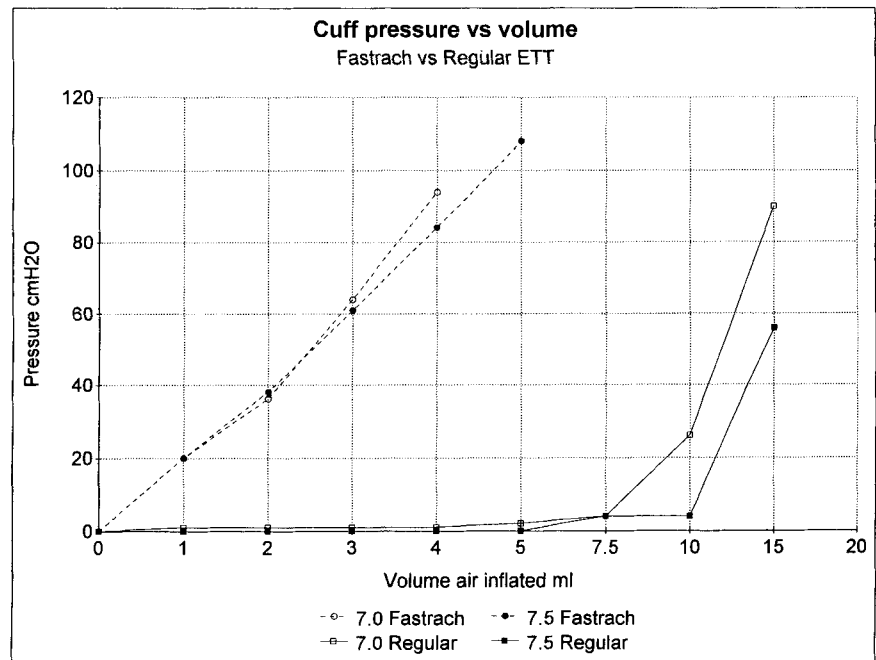
We noted that air leaked out of his mouth during positive-pressure ventilation, and continuous positive airway pressure was only 5 cm water. The pilot balloon of the endotracheal tube felt full but not particularly tight when it was palpated, but it registered pressures >100 cm water. A chest radiograph showed that the tip of the endotracheal tube was located in the middle of the trachea. A clean endotracheal tube of the same type was tested *in vitro* and found to register pressures off the scale (>120 cm water) with as little as 5-7 ml of injected air. The cuff was inflated further until no leak was detected.

We measured the pressure-volume relation of Fastrach 7.0 and 7.5 endotracheal tubes and compared them with the same size regular endotracheal tubes (Mallinckrodt Medical Intermediate Hi-Lo). Increments of air (2-5 ml) were injected by syringe into the cuff system *via* a stopcock. The resulting air pressure in the cuff was measured after equilibrium was reached using a device called a Cufflator tracheal cuff inflator and manometer (J. T. Posey). Data are presented in figure 1.

Euromedical was contacted by telephone and confirmed our observation that the endotracheal tube was a low-volume, high-pressure

## CORRESPONDENCE

Fig. 1. Pressure–volume relations of Fastrach #7 and #7.5 endotracheal tubes compared with regular endotracheal tubes of the same sizes. New endotracheal tubes were inflated with air to the indicated volumes through a stopcock using a syringe. The resulting air pressure in the cuff was measured after equilibrium and plotted against the volume of air inflated.



cuffed one but was not labeled as such. They maintain that new high-volume, low-pressure endotracheal tubes will be provided in the future with the Fastrach LMAs, but many anesthesiologists may be unaware that they are using low-volume, high-pressure endotracheal tubes. The pilot balloon, when inflated to >120 cm water “feels” the same as a high-volume, low-pressure pilot balloon when it is palpated. Therefore, we recommend that the endotracheal tubes provided with the Fastrach LMA be tested before they are used and that high-pressure cuffs be avoided in patients who might need postoperative mechanical ventilation. If a low-volume, high-pressure endotracheal tube such as the one we describe is used, it can be changed to a more suitable endotracheal tube over a tube changer, such as one produced by Cook Catheter. An alternative is to use a regular endotracheal tube that has

been softened in warm water through the Fastrach LMA (and passed with the curve facing in the posterior position).

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(Accepted for publication December 1, 1998.)

Anesthesiology  
1999; 91:593-5  
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*In Reply:*—We appreciate the opportunity to reply to the letter by Drs. Wiesel and Warm regarding the silicone ILM endotracheal tube (Euromedical, Sungai Petani, Kedah, Malaysia). The authors report successful tracheal intubation and ventilation in a 52-yr-old man for cervical spine stabilization using the intubating LMA-Fastrach (LMA North America, San Diego, CA) and a 7.5-mm silicone ILM endotracheal tube designed for use with it. The patient was ventilated for 3 days using this tube; however, when he subsequently required repeated intubation, the authors noted that a seal was not initially achieved. The problem was easily solved by inflating the cuff with more air, but the authors were concerned to note the pressure in the cuff was 100 cm water before a seal was achieved.

Wiesel and Warm make three points.

1. The product labeling does not state that the endotracheal tube is of the low-volume, high-pressure type, possibly resulting in anesthesiologists being unaware that they are not using a high-volume, low-pressure cuff.
2. Clinicians should test the cuff before use.
3. The product is unsuitable for patients who require postoperative mechanical ventilation.

We asked Dr. A. I. J. Brain, the inventor of the endotracheal tube in question, to comment on these points. His written reply from December 21, 1998 follows.

The silicone cuff of this tube is designed to form a close-fitting sleeve on the shaft to permit smooth passage through the intu-