

ing the respiratory cycle, the diameter of the IJV changes, and when pressure is applied with the probe, the vein collapses and the carotid artery does not. The IJV was identified easily by these ultrasonic findings. The physician stands at the patient's head and introduces the needle caudally through the skin just under the probe. The needle at a depth of 1 cm can be visualized as an ultrasonic image on the oscilloscope. The correct angle and depth of the needle was determined from the ultrasonic image (fig. 2). Puncture of the IJV was confirmed by aspiration of dark blood, and the cannula was then advanced down the needle into the vein and the needle was withdrawn. A guidewire for a Swan-Ganz® catheter or a catheter for the central venous pressure measurement was inserted into the vein through the cannula. All of these procedures were observed on the oscilloscope. Ultrasound-guided IJV catheterization was performed 160 times on unselected patients by all members of our anesthetic department. There was no failure in achieving satisfactory venous puncture and catheterization. During the two-year trial, we have not had any complications with this technique. The advantage of this technique was safe and easy puncture of the IJV in patients with bleeding tendency or cervical hematoma due to inadvertent carotid puncture oc-

curing with conventional techniques. The disadvantages were the cost of the equipment and the probe being too large for a short neck or a child.

AKITOMO YONEI, M.D.

TADAHIKO NONOUE, M.D.

ATSUO SARI, M.D.

Director

Department of Anesthesia  
Kurashiki Central Hospital  
1-1-1 Miwa Kurashiki  
Okayama, Japan 710

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### Cricoid Pressure, Awake Intubation, or Both?

*To the Editor:*—The experiment by Salem *et al.*<sup>1</sup> attempted to resolve the question of the desirability of leaving a nasogastric tube in place during rapid-sequence induction. Although cricoid pressure was found to be highly effective in occluding the upper esophagus in six fresh cadavers, for several reasons these findings may not allow one the degree of certainty with which Salem recommends this course of action in the clinical setting. First, the force of cricoid compression may well have been much greater than that used clinically, and reduction in the force of compression to meet the needs of intubation may result in reflux. Second, cricoid compression has been known to distort and/or laterally displace the glottis, and extensive anterior-posterior compression of the cricoid may also result in compromise of the narrowest lumen to be traversed with intubation. Third, no attempt was made to intubate the cadaver, and the antioclusive effects of

anterior displacement forces of laryngoscopy require evaluation.

The advantage of an 18-Fr nasogastric tube as a "blow off" valve is questionable because induction is generally delayed until suction of gastric contents becomes non-productive. Slow withdrawal of the nasogastric tube allows aspiration of esophageal and pharyngeal contents as well as subsequent evaluation of the patency of the tube itself, which frequently becomes occluded with particulate matter not found in colored saline. This slow withdrawal of the nasogastric tube may be particularly useful in patients with hiatal hernia or achalasia, where the danger of aspiration arises from material proximal to the stomach. Rare entities such as megaesophagus could preclude efficacy of cricoid compression, the upper esophagus becoming much wider than the cricoid. With Zenker's diverticulum, aspiration secondary to cricoid compression

itself could occur. Of question also is whether early post-mortem changes of cricopharyngeal and esophageal musculature constriction and/or localized edema of the area may have in some way contributed to superior conditions of occlusion in this experiment. A final question is whether sagittal localization of the nasogastric tube can preclude closure of the esophagus during cricoid compression, allowing the parasagittal lumen of the esophagus to remain open.

Prevention of aspiration cannot be guaranteed. Continual attention to and protection of the airway is mandatory in this setting, even with an inflated endotracheal tube cuff in the proper position.

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*In reply:*—Our investigation, performed in fresh cadavers, confirmed that firmly applied cricoid pressure is effective in sealing the esophagus around an esophageal tube against an intraesophageal pressure up to 100 cmH<sub>2</sub>O.<sup>1</sup> Dr. Kempen raises important questions regarding extrapolating our data to the clinical setting. First, the force applied during cricoid pressure might have been greater than those forces used in clinical situations and, thus, might have compromised the glottic lumen necessary for successful endotracheal intubation or might have distorted and/or displaced the glottis laterally. Second, laryngoscopy may interfere with the efficacy of cricoid compression in occluding the esophagus around the nasogastric tube during endotracheal intubation, which was not done in our investigation.

We believe that these problems can be avoided by simply adhering to the original technique as described by Sellick.\* The neck must be extended so that the esophagus will be directly posterior to the cricoid cartilage, and thus sealing of the esophagus would be easily accomplished by cricoid compression.\* Furthermore, lateral displacement of the glottis can be prevented by using three fingers. The cricoid cartilage is palpated and lightly held between the second finger and the thumb while the index finger is placed on the anterior surface of the cricoid cartilage.\* Pressure is increased by the index finger as consciousness is lost, with the cricoid maintained in its central position.\* Unfortunately, Sellick's original description is not strictly

PAUL MARTIN KEMPEN, M.D.  
*Resident*  
*Department of Anesthesiology*  
*University of Michigan*  
*Ann Arbor, Michigan 48104*

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followed by many practitioners, and drawings in textbooks do not represent the maneuver as described by Sellick.

Interference with glottic patency (and intubation) can occur if excessive pressure is exerted, especially in pediatric patients.<sup>2,3</sup> Unfortunately, there is no easy way of assessing the degree of cricoid pressure. In general, firm pressure is used to prevent gastric contents from reaching the pharynx. If cricoid pressure is used for preventing gastric inflation during bag-mask ventilation, especially in pediatric patients, gentle, rather than firm, pressure would be desirable.<sup>2</sup>

Laryngoscopy may interfere with the efficacy of cricoid pressure only if improperly performed and if excessive traction is applied by the blade.<sup>4</sup> Recently, we have been successfully using cephalad displacement of the larynx as a technique to enhance visualization of the larynx in difficult intubations. Perhaps the same technique can be used while applying cricoid pressure in intubating patients with a full stomach. This will facilitate exposure of the glottis without interfering with the efficacy of the maneuver. In our investigation, the pharynx was visualized with a laryngoscope and at no time was the efficacy of cricoid pressure compromised.

The importance of emptying the esophagus in certain situations has previously been emphasized.<sup>5</sup> However, a functioning nasogastric tube will help maintain a low intragastric pressure until the time of anesthetic induction, but should not be relied on as a guarantee of emptying the stomach. Therefore, if a rise in intragastric pressure occurs during induction, a functioning nasogastric tube will act as a "blow-off" valve while cricoid pressure will prevent gastric or esophageal contents from reaching the

\* Sellick BA: The prevention of regurgitation during induction of anaesthesia. *First European Congress of Anaesthesiology* 89:1-4, 1962.