End-tidal CO₂ Analyzers in Proper Positioning of the Double-lumen Tubes

To the Editor:—Correct positioning of a double-lumen tube is confirmed by a combination of: 1) chest auscultation and observation during clamping and declamping the tracheal and bronchial lumens; 2) separate airway pressure measurement; 3) chest x-ray; and 4) fiberoptic bronchoscopy.¹ Maintenance of the correct position during surgery is aided by other techniques, which include an endobronchial cuff leak indicator or an air bubble leak detection method.² However, a properly positioned double-lumen tube can dislodge from its proper position either when the patient is turned into the lateral decubitus position or when manipulation occurs during surgery. Furthermore, once the patient is prepared and draped, either the chest is not easily available for auscultation or the quality of breath sounds often is not sensitive enough for detecting displacement of the double-lumen tube.

We have found that end-tidal CO₂ monitoring for each lung is a valuable adjunct for assuring proper tube placement. Two end-tidal CO₂ analyzers are connected to the bronchial and tracheal end of the double-lumen tube (fig. 1). The analyzers can be coupled with one or two capnographs. The correct position of the double-lumen tube can be identified by simultaneous and synchronous needle movement of two analyzers. The wave forms from each lung are examined for shape, height, and rhythm, depending on the correct position of the tube as well as the ventilation-perfusion ratio for each lung (fig. 2).³ Clamping of each lumen would result in “no needle oscillation” of the appropriate CO₂ analyzers.

In conclusion, end-tidal CO₂ monitoring for each lung is a valuable noninvasive monitoring technique for detecting the proper position of the double-lumen tube and early diagnosis of any mishaps related to partial obstruction or tube displacement throughout the procedure.

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Hemimacroglossia and Unilateral Ischemic Necrosis of the Tongue in a Long-duration Neurosurgical Procedure

To the Editor:—Complications of swelling of the tongue and head and neck during neurosurgical procedures have been reported. These reports described insertion of oral airways in adults and procedures with fixed positions of the head and neck for 10 h and 14 h respectively. Both articles suggested that the anatomy of the venous drainage of the tongue and head had been compromised. Ellis et al. suggested that bilateral venous occlusion was necessary to cause venous edema. The same articles suggested possible methods of avoiding the positional complications of macroglossia, i.e., 1) avoid the use of an oral airway (which may compress and occlude venous drainage of the tongue); 2) use a bite block (to avoid tongue compression by the teeth); 3) if a chin support bar is used, check the head support (to avoid soft tissue compression); and 4) avoid extreme flexion of the head against the chest (which may compress airway, tube, and tracheal rings against base of tongue). Despite following these recommendations, we still had a severe case of postoperative macroglossia.

A 56-year-old woman was operated on for a vertex parasagittal meningioma. The trachea was intubated uneventfully with the use of an oral 7.5-mm endotracheal tube, and the breath sounds were equal. In the supine position, the head was fixed with pin head holders. There was no oral airway inserted. The chin was one finger-breadth above the chest, and extreme flexion of the neck was not evident. No venous congestion of the head and neck were noted before draping. The neurosurgical procedure was uneventful and lasted 8 h.

The patient presented with primarily unilateral macroglossia postoperatively and subsequently developed a partial necrotic slough of the superior and anterior surfaces of the tongue. The unilateral swelling was seen immediately postoperatively. A mild upper airway obstruction was noted in the recovery room for a few h postoperatively. A large hematoma at 24 h and subsequent necrotic slough at approximately 72 h postoperatively was noted by an ENT consultant. The patient experienced severe difficulty with speech and swallowing for 6 days and an extremely sore tongue for 10 days. She was kept on a liquid diet for 3 weeks until the necrotic areas had healed. No severe airway compromise occurred and there were no long-term complications.

Recognizing that precautions were taken to avoid macroglossia, we postulate two mechanisms for this complication: 1) the right side of the tongue was severely compressed by the tube and a necrotic slough occurred; and/or 2) the swelling of the right side may have resulted from venous occlusion of the tongue base with increased tongue size and secondary compression of the tongue against the tube in a confined space.

Previously suggested means to prevent this complication may not be enough to prevent this problem in every instance. Hence, we would additionally recommend that in long procedures where forward flexing of the neck is required or use of a mandibular support bar is necessary, visual checking of the tongue, head, and neck be performed by the anesthesiologist every h during the procedure. If there is any question of compromise of the venous drainage of these areas, then repositioning of the head and neck should be performed.

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