motor pathways.[11] This signal can be recorded over the spinal cord. They suggested that this has been more reliable than SEP in predicting motor function. A possible adverse effect of this method seems to be visual flash or dimming during stimulation and the triggering of a seizure in a seizure-prone patient. However, no epileptiform activity has been observed in EEG monitoring during stimulation in humans.[11] This method may offer a number of possibilities for the development of brain and spinal cord monitoring techniques but it requires further study.

In summary, SEP is a simple, noninvasive, and sensitive monitor for cerebral and dorsal spinal cord function during thoracic or thoracoabdominal aortic aneurysm surgery but should not be expected to always be an accurate predictor of motor function.

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A Speaking Endotracheal Tube

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During ventilatory assistance via an endotracheal tube, patients cannot speak. This loss of speech may result in great fear, frustration, and withdrawal of the intubated patient[1,2] Many techniques of communication have been substituted for speech in an effort to alleviate this anxiety, including lip reading, writing and the use of hand signals. Unfortunately, few hospital staff people are able to lip read, writing is cumbersome, and many times the intubated patients lacks the strength or ability to comply with the use of hand signals.[3] Speech with the electrolarynx has been attempted but takes some time to master and at times patients find it difficult to use.[4]

The following clinical report describes the use of an alternative approach, a speaking endotracheal tube, and a prospective study to evaluate its effectiveness. To date, no such device or study has been described in the medical literature.

Materials and Methods

The speaking endotracheal tube (S.E.T. Tube™)‡ is constructed in a manner similar to a conventional endotracheal tube with the addition of an extra lumen used to conduct a tone to the posterior oral pharynx (fig. 1). The tone generator used to supply this tone consists of two component parts, a pulse generator and an electrically controlled valve. The pulse generator is a small handheld, battery-powered unit that is controlled by the patient using a sensitive switch easily activated by a light touch. The valve is opened and closed by the electrical impulses

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‡ Available through Dacomed Corporation, 1701 East 79th Street, Minneapolis, Minnesota 55420.

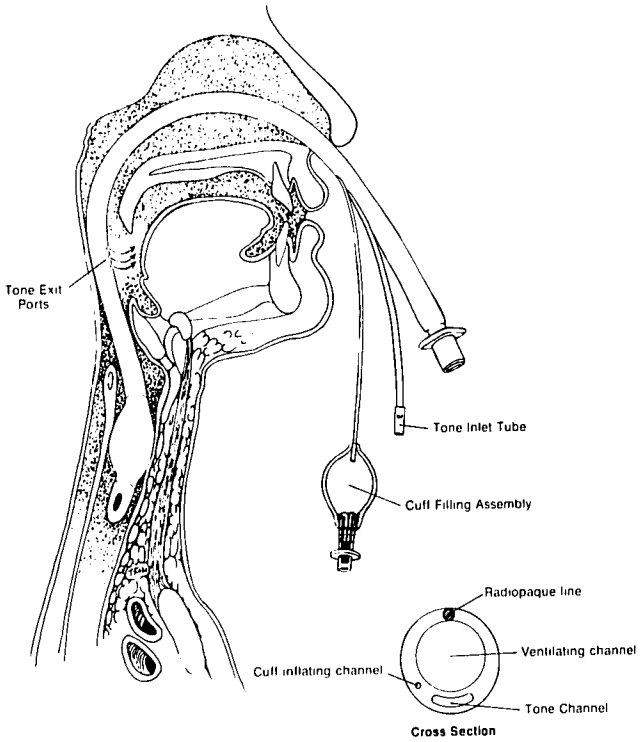

FIG. 1. View of the S.E.T. Tube™ in place with cross-section.

from the pulse generator at a sufficient rate to produce a tone when the valve is connected to a compressed gas source. This gas source can be either air or oxygen from a compressed tank or hospital wall supply at a flow rate of 1–2 $l \cdot min^{-1}$. The tone generated in this manner is conducted to the oral pharynx by the S.E.T. Tube™ and articulated into words by the patient with the tongue and lips.

The described S.E.T. Tube™ and companion tone generator were evaluated in a study involving seven patients. The seven patients gave their informed consent to participate, and the study protocol was approved by the Human Experimental Committee, the institutional review board of our hospital.

TABLE 1. Definitions of Ratings

Rating	Definition for Quality of Speech	Definition for Ease of Speech
Excellent	Understood without directly observing patient	No repeating needed by patient
Good	Must see lips and face to understand patient	Patient must repeat one time
Fair	Difficult to understand patient	Patient must repeat two or three times
Poor	Impossible to understand patient	Patient must repeat more than three times

TABLE 2. Rating Obtained by Patients Using the S.E.T. Tube™

Rating	Number of Patients Receiving Rating	
	Quality of Speech	Ease of Speech
Excellent	5	4
Good	1	2
Fair	0	0
Poor	0	0
Total	6	6

The patients selected for the study were alert and free of any abnormality affecting their ability to articulate. Following nasotracheal intubation with the S.E.T. Tube™, the patient's ability to produce speech was rated in two categories, the quality of speech and the ease of speech, with the use of definitions listed in table 1. The patient's best performance was used in the evaluation conducted by the nursing staff involved in the care of the individual patients. In addition, we obtained audio tapes of the vocal performance in all but one patient.

RESULTS

Of the seven patients enrolled in the S.E.T. Tube™ study protocol, one patient declined to use the speaking function of the tube before extubation secondary to general postoperative discomfort from his abdominal surgery. As a result, data concerning the speaking function of the tube were not obtained and the patient was dropped from the study. The results of the remaining six patients and their evaluations are summarized in table 2.

All but one patient was understood without being directly observed while speaking with the S.E.T. Tube™. Four of the six patients could be understood without having to repeat themselves, while two patients occasionally needed to repeat their statements. One of these patients had copious oral secretions that resulted in a gurgling sound. Periodic suctioning of these oral secretions greatly improved the speech of this patient.

All patients were able to produce intelligible speech within minutes of the first attempt by merely moving their lips while activating the tone generator. Two patients were able to speak and could be understood immediately.

DISCUSSION

In general, the S.E.T. Tube™ was found to successfully produce intelligible speech in all patients that attempted speech. The patients needed little or no coaching and experienced no ill effects other than a mild tickling sensation in the hypopharynx from the vibrating air flow during initial attempts at speech. This tickling sensation resulted in some coughing initially but subsided as the patient became accustomed to it.

Potential complications of the S.E.T. Tube™ are expected to be similar to those of any endotracheal tube. During this study the S.E.T. Tube™ was used exclusively via the nasotracheal route. Oral intubation is possible, but the speech quality would likely be decreased.

The patient's ability to speak was found to be most helpful to the nursing staff. Although the patients were acutely ill and elected not to speak frequently, their use of the speaking function of the S.E.T. Tube™ was routine and prompted by either the patient's requests or inquiries from the hospital staff or family members. The patients as well as their families seemed less apprehensive when communication by speech was made available.

In conclusion, the S.E.T. Tube™ successfully allows the intubated patient to consistently produce self-activated speech with little or no ill effects.

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Benign Intracranial Hypertension and Anesthesia for Cesarean Section

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Benign intracranial hypertension (BIH) is defined as a syndrome of elevated intracranial pressure without clinical, laboratory, or radiologic evidence of a focal lesion or hydrocephalus.[1–6] The four criteria of BIH are as follows: 1) elevated intracranial pressure, *i.e.*, cerebrospinal fluid (CSF) pressure above 200 mmH_2O; 2) normal CSF composition; 3) no alteration in the state of consciousness; and 4) absent focal intracranial lesions.

During pregnancy, BIH is rare,[7–9] with only three cases of recurrence reported.[7,8,10] With pregnancy, the symptoms worsen in 50% of the cases and invariably resolve after abortion or delivery.[11,12] Therefore, a female with an active disease should be advised to delay pregnancy until all signs and symptoms have abated. Worsening of the condition during pregnancy rarely requires termination of pregnancy provided adequate therapy is used. Vaginal delivery is not contraindicated, despite CSF pressure elevation during uterine contractions.[13,14]

The anesthetic management of the obstetric patient with BIH rarely has been described. Palop *et al.* reported two cases of delivery under epidural anesthesia.[15] Powell[16] briefly described one case of cesarean section under general anesthesia. Koontz *et al.*[12] reported seven cases, five of whom delivered under pudendal nerve block or local anesthetic infiltration and two under spinal anesthesia. The headache resolved in all cases within 72 h of delivery. However, the details of anesthesia were lacking. For this reason and because of the paucity of reports of anesthesia in BIH, we report these two cases.

Report of Two Cases

Patient 1. This patient was a gravida 2, para 1, 31-year-old, weighing 91 kg and she was 155 cm tall. She began having headaches at the age of 22 years. At that time the headaches were severe, unrelieved by analgesics, and lasted for weeks. She was seen by a neurologist, who ordered an EEG and a computerized axial tomography of the brain, both had negative results.

She did well for 6 years. Then, during her first pregnancy the headaches recurred, warranting examination by a neurologist and a neuroophthalmologist at the 13th week of gestation. Fundus examination showed bilateral papilledema, moderate enlargement of ophthalmic veins, absent venous pulsations, and minimal enlargement of the blind spot with pupillary flare. Her corrected vision, visual fields, intraocular pressure, and slit lamp examination were normal and stayed unchanged throughout pregnancy. Computerized axial tomography of the brain was unremarkable. Lumbar puncture revealed an opening pressure of 340 mmH_2O, and the diagnosis of BIH was established. She was treated with repeated lumbar punctures during the course of pregnancy. At 41 weeks gestation she was admitted to another hospital with the diagnosis of fetal demise. Owing to the floating and high position of the vertex, the closed cervix, and insistence of the patient not to go through induction and labor, a primary cesarean section under general anesthesia was performed. Following delivery, the headaches and papilledema subsided, and CSF pressure was normal 2 months postpartum.

Three years later, she conceived again. During this second preg-

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