INTRODUCTION

Early mobilization of critically ill patients has recently been promoted to sustain patients’ physical function and to support airway clearance during mechanical ventilation.\(^1\)\(^-\)\(^3\) Because sedation is usually interrupted during active rehabilitation sessions,\(^1\) patients become more aware of their surroundings and experience pharyngeal discomfort with the recovery of consciousness. Patients often then try to communicate verbally, but difficulties caused by intubation frustrate them, frequently leading to reduced attention and less cooperation during the session.\(^1\)\(^-\)\(^3\) Consequently, achieving effective communication with orally intubated patients during periods of reduced sedation is a challenging but important task for critical care rehabilitation.

An electrolarynx (EL) is commonly used in voice rehabilitation after laryngectomy.\(^5\) The use of an EL for communicating with mechanically ventilated patients in the intensive care unit (ICU) has been recently reported;\(^6\)\(^-\)\(^8\) however, its use remains uncommon, probably because articulation is often unsatisfactory. This report describes successful verbal communication with an orally intubated patient achieved by using an EL during early mobilization. Based on our experience, we report some suggested procedures to achieve successful articulation with an EL.
An 82-year-old man, who was intubated and undergoing mechanical ventilation for the treatment of acute respiratory failure caused by severe pneumonia, was referred to the rehabilitation department on day 2 of hospitalization. The Acute Physiology and Chronic Health Evaluation II score at admission was 26. The patient responded well to intensive medical therapy, showing a favorable clinical course. The physical findings on the day of the first rehabilitation session were as follows: the Glasgow Coma Scale score was 10/15 (E4VtM6), the Richmond Agitation–Sedation Scale (RASS) score was 0, the Medical Research Council score was 50/60, and the Functional Independence Measure (FIM) score was 49 points (motor subscale score, 19 points; cognition subscale score, 30 points). The patient tried to speak during the spontaneous awakening trials and breathing trials for weaning off mechanical ventilation. His lips moved well, but we were unable to understand the words. Legible writing was difficult because of upper limb fatigue; moreover, use of the letter board was time-consuming. The patient was frustrated and exhibited a negative attitude toward physical therapy. In terms of impairment of the vibrating apparatus, orally intubated patients are similar to those who undergo total laryngectomy. Consequently, we attempted to use an EL, which is commonly used in voice rehabilitation after total laryngectomy. After the best position for the EL was explored for a few minutes in cooperation with the speech-language pathologist, phonation was recognized. We followed a trial-and-error approach and found that placement of the EL near the larynx was effective. Nevertheless, the patient’s words were still difficult to understand, being grade 5 according to the Taguchi Conversational Intelligibility Criteria (TIC). We further examined the patient and found that the intubation tube was disrupting tongue movement. To minimize the restriction of tongue movement, the intubation tube needed to be located at the corner of the patient’s mouth. After adjusting the tube, intelligible sounds were recognized without the passage of air through the vocal cords (Fig. 1). Nasal and lip closure sounds were incomplete but were sufficient for the medical staff to predict what the patient wanted to say. Articulation of basic phrases, such as “Good morning,” “I have a chest pain,” “I have a headache,” and “I am hungry” were practiced and confirmed as grade 2 or less according to the TIC; the Electrolarynx Effectivity Score was 5. Successful communication was subsequently achieved between the patient and medical staff during physical therapy. The patient became cooperative, and rehabilitation progressed to upright sitting and standing with oral intubation. Mucociliary clearance was promoted, resulting in successful extubation. The patient was transferred to the general ward after 5 days in the ICU.

This study was approved by the Research Ethics Committee of Kyoto Medical Center and was carried out in accordance with the principles of the Declaration of Helsinki and CARE guidelines. Written informed consent was obtained from the patient for publication of this case report.

In recent years, early mobilization for mechanically ventilated patients in the ICU has been promoted to improve patient outcomes. Because communication difficulties during mechanical ventilation often cause feelings of insecurity and significant frustration, establishing effective communication is desirable during rehabilitation sessions. The commonly used approaches to communicating with patients on mechanical ventilation involve simple methods, such as head nods, mouthing words, gesturing, or writing. However, these methods are time-consuming and often insufficient to meet patients’ needs. Other assistive communication tools, such as communication boards or high-tech communication interventions, are not commonly used because they require sufficient muscle power of the upper extremities, linguistic and reading skills, and sustained attention spans. Over the past 5 years, the use of an EL has been introduced to aid communication in orally intubated patients. The EL allows patients to express their wishes quickly without special
skills or prolonged practice. Our current experience suggests that it takes even less time to achieve phonation in orally intubated patients than in post-laryngectomy patients, which is consistent with the findings of a previous report.\(^6\) This is probably because the vocal apparatus in orally intubated patients is anatomically preserved and without post-operative swelling and/or scarring. Nevertheless, the application of an EL remains uncommon, probably because articulation is often unsatisfactory in orally intubated patients compared to those who undergo a tracheostomy.\(^7\) Indeed, we initially failed to achieve successful articulation in the current case. In a Dutch study, it was pointed out that the tongue’s range of motion must be preserved at the level at which patients can place the tip of their tongue behind their top front teeth;\(^8\) however, this level of tongue motion seems to be insufficient for intelligible Japanese articulation. We found that restriction of the movement of the base of the tongue should be minimized to ensure that patients can produce velar consonants. For this purpose, the intubation tube should be placed at the corner of the mouth. Moreover, a small amount of slack in the tube is necessary to keep it away from the side and base of the tongue as much as possible (Fig. 2a,b). The efficacy of this approach was subsequently confirmed in other patients. Other causes of failure to achieve effective articulation include insufficient strength of the perioral muscle to produce an acoustic effect, slow speech rates, and delirium (RASS score of \(-2\) or less).

In summary, although the effectiveness of EL use in intubated patients should be further evaluated in multiple cases, this method of communication is worth considering during early mobilization. The use of an EL is quick and easy. It has the advantage of meeting unpredictable demands for communication. Therefore, the use of an EL in combination with other tools could potentially improve communication with orally intubated patients. Our current experience indicates that the selection of patients (RASS score of 0 or \(-1\)) and careful placement of the intubation tube are key factors in achieving intelligible articulation in orally intubated patients.

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**CONFLICTS OF INTEREST**

The authors declare no conflicts of interest.

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**Fig. 2.** Appropriate (a) and inappropriate (b) positions of the endotracheal tube for intelligible articulation. Less compression of the side and base of the tongue by the tube [asterisks in (a)] results in minimal restriction of tongue movement.
REFERENCES


