Spinal Cord (2013) 51, 341–342

www.nature.com/sc

CASE REPORT

Communicating by electrolarynx with a blind tetraplegic spinal cord injury patient on mechanical ventilation in the ICU

K Shimizu, H Ogura, T Irisawa, Y Nakagawa, Y Kuwagata and T Shimazu

Study design: Single-subject case.
Objectives: To describe the atypical presentation of communication with a blind tetraplegic spinal cord injury patient on a respirator using an electrolarynx.
Setting: Critical care center in Osaka, Japan.
Methods: A 53-year-old blind man with tetraplegic spinal cord injury was admitted to our center. It was difficult for him to express his desires and to communicate with others about his severe condition and other details of his care. We began to use an electrolarynx to communicate with this patient because he could move his mouth.
Results: With use of the electrolarynx, the patient gradually became better able to speak fluently by electrolarynx on the first day of use. The electrolarynx allowed us and his family to communicate with him. He was pleased with the improvement in communication.
Conclusion: An electrolarynx is a useful method for communicating with blind tetraplegic spinal cord injury patients on mechanical ventilation.
Spinal Cord (2013) **51,** 341–342; doi:10.1038/sc.2012.170; published online 29 January 2013

Keywords: spinal cord injury; electrolarynx; communication; augmentative and alternative communication; ventilator; ALS

INTRODUCTION

It is difficult to communicate with tetraplegic spinal cord injury patients on mechanical repiratory support because they can neither move their arms and legs nor speak. An electronic communications system such as an eye tracking system is one method of communication for tetraplegic patients, but it is not suitable for patients who are blind.

An electrolarynx is a battery-powered device that incorporates an internal preset pitch that can be adjusted to meet individual preference.[1] The electrolarynx is used by pressing the device onto the skin on one side of the neck at the level of the glottis. The electronic sound source vibrations transmitted through the neck tissues create speech when movements of articulators such as the lips, tongue and jaw are made. The electrolarynx is mainly used in patients after laryngectomy or in those undergoing stroke rehabilitation. Here, we report successful communication by electrolarynx with a blind tetraplegic spinal cord injury patient on mechanical respiratory support.

CASE REPORT

A 53-year-old blind man accidentally fell from a platform. When the paramedics arrived, he was alert and conscious and his vital signs were stable. However, he could not move by himself, and he was transferred to our department. His blood pressure was 150/68 mm Hg, and his heart rate was 56 beats min^{-1}. He showed an abdominal respiration pattern, and his O_2 saturation was 98%. He could not move his four limbs, and he had lost motor and sensory function below the C4 level. T2-weighted magnetic resonance imaging revealed spinal cord compression at the level of C2-C5. Methylprednisolone sodium succinate was administered for this spinal injury.[2] His repiratory function gradually decreased because of his weakened respiratory muscles, and he was intubated and managed on a mechanical respirator on day 2 after admission. He did not recover spontaneous respiration. He was transferred to another hospital near his hometown on hospital day 24.

COMMUNICATION WITH THE PATIENT

Although blind, tetraplegic and on mechanical ventilation, the patient was alert. We could notice whether he had something to say by his mouth movements, but we could not understand what he meant from his mouth movements when he attempted to communicate. It was difficult for him to express his desires and to communicate with us and his family about his severe condition and other details of his care.

We began to use an electrolarynx to communicate with this patient because he could move his mouth. We held the electrolarynx on one side of his neck at a location where he could speak well with the device (Figure 1). At first, it was difficult to understand what he said. He gradually became better able to speak fluently by electrolarynx after we found a better position for speech on his neck, and we began to understand each other on the first day of electrolarynx use. Even inexperienced listeners including the medical staff and his family

Department of Traumatology and Acute Critical Medicine, Osaka University Graduate School of Medicine, Osaka, Japan
Correspondence: Dr K Shimizu, Department of Traumatology and Acute Critical Medicine, Osaka University Graduate School of Medicine, 2-15 Yamadaoka, Suita, Osaka 565-0871, Japan.
E-mail: shimiken@hp-emerg.med.osaka-u.ac.jp
Received 2 July 2012; revised 6 November 2012; accepted 20 November 2012; published online 29 January 2013

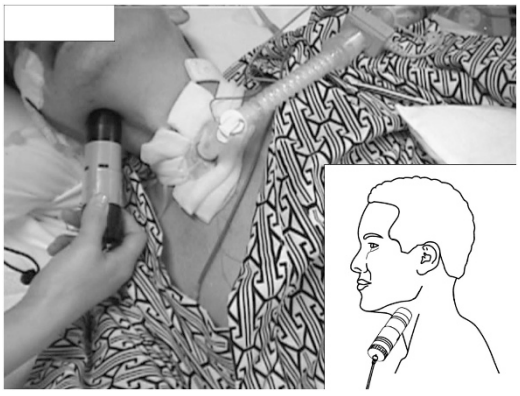

Figure 1 Photograph and drawing showing communication with this blind ventilated patient by electrolarynx. A full color version of this figure is available at the *Spinal Cord* journal online.

could use the electrolarynx efficiently. His sister also could talk with him using the electrolarynx, and she gave us the details of several important issues the patient had. He was very pleased with the improved communication. He obtained another electrolarynx for himself and was transferred to another hospital.

DISCUSSION

It is difficult for tetraplegic spinal cord injury patients on a respirator not only to let others know of their desire to speak but also to communicate with others. One method of communication is via electronic augmentative and alternative communication devices.[3] Eye tracking is reported to be one of the least fatiguing methods. These systems are efficient for patients with tetraplegia but are not suitable for blind people. Blind people can use Braille, but this communication method is difficult in patients with tetraplegia who are on mechanical ventilation.

For speech during mechanical ventilation, the cuffless tracheostomy allows air flow through the larynx during expiration in the chronic stage.[4] Adjusting the ventilator mode and the tracheostomy tube can improve speech and communication.[5,6] Patients face a long and lonely struggle to achieve effective communication as they cope with such difficulties as managing their changed speech condition, adapting to changes in communication, dealing with the lack of privacy, depending on technology and handling breakdowns in communication.[7] In the acute stage, however, risk of aspiration must be avoided because aspiration can cause ventilator-associated pneumonia, which has high morbidity and mortality.[8] There could be risk of aspiration when using a deflated cuff or cuffless tracheostomy. The electrolarynx is much safer in that it can be used without deflating the cuff.

The electrolarynx is a battery-powered device that can be used for communication after removal of the entire larynx as a treatment for laryngeal cancer. In the present case, this blind patient suffered a spinal injury and suddenly could not communicate with others. He could be physiologically and psychologically damaged due to this unexpected event and loss of communication. It was not an easy task for us to inform him of his prognosis or for him to be able to express his desires.[9] Initially, we could communicate only by yes or no questions until we began to use the electrolarynx, and his family could not communicate in detail with him without the electrolarynx.

When using the electrolarynx, it is difficult to transmit the vibrated sound to the machine in patients with a swollen neck, and we would not recommend the device for a patient with significant neck edema. As for training, the doctors and nurses could use the electrolarynx on the first day of use. All that is required is to touch the patient's neck with the device and find a good position for speech. It is important for the medical staff that the electrolarynx is easy to learn and use because the medical staff in the intensive care unit (ICU) changes over time. In decuffing with the ventilator, respiratory adjustment and adaptation are difficult problems.[5] We experienced few respiratory problems because electrolarynx speech is related to vibrated electronic sound from the neck and not to breathing.

As a limitation in this case, it is difficult to compare and rate the electrolarynx against other methods such as mouthing, manipulating the ventilator or tracheostomy, or eye tracking because this was a rare case of a blind tetraplegic spinal cord injury patient on mechanical ventilation in the ICU. In addition, we could not follow this patient after discharge from the ICU over the long term. Further study is needed to elucidate the effectiveness of electrolarynx use in patients with spinal cord injury on mechanical ventilation.

In conclusion, the electrolarynx is a useful method for communicating with spinal cord injury patients on mechanical ventilation. We believe that this communication device will lead to better relief for disabled patients by allowing them to communicate their desires to their family and the healthcare staff.

DATA ARCHIVING

There were no data to deposit.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

1 Liu H, Ng ML. Electrolarynx in voice rehabilitation. *Auris Nasus Larynx* 2007; **34**: 327–332.
2 Bracken MB, Shepard MJ, Collins WF, Holford TR, Young W, Baskin DS *et al*. A randomized, controlled trial of methylprednisolone or naloxone in the treatment of acute spinal-cord injury. Results of the Second National Acute Spinal Cord Injury Study. *N Engl J Med* 1990; **322**: 1405–1411.
3 Beukelman D, Fager S, Nordness A. Communication Support for People with ALS. *Neurol Res Int* 2011; **2011**: 714693.
4 Hoit JD, Shea SA, Banzett RB. Speech production during mechanical ventilation in tracheostomized individuals. *J Speech Hear Res* 1994; **37**: 53–63.
5 Hoit JD, Banzett RB, Lohmeier HL, Hixon TJ, Brown R. Clinical ventilator adjustments that improve speech. *Chest* 2003; **124**: 1512–1521.
6 Nomori H. Tracheostomy tube enabling speech during mechanical ventilation. *Chest* 2004; **125**: 1046–1051.
7 Laakso K, Markstrom A, Idvall M, Havstam C, Hartelius L. Communication experience of individuals treated with home mechanical ventilation. *Int J Lang Commun Disord* 2011; **46**: 686–699.
8 American Thoracic Society; Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. *Am J Respir Crit Care Med* 2005; **171**: 388–416.
9 Kirshblum S, Fichtenbaum J. Breaking the news in spinal cord injury. *J Spinal Cord Med* 2008; **31**: 7–12.