

Case Report

Management of Lacerated and Swollen Tongue after Convulsive Seizure with a Mouth Protector: Interprofessional Collaboration Including Dentists in Intensive Care

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We encountered a 74-year-old male patient with tongue laceration after convulsive seizures under intensive care. The tongue showed severe swelling, and the right ventral surface had been lacerated by his isolated and pointed right lower canine. Our university hospital has established a perioperative management center, and is promoting interprofessional collaboration, including dentists, in perioperative management. Dentists collaborating in the perioperative management center took dental impressions, with the support of anesthesiologists who opened the patient's jaw under propofol sedation, to produce a mouth protector. By raising the patient's bite, the completed mouth protector prevented the isolated tooth from contacting the tongue and protected the lacerated wound. Use of the mouth protector prevented the lacerated tongue from coming into contact with the pointed tooth, and the tongue healed gradually. These findings underscore that interprofessional collaboration including dentists can improve the quality of medical care.

Key words: mouth protector, tongue laceration

Tongue laceration under anesthesia and/or sedation is a relatively uncommon complication, although it may occur in patients with disturbance of consciousness due to convulsive seizures. In such cases, interprofessional collaboration can improve the quality of medical care, particularly if dentists are among the professionals consulted. Dentists often use mouth splints or mouth guards in daily clinical practice, e.g., in orthodontic therapy or to prevent dental injury in athletes [1, 2]. We considered that these

devices could also be useful for successfully management of the lacerated tongue.

Here, we present a case of tongue laceration caused by convulsive seizures after cardiopulmonary resuscitation in a patient who received intensive care after laryngectomy and esophagectomy for esophageal cancer. The management of this case demonstrated how interprofessional collaboration can lead to better perioperative management.

Case Description

The patient was a 74-year-old man who underwent total laryngopharyngeal and esophageal resection, bilateral neck dissection, and reconstructive surgery

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of the pedicle jejunum for esophageal cancer. After surgery, he received intensive care. This patient developed disturbance of consciousness due to a convulsive seizure on postoperative day (POD) 17. Five days after recovery (POD 22), laceration of the ventral surface of the tongue was discovered by the intensive care unit (ICU) staff (Fig. 1A), and a consultation with the dentist in the Perioperative Management Center was made. Our university hospital has established a perioperative management center, and is promoting interprofessional collaboration with the inclusion of dentists in perioperative management. The dentist noted a severely swollen tongue, the right ventral surface had been lacerated mainly by the right lower canine, which was pointed and isolated without adjoining teeth. The dental staff developed a plan to

manage the lacerated tongue with a mouth protector that would raise the bite on the right side, thereby making space for the swollen tongue on the left side and preventing further laceration from the isolated right canine. It is rare in dental treatment to raise the bite on only one side, while making space for the swollen tongue on the opposite side, as in this case (Fig. 1B).

To aid in taking a dental impression, the anesthesiologists sedated the patient with propofol, then assisted in holding his jaw open. The impression was used to produce a mouth protector at the Division of Dental Laboratory, Clinical Support Department, Okayama University Hospital. A 3-mm sheet of ethylene vinyl acetate copolymer (Dreve Dentamid GmbH, Unna, Germany) was vacuum-molded by Angel

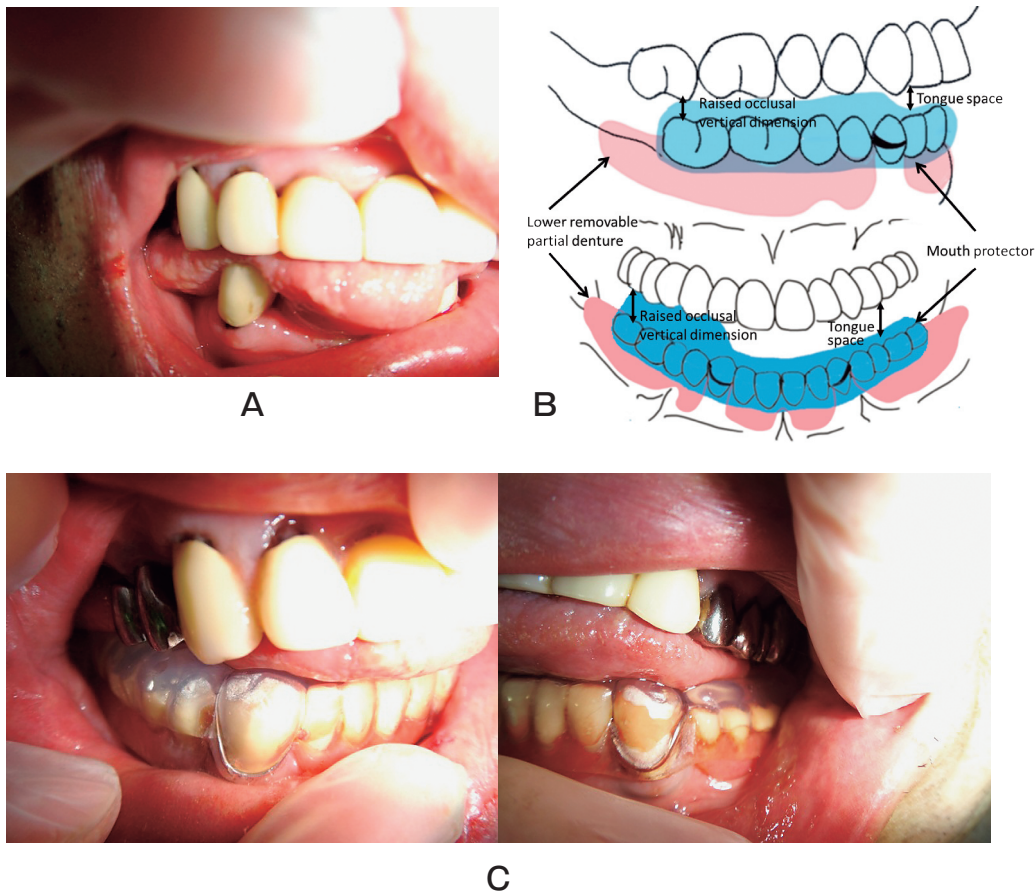


Fig. 1 **A**, Laceration of the right ventral surface of the swollen tongue. The lacerated swollen tongue frequently made contact with the pointed right lower canine; **B**, Detailed structure of the mouth protector. To manage the lacerated tongue, space was made for the swollen tongue. The mouth protector prevented biting by raising the bite; **C**, The inserted mouth protector. The swollen and lacerated tongue was protected from biting. The laceration healed gradually.

DUALFORMER (Daiei Dental Product Co., Ltd., Osaka, Japan) with a plaster figure made from a dental impression taken in the ICU. The detailed structure of the mouth protector is shown in Fig. 1B.

One day after taking the dental impression, the custom-made mouth protector was inserted, and the swollen and lacerated tongue was protected from further injury (Fig. 1C). Five days after inserting the custom-made mouth protector, healing of the tongue wound was observed, while swelling of the tongue remained. On the following day, swelling of the tongue subsided, and no further tongue laceration occurred.

Discussion

In this case, we produced a custom-made mouth protector for a patient after a convulsive seizure, which was designed to prevent aggravation of a tongue laceration. The possibility of recurrence was not high in this case, but the lacerated swollen tongue frequently made contact with the pointed lower canine. The bite-raising custom-made mouth protector was effective for creating a space for the swollen tongue, and for protecting the ventral surface of the tongue by covering the pointed tooth.

A recent review [2] described investigations on the use of mouth guards to protect athletes from dental injury, and classified these guards into 3 basic types based on their manufacture and use—*i.e.*, stock prefabricated, mouth-formed, and custom-made mouth guards. Stock prefabricated mouth guards can be made from either rubber or a plastic material. These are disposable and inexpensive, and do not require any special preparation. However, they fit loosely and their potential for modification is limited. Most mouth-formed mouth guards are constructed from a preformed thermoplastic shell of polyvinyl acetate polyethylene copolymer or polyvinyl chloride that is softened in warm water and then molded in the mouth by the user. However, mouth-formed mouth guards tend to be bulky. To overcome this drawback, custom-made mouth guards are individually made in a laboratory on a plaster figure poured from impressions of the wearer's mouth. Because these protectors are carefully modified by dental technicians in the laboratory, this method has the best operability, [3]. Custom-made mouth guards are thus a better option than the other types in current medical use, and

should be the first choice when possible.

Similar approaches were reported previously. The effectiveness of mouth protectors to prevent self-induced injury in the ICU was reported [4, 5]. The oral self-injuries in these reports were similar to that in our patient. That is, these patients had cerebral disorders due to traumatic accidents, and bit or otherwise injured their own lips or tongue in the ICU [4, 5]. The impressions for their mouth protectors were taken after oral self-injury. The mouth protectors described by Wilkinson *et al.* [4] were similar to that reported here, although their subjects were relatively young and had almost all of their teeth. Older subjects may have advanced periodontitis, and thus may have an isolated tooth that is more likely to lacerate the tongue. Our case demonstrated the usefulness of a mouth protector to prevent further laceration of the tongue and promote wound healing. The mouth protector reported by Roberts (1995) [5] and Aristidis *et al.* (2010) [6], which was made of wire and acrylic, was more complicated than that described here, and was effective for long-term use because of its durability. In the present case we selected a simpler type of mouth protector for short-term use.

It would be difficult for a doctor or dentist working alone to make such a custom-made mouth protector. Doctors working alone would not be able to take an adequate impression, while dentists working alone would have difficulty in taking an impression in patients under intensive care management, who sometimes cannot open their mouth in response to instructions. However, with interprofessional collaboration between doctors and dentists, it is not difficult to take a dental impression under anesthesia.

Custom-made mouth protectors made by dentists will be more expensive than stock-prefabricated and mouth-formed mouth protectors [2]. However, the modification, application, and adequateness of custom-made mouth protectors are much better than those of the stock-prefabricated and mouth-formed types. There is no standardized treatment protocol for oral self-injury, so therapy must be individualized [7]. Custom-made mouth protectors could prevent further tongue laceration and promote healing, in addition to preventing bleeding and problems associated with infection. If infectious problems occur, the costs required for treatment would be much higher than the cost of a mouth protector. Therefore, we feel that the

application of a custom-made mouth protector for each patient would be more economical than subsequent treatment of complications that may arise without such intervention.

In conclusion, we managed a patient with tongue laceration after a convulsive seizure under intensive care following surgery using a mouth protector. The mouth protector contributed to wound healing of the lacerated swollen tongue by preventing contact with a pointed isolated tooth. Under such conditions, inter-professional collaboration including dentists can lead to better medical care.

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