

Tongue bite in a patient with tracheostomy after prone position -A case report-

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A 22-year-old man underwent an operation for posterolateral fusion of the lumbar spine at L3-5. He was ventilated via a tracheostomy site in a prone position for 210 minutes. Ventilator function and eyeballs were checked periodically. After changing his position to supine for the wake-up test, it was noticed that his tongue was self-inflicted and looked to be cut unless immediate decompression was applied. After several manual attempts to open the mouth failed, anesthesia depth was deepened with thiopental sodium and neuromuscular blocker to decompress and reposition the tongue into the intraoral cavity. Minimal teeth marks and scarring remained after seven months without any complications. (Korean J Anesthesiol 2011; 60: 365-368)

Key Words: Human bite, Prone position, Tracheostomy.

Tongue bite is a rare perioperative complication during general anesthesia because most patients are relaxed and intubated. However, it can occur in the absence of a bite blocker or under certain clinical conditions. Some reports in the literature link tongue injury with seizure associated with severe eclampsia or anoxic brain damage, accidental trauma, and spine surgeries in the prone position [1-3].

Increased stress hormones and postoperative sleep disturbance have been reported after the wake-up test, even if the operation was uneventful and the patient was hemodynamically stable [4,5]. However, upper airway complication involving the tongue is extremely rare.

According to the degree of injury, a bitten tongue in the absence of intubation can provoke various adverse effects, which range from mucosal erosion [3,6] to macroglossia followed by

airway obstruction [1,7]. During surgery in the prone position, anesthesiologists should anticipate possible physiologic and anatomic changes and concentrate on careful positioning in order to minimize complications.

We present the case of a male patient with a tracheostomy who bit his tongue after a spine procedure and discuss the possible mechanisms and preventive strategies.

Case Report

A 78 kg, 183 cm, 22-year-old male patient was delivered to an operating room for posterolateral lumbar spine fusion at L3-5 and humerus operation. Thirty-five days previously, he was admitted via the emergency department with a diagnosis of multiple traumas after a fall from 10 m. Temporary

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tracheostomy had been performed twenty days ago for mechanical ventilation to treat acute respiratory distress syndrome.

Preoperatively, he was alert and able to ventilate via a size 8.0 mm cuffed tracheostomy tube (Portex®, Smiths Medical, Kent, UK) without ventilator assistance. All laboratory test results were normal. There were no upper airway tract abnormalities except tracheostomy, broken upper teeth, and a slight open-bite.

After installing monitors (EKG, pulse oximetry and invasive arterial blood pressure), general anesthesia was induced intravenously with thiopental 325 mg, fentanyl 150 µg, and rocuronium 50 mg. Because he was scheduled for spine surgery in the prone position, the airway was prepared to secure adequate ventilation, as follows: cleansing of the intraoral and endotracheal space with a sterile suction tube, replacing the tracheostomy tube with a size 8.0 mm cuffed flexible tracheal tube (TT) (Safety-Flex®, Mallinckrodt Medical, Athlon, Ireland), confirming the depth of the TT by ballottement and auscultation, staying the TT to the tracheostomy site by suturing with silk 3–0, applying padding to the anterior neck with gauze to prevent sharp angulation of the TT, and draping the anterior neck with transparent dressing (Tegaderm®, 3M, USA).

Anesthesia was maintained with sevoflurane 1.5–3.0 vol% in oxygen with positive pressure ventilation. Continuous intravenous infusion of remifentanil 0.1–0.2 µg/kg/min and rocuronium 10 mg/hr followed. After moving the patient to the prone position, the TT and both eyes were checked regularly. The operation was uneventful and took 210 min. After the surgeon requested a wake-up test thirty minutes before the end of spine surgery, rocuronium infusion was stopped to prepare the test, and the concentrations of remifentanil and sevoflurane were decreased to 0.1 µg/kg/min and 0.5 vol%, respectively. These dosages were continued throughout the rest of the procedure to avoid pain and unpleasant memory. However, neuromuscular function and depth of anesthesia monitoring were not applied, as these were not routine. There were no remarkable events before changing the patient's position. As humerus operation was scheduled, it was determined that the patient would be more comfortable in the supine position for the wake-up test.

After closure of spine surgery, the patient was moved into a supine position, and a bite injury to the anterior third of tongue was noticed. The protruding portion of the tongue was cyanotic and edematous, and it seemed that it might be cut if decompression was not employed emergently. The anesthesiologist responsible tried to open the mouth and insert a bite blocker manually after extending the neck. After several attempts to open the mouth failed, sevoflurane concentration was increased to 4.0%, and thiopental 150 mg, midazolam 3 mg, and rocuronium 20 mg were administered intravenously. The mouth began to open slightly approximately thirty seconds

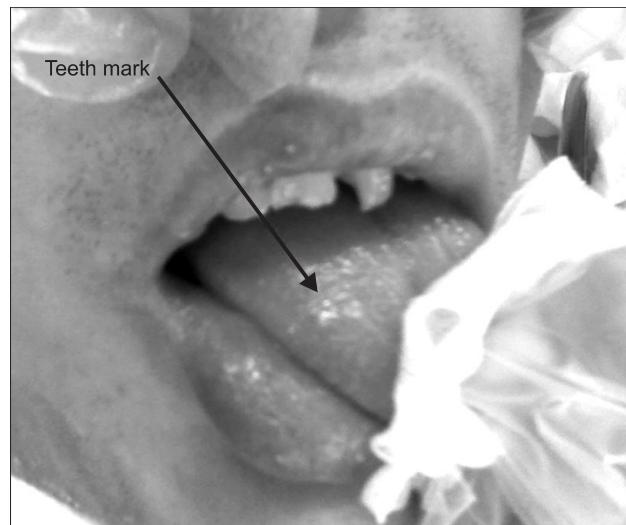


Fig. 1. Teeth mark of the tongue immediately after bite.

after rocuronium administration, and the protruding portion of the tongue was repositioned into the intraoral cavity. Because of inappropriate preparation for the wake-up test and need for emergent tongue decompression requiring deepening of anesthesia level, the proposed wake-up test could not be performed.

Within several seconds after decompression, the affected area became pinkish and seemed to be receiving adequate blood supply, and the edema reduced markedly after a manual massage with cold saline-soaked wet gauzes. Horizontal bite marks and a reddish erosive lesion were present on the anterior third of the tongue (Fig. 1). After application of ointment to the erosive area, a bite blocker was inserted. The time between identification and decompression was about five minutes, but the duration of biting could not be estimated. Because no swelling or deep laceration was detected, the humerus operation was started.

After the 280 min operation finished, the patient was sent to an ICU. The patient had no recollection of intraoperative events at follow-up examination and interview. However, the patient complained of mild tongue pain during rest, which was aggravated during movement. The bitten area was pinkish and well circulated, and no hematoma, deep laceration, or movement dysfunction were evident. The patient was discharged thirty days after operation without pain but with some scarring on the right anterolateral one third of the tongue. This scar persisted at seven months after discharge, but there were no other tongue complications.

Discussion

Reported airway complications in the prone position include

swelling of the tongue, accidental extubation, and obstruction of ventilating tube by secretions [8-10]. However, tongue bite is extremely rare during general anesthesia, especially in a patient with a tracheostomy.

If the degree of injury is limited to the mucosa, tongue irritation or sores usually heal within a few days. However, if it is severe, hemorrhage, hematoma, severe swelling, and airway obstruction may occur [1-3,7]. Furthermore, forceful biting can cause deformity [3]. Therefore, if the tongue is bitten during the perioperative period, the anesthesiologist should evaluate the severity of the injury. If the bite force is powerful enough, it can cause direct muscular and vascular injury and compromise circulation in the distal tongue. In addition, a bite can induce a vicious cycle of compression, congestion, swelling, and more compression.

Suggested biting mechanisms while in the prone position are as follows: an open mouth, tongue protrusion, edema, and eventual unconscious biting. The main reasons in this case were the neglected preoperative intraoral care and inadequate intraoperative wake-up test. We admittedly overlooked the possibility of tongue protrusion and concentrated only on securing ventilation. During the absence of intraoperative masseter muscle tone, the mandible tends to open, and the tongue can fall downward due to gravity. Although head extension increases the pharyngeal airway space [11], external mechanical force and tight dressing of the neck could reduce the size of the hypopharyngeal space, displace the tongue, and compromise venous return [3,12]. If edema is severe enough to cause contact between the tongue and upper and lower teeth, a bite might occur. Reported causes of macroglossia are direct compression of the lingual vein, fluid overload, seizure, and prolonged operation time in the prone position [1,3,7,12].

For an optimal wake-up test, the patient should be calm and conscious enough to obey commands. During preparation for the wake-up test, inspiratory activation of the genioglossus muscle increases the incidence of tongue protrusion [13,14]. If the patient is unconscious and regains masseter muscle power, unconscious mastication could cause a tongue bite. Therefore, during preparation for the wake-up test in the prone position, meticulous monitoring of neuromuscular function and depth of anesthesia are mandatory.

Manual insertion of a bite blocker or a complete denture in an edentulous patient increases intraoral cavity volume [6,7] and it could stop the aforementioned vicious cycle. If manual reduction is ineffective, immediate use of a neuromuscular blocking drug and deepening anesthesia should be considered [7]. These actions will definitely reduce biting force and convulsive cerebral activity if a seizure occurs. After decompression, an antiseptic mouth rinse and active mobilization with wet gauze can reduce swelling quickly and prevent drying and superficial

injury [1,2]. Analgesia and a numbing gel should be considered, but the effects of steroid and prophylactic antibiotics are controversial [1,3].

Careful preparation for the wake-up test is probably the most important requirement to prevent tongue bite in the prone position. To reduce the risk of tongue protrusion, pressure to the neck should be minimized, and in this context a neutral head position and the use of staying suture of the TT rather than gauze packing to the anterior neck are advantageous. Closing the mouth before operation reduces the likelihood of tongue protrusion in a tracheostomy patient [1]. Long length and hard material bite blocker can precipitate sublingual hematoma, laceration, and tongue edema [15]. Therefore, if a bite blocker is inserted preoperatively, it must be short and soft enough to prevent tongue and teeth trauma.

In summary, anesthesiologists need to be aware of the possibility of tongue protrusion when a patient with a tracheostomy is operated upon in the prone position. In particular, in tracheostomy patients, careful intraoral preparation is mandatory and bite blocker placement is preferred.

References

1. Saah D, Braverman I, Elidan J, Nageris B. Traumatic macroglossia. Ann Otol Rhinol Laryngol 1993; 102: 729-30.
2. Alvi A, Theodoropoulos PA. Self-inflicted traumatic macroglossia. J Laryngol Otol 1997; 111: 75-6.
3. Miura Y, Mimatsu K, Iwata H. Massive tongue swelling as a complication after spinal surgery. J Spinal Disord 1996; 9: 339-41.
4. Eroglu A, Solak M, Ozen I, Aynaci O. Stress hormones during the wake-up test in scoliosis surgery. J Clin Anesth 2003; 15: 15-8.
5. Rehberg S, Weber TP, Van Aken H, Theisen M, Ertmer C, Bröking K, et al. Sleep disturbance after posterior surgery with an intraoperative wake-up test using remifentanil. Anesthesiology 2008; 109: 629-41.
6. Tan WK, Liu EH, Thean HP. A clinical report about an unusual occurrence of post-anesthetic tongue swelling. J Prosthodont 2001; 10: 105-7.
7. Jakobson DJ, Einav S, Krichevsky I, Sprung CL, Sela MS. Traumatic macroglossia: a life-threatening complication. Crit Care Med 1999; 27: 1643-5.
8. Pivalizza EG, Katz J, Singh S, Liu W, McGraw-Wall BL. Massive macroglossia after posterior fossa surgery in the prone position. J Neurosurg Anesthesiol 1998; 10: 34-6.
9. Dingeman RS, Goumnerova LC, Goobie SM. The use of a laryngeal mask airway for emergent airway management in a prone child. Anesth Analg 2005; 100: 670-1.
10. Lin JA, Wong CS, Cherng CH. Unexpected blood clot-induced acute airway obstruction in a patient with inactive pulmonary tuberculosis during lumbar spine surgery in the prone position--a case report. Acta Anaesthesiol Taiwan 2005; 43: 93-7.
11. Muto T, Takeda S, Kanazawa M, Yamazaki A, Fujiwara Y, Mizoguchi I. The effect of head posture on the pharyngeal airway space (PAS). Int J Oral Maxillofac Surg 2002; 31: 579-83.

12. McGlinch BP, Martin DP, Volcheck GW, Carmichael SW. Tongue engorgement with prolonged use of the esophageal-tracheal Combitube. *Ann Emerg Med* 2004; 44: 320-2.
13. Cheng S, Butler JE, Gandevia SC, Bilston LE. Movement of the tongue during normal breathing in awake healthy humans. *J Physiol* 2008; 586: 4283-94.
14. Kairaitis K, Verma M, Fish V, Wheatley JR, Amis TC. Pharyngeal muscle contraction modifies peri-pharyngeal tissue pressure in rabbits. *Respir Physiol Neurobiol* 2009; 166: 95-101.
15. Deiner SG, Osborn IP. Prevention of airway injury during spine surgery: rethinking bite blocks. *J Neurosurg Anesthesiol* 2009; 21: 68-9.