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Don’t Bite Your Tongue.

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The Case

A 63-year-old woman with a past medical history of hypertension, osteoarthritis, migraine headaches, and daily smoking was admitted to a hospital for anterior cervical discectomy (levels C4-C7) and plating for cervical spinal stenosis under general anesthesia, using neuromonitoring modalities of somatosensory evoked potentials and motor evoked potentials.

The patient was placed under general anesthesia and intubated. The operation proceeded uneventfully and intraoperative neuromonitoring (somatosensory and motor evoked potentials) was used to help prevent spinal cord and peripheral nerve injury. During extubation after surgery, the anesthesia care provider noticed a large (approximately 4-5 cm) laceration on the underside of the patient’s tongue, with an associated hematoma. This finding was attributed to the fact that the inexperienced anesthesia care provider was unaware of the fact that motor evoked potentials can cause an anesthetized patient’s jaw to clench quite strongly, and thus had not placed a bite block in the patient's mouth.

The patient's tongue laceration resulted in pain and difficulty speaking. A consultation with an otorhinolaryngologist (ENT surgeon) was obtained. This surgeon recommended taking the patient back to the operating room so that her tongue laceration could be repaired. The patient was discharged the next day, with follow-up arranged by both the neurosurgery team and the otolaryngology team. She recovered uneventfully from her tongue laceration.

The Commentary

By Naileshni S. Singh, MD

Anesthesia providers must be knowledgeable not only about the anesthetic management of surgical procedures, but also about possible anesthetic, surgical and other operating room complications. Various ancillary monitoring modalities used during some complex surgeries may have significant effects on the

patient’s anatomy and physiology. In this case, lack of awareness regarding complications of transcranial electrical stimulation (TES) motor evoked potential monitoring contributed to morbidity. Masseteric muscle spasm probably caused the patient's tongue laceration, which required another surgical intervention.

Background

Oropharyngeal injuries are a known complication of airway management during procedures requiring anesthesia. Airway manipulation, including placement of an endotracheal tube or a supraglottic airway device, can cause injuries to lips, teeth, tongue, tonsils, and other oropharyngeal structures.[1-3] According to analyses of closed claims from the American Society of Anesthesiologists database,[4] 6-7% of claims against anesthesiology providers were for injuries during airway management, with the larynx being the most common site of injury, followed by the pharynx and the esophagus. Data from England demonstrate a similar percentage of claims related to airway management (8%).[5] Intubation-related injuries also impose a significant financial burden; one study of matched case and control patients estimated that these injuries increase hospital costs by 20% and length of stay by one day, on average.[6] One study from a Japanese teaching hospital reported a 20% incidence of lip injuries during endotracheal anesthesia managed by resident trainees, with lower rates of dental and pharyngeal injuries.[7] As described in one review, the “severity of oropharyngeal injury ranges from minor hematomas and mucosal lacerations that heal spontaneously to larger soft tissue defects that may require primary repair with suture.”[2] Some injuries result in excessive bleeding that may require reparative surgical intervention, or airway swelling that may cause respiratory compromise requiring prolonged intubation.

In addition to airway manipulation, other intraoperative factors may also contribute to oropharyngeal injuries. Several studies have analyzed rates of injury during surgical procedures utilizing TES motor evoked potential monitoring. Motor evoked potentials monitor the integrity of motor pathways during surgical procedures involving the brain, spine, or paraspinal structures. TES is applied through electrodes placed on the scalp, to avoid sensory contamination, while responses are recorded in peripheral muscle groups. Changes in motor evoked potentials can indicate an impending neurologic injury and should trigger an investigation of surgical, anesthetic, or physiologic explanations for signal changes.

This type of intraoperative monitoring may minimize the risk of paralysis, which is a catastrophic and potentially preventable complication of spinal surgery. However, during this form of neuromonitoring, jaw muscles can contract forcefully, causing bite injuries of oral structures such as the lip and tongue. The mechanisms for jaw contraction are variable and may include temporalis or masseter muscle contraction or trigeminal and corticobulbar tract activation. Bite injuries can lead to lingual hematomas, necrotic lesions, and airway obstruction, which may further complicate clinical care.

Tamkus and Rice reported 111 bite injuries during 17,273 operations, or an incidence of 0.63%.[8] Most of these injuries involved the tongue rather than the lips, and a few required surgical repairs with sutures (0.14%). Schwarz and colleagues reported a lower incidence of bite lacerations, mostly mild and involving the tongue, of 0.13% among 18,862 spine procedures.[9] Yata and colleagues reported that 12 of 186

patients undergoing TES presented with lip, oral, or tongue injuries; all but one of these patients fully recovered within 12 days.[10] Severe movement during stimulation (defined as “movement that greatly hindered surgery”) was linked to increased incidence of injury. A review of the published literature by MacDonald included 35 cases of tongue or lip lacerations with 1 mandibular fracture.[11] Otherwise, he found no neuropsychological effects (including headache or endocrine abnormalities) and only 2 minor scalp burns from intraoperative transcranial motor evoked potential monitoring.

Improving Patient Safety

The most widely recommended approach to prevent intraoperative bite injuries is to insert a bite block, often made of sterile gauze, into the mouth of the anesthetized patient to mechanically block the teeth from biting down on the lip or tongue. However, Tamkus and Rice found that misaligned dentition or missing teeth sometimes allowed the bite block to move out of position. They suggested the use of appropriately sized bite blocks (to prevent the teeth from closing on the tongue) that are carefully secured throughout general anesthesia.[8] In this patient’s case, a bite block might have mitigated the risk of oropharyngeal or lip injury during TES motor evoked potential monitoring. However, the bite block should be of adequate size and firmness, and anesthesia care providers should periodically check the integrity of the bite block throughout the operation.

Although much of the evidence and data on intraoperative facial and airway injuries related to anesthesia management is in anesthesia literature, other care providers also have a role in preventing injuries during surgical cases that use TES motor evoked potential monitoring. For example, communication between the surgical team and others in the operating room may remind the anesthesia care provider to insert a bite block. The technologist who does the TES motor evoked potential monitoring should also alert team members to the use and risks of this type of monitoring. Regardless of whether a bite block is used, the airway should be assessed during extubation for any evidence of damage. If significant sites of bleeding or lacerations are noted, the need for surgical repair should be assessed. Lastly, patients who will undergo this type of monitoring should be educated regarding potential risks and benefits so informed consent is part of the preoperative consent discussion.

Take Home Points

- Transcranial electrical stimulation motor evoked potential monitoring can cause bite injuries of the lips and oropharyngeal areas in anesthetized patients.
- Perioperative anesthesia care providers should be vigilant regarding risks when this type of monitoring is utilized, including informing patients prior to surgery.
- The risk of tongue injury can be reduced through the use of appropriately sized bite blocks (to prevent the teeth from closing on the tongue) that are carefully secured and periodically inspected throughout the procedure.
- While incidence of bite injuries is low, a small number of patients will require further interventions such as surgical repair.

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