Learning From Others:

A Case Report From the Anesthesia Incident Reporting System

Anesthesia Quality Institute
ANESTHESIA INCIDENT REPORTING SYSTEM (AIRS)

Detailed review of unusual cases is a cornerstone of anesthesiology education. Each month, the AQI-AIRS Steering Committee will abstract a case and provide a detailed discussion based on a submission to the national Anesthesia Incident Reporting System. Feedback regarding this item can be sent by email to ***r.dutton@asahq.org****. Report incidents to* ***www.aqiairs.org****.*

Case 2012-4: Bite Your Tongue!

A 45-year-old, 80-kg, ASA Physical Status 2 woman is scheduled for anterior C-spine fusion. She has had a one-week history of progressively worsening numbness and tingling in her fingers, and notes worsening of symptoms with severe neck extension. On physical exam, she has an MP II airway and is missing both upper and lower front teeth. The surgeon requests intraoperative neurophysiological monitoring.

Induction and intubation are straightforward, the tube is taped to the left side of the mouth, and a 4x4 rolled gauze pad is placed on the right side of the mouth to serve as a bite block. Neurophysiological monitoring electrodes are attached to the patient.

The case is uncomplicated. During pre-emergence, a small amount of blood is noted on the bite block. Suctioning reveals more blood in the mouth, and an ENT consultation is obtained. Evaluation of the oropharynx under anesthesia reveals a 3 cm laceration of the left inferior tongue. Five absorbable sutures are placed. Subsequent emergence and extubation are uneventful. On POD #1, the patient notes tongue soreness and difficulty swallowing, but is discharged from the hospital on schedule and recovers uneventfully.

Background: Motor-evoked potential (MEP) monitoring is a well-established and effective strategy for monitoring the integrity of nerve pathways during spine surgery (Macdonald, 2002). Although specific approaches differ, MEP monitoring generally involves subcutaneous electrodes inserted into the scalp that apply between 300-1000V and generate up to 1500 mA bursts across cortical areas (Macdonald, 2006). Such high-intensity stimulation then produces direct and indirect excitation of corticospinal tract neurons, and ultimately stimulation of the distal muscle.

Motor-evoked potential monitoring during spine surgery is generally safe. However, large-scale retrospective reviews (MacDonald, 2002; Schwartz, 2011) note rare electricity-related complications such as seizures, scalp burns and cardiac arrhythmias. Assessment of motor response requires the avoidance of muscle relaxation, which in turn requires increased vigilance to anesthetic depth to prevent patient movement during delicate portions of the surgery. The tongue laceration in this case is an example of the most common complication of motor-evoked potential monitoring. The incidence of tongue and lip injuries (due to evoked-potential-induced jaw muscle activity) is estimated at 0.14 to 0.19 percent (Macdonald, 2002; Schwartz, 2011), and case reports of oral airway trauma due to muscle activity have ranged from lip and tongue lacerations to mandibular fracture. A minority of lacerations require otolaryngologic consultation.

Cervical spine surgeries are at particular risk because of C3-4 stimulation, which directly activates the temporalis muscle (Deiner, 2009). Another factor is prone positioning, which may predispose to tongue swelling and increase the chance of the tongue being caught between the teeth (Lam, 2000). As in this case, most clinicians will prophylactically place a bite block to separate upper and lower teeth from each other and to keep the tongue from protruding between the upper and lower jaw. Such a strategy, however, does not prevent lacerations or other oropharyngeal injury. Numerous case reports of bite block dislodgement, movement of the tongue between the teeth and injury despite bite block placement exist (Deiner, 2009; Schwartz, 2011).

Although no randomized trials exist regarding the type of bite block and how it should be placed, most case reports and reviews recommend a block sufficiently soft to prevent

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dental trauma from repeated biting, but hard enough to not deteriorate under the force of a human bite. Rigid bite blocks are infrequently used, in part due to prolonged pressure on the posterior tongue, causing lingual nerve injury. While clinical recommendations for soft bite blocks (often "hand-made" using rolled up 4x4 gauze pads) exist (Drummond, 1999; Chaturvedi, 2009), it should be noted that reports of tongue injury, lingual nerve injury, macroglossia, lingual hematomas and airway swelling sufficient to warrant emergent tracheostomy have all been observed (Lam, 2000; Deiner, 2009; Kawaguchi, 1995; Ellis, 1975). Some clinicians report success with commercial products originally intended for dental care (Deiner, 2009). These devices have a rigid shaft that allows more precise positioning of the bite block. In this case, where missing front teeth clearly point to a posterior bite injury involving the molars, such a device may have had more efficacy. Frequently checking the position of the bite block and tongue to verify that the tongue remains protected is also recommended, but may be difficult because of the close proximity to the surgical field.

Unlike in this case, most tongue and lip lacerations are self-limited. All large-scale trials report a low (<20 percent) incidence of surgical intervention and no lasting sequelae.

Key Points

- The use of motor-evoked potentials can predispose to tongue and lip lacerations due to motor-evoked biting activity in anesthetized patients.
- The overall incidence of this complication is rare and ranges from 0.14 percent to 0.19 percent in large-scale retrospective studies. Tongue and lip lacerations are the most common complication of motor-evoked potential monitoring.
- Risk factors for this complication include prone positioning (which may increase tongue size) and C3-C4 focused stimulation, which directly activates the temporalis muscle.
- Although no randomized trials exist regarding preventative strategies, most clinicians place a bite block prior to the start of monitoring to prevent teeth occlusion. Because rigid bite blocks may damage teeth or cause pressure injury to oropharyngeal structures, soft bite blocks are recommended.
- The bite block should be placed to prevent occlusion by both front teeth and molars and to keep the tongue in the middle of the mouth. Note that soft bite blocks may also cause pressure injury. Case reports of tongue and airway swelling following spine surgery suggest that care should be taken on extubation to avoid upper-airway occlusion.
- Shifts in positioning may occur during the case. Ongoing vigilance to bite block placement, head position and eye pressure is recommended.

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