

Rare Case of Temporomandibular Joint Dislocation during Spinal Surgery with Neuromonitoring in the Prone Position

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Abstract

Temporomandibular Joint (TMJ) dislocation during spinal surgery is exceedingly rare, particularly in pediatric patients. We report a 16-year-old female who developed bilateral TMJ dislocation following posterior spinal fusion performed in the prone position with intraoperative neuromonitoring. Excessive masseter muscle contraction during motor-evoked potential stimulation was suspected to have contributed to the dislocation. Prompt recognition and manual reduction resulted in complete recovery without sequelae. This case highlights the importance of careful communication with neuromonitoring teams, optimized stimulation settings, and postoperative vigilance to prevent and promptly manage TMJ complications associated with motor-evoked potential monitoring.

Keywords

Temporomandibular Joint Dislocation, Motor-Evoked Potentials, Intraoperative Neuromonitoring, Prone Position, Spinal Surgery, Pediatric Anesthesia

1. Introduction

Intraoperative neuromonitoring (IONM), including motor-evoked potentials (MEPs) and somatosensory-evoked potentials (SSEPs), is widely used during spine and brain surgery to help detect and prevent neurologic injury in real time [1]. MEP

stimulation can cause forceful, involuntary muscle contractions [2], and prone positioning for extended spinal procedures adds further risk to musculoskeletal and craniofacial structures [3].

We report a rare case of temporomandibular dislocation during spinal surgery with neuromonitoring in the prone position, suspected to be associated with excessive masseter muscle contraction during MEP monitoring.

2. Case Report

Our patient was a 16-year-old female with no significant past medical or surgical history of idiopathic scoliosis who presented for posterior spinal fusion to correct for scoliosis. She had no history of temporomandibular joint symptoms, joint hypermobility, or prior dislocation, which was confirmed during the plastic surgery consultation. At baseline, she denied back pain, numbness, tingling, or bowel/bladder issues. On imaging, she was found to have a 70° right thoracic curvature and 36° left lumbar curvature. Risser 4. Her MRI revealed no intraspinal abnormalities. Her PFTs showed a restrictive pattern, with an FVC of 66 and FEV1 of 67. She underwent spinal fusion under general anesthesia, and the intraoperative course was uneventful. She was induced with propofol and remifentanyl and underwent straightforward intubation with a 7.0 endotracheal tube. She was positioned prone with the head in a neutral position on a foam prone pillow, with the eyes and nose kept free of pressure; no jaw movement or pressure on the mandible was noted during the case. The operation lasted from approximately 0730 to 1300 (5.5 hours). Intraoperatively, she received total intravenous anesthesia with infusions of propofol, ketamine, remifentanyl, and tranexamic acid, along with multimodal analgesia with Tylenol and Toradol. Transcranial motor-evoked potentials were monitored throughout the case. The first two stimulations were delivered at 325 V, after which the intensity was reduced to 300 V for the remaining nine stimulations, given periodically as clinically indicated. Motor-evoked potentials remained stable and intact throughout the case, with no signal loss. The intraoperative course was uneventful, and the patient was successfully extubated. On awakening in the recovery room, the patient reported jaw pain and difficulty closing the jaw.

The patient exhibited minimal facial swelling, bilateral tenderness over the temporomandibular joint (TMJ), and a locked open jaw on physical examination. A consultation with a plastic surgeon confirmed the diagnosis of TMJ dislocation. No additional imaging was performed. Management was guided by clinical examination alone. Fracture was considered unlikely given the absence of trauma, and following reduction the patient regained normal occlusion and full mandibular range of motion, further supporting the clinical diagnosis without imaging. The plastic surgeon successfully reduced the dislocation manually, and the patient was advised to follow a soft diet for two weeks. At the two-week follow-up in the plastic surgery clinic, the patient progressed to a regular diet without further intervention or complications.

3. Discussion

3.1. Review of Similar Cases

Complications associated with neuromonitoring and prone positioning during spinal surgeries have been well documented in case reports and studies. We present the first case of temporomandibular joint (TMJ) dislocation that occurred in the prone position during neuromonitoring in a pediatric patient. Although TMJ dislocation during surgery in the prone position is rare, it has been documented in at least one other case.

A study by Munireddy *et al.* [4] described a similar incident involving a 76-year-old male who underwent surgery in the prone position to repair an atlanto-axial dislocation that also required neuromonitoring. The team hypothesized that overstimulation of the masseter muscle during motor-evoked potential (MEP) recording led to bilateral TMJ dislocation. A plastic surgeon successfully reduced the dislocation manually, but the patient required surgical revision because of improper screw placement.

For the second surgery, this patient was nasally intubated using a fiber-optic bronchoscope and a stabilization brace was applied around the face to secure the mandible. The brace remained in place for several hours after the extubation. This preventative approach proved effective, and a second surgery was completed without TMJ dislocation.

This case highlights the risk of TMJ dislocation during prolonged surgery in the prone position with neuromonitoring. It also emphasizes the importance of employing preventive strategies, such as mandibular stabilization, to minimize this risk in patients susceptible to such complications.

3.2. Role of Neuromonitoring

Neuromonitoring is essential in modern spinal surgery, as it allows the surgical team to protect neural structures from injury. By continuously recording sensory and motor evoked potentials, neuromonitoring enables the early detection of nerve compromise and guides intraoperative adjustments. Studies have shown that MEPs and SSEPs are invaluable for preventing postoperative neurological deficits [1] [3]-[5]. According to Ghatol *et al.*, integrating neuromonitoring into spine surgery significantly reduces the incidence of permanent nerve damage, although it carries the risk of certain complications [6]. These complications can be related to electrical current, including burns or seizures, or to forceful muscle contractions, including tongue laceration, tooth fracture, or mandibular fracture.

3.3. TMJ Dislocation: Risks and Management

TMJ dislocation is rare but can occur in patients when the jaw is placed under excessive force or awkward positioning. Common symptoms of TMJ dislocation include pain, difficulty closing the mouth, difficulty eating, facial asymmetry, and facial swelling. Chronic untreated TMJ dislocation can result in permanent fibrotic changes within the TMJ space [7]. Management typically involves manual

reduction by a skilled clinician followed by observation. As demonstrated in this case, early identification and prompt dislocation reduction can prevent long-term complications. Additional imaging and surgical intervention may be required in severe or recurrent cases.

3.4. Proposed Mechanism

Transcranial MEP stimulation activates not only the corticospinal tracts but also the corticobulbar tracts and trigeminal nerve, producing sudden, involuntary contraction of the masticatory muscles. The masseter and temporalis muscles primarily close the jaw, while MEP stimulation also engages the lateral pterygoid muscle, which draws the mandible forward and laterally. Intense, asynchronous contraction of these muscles can generate abnormal shear forces across the joint. During prone spinal surgery, facial support devices such as foam masks or prone pillows can place external pressure on the mandible, and the neck flexion often required for surgical exposure further alters head and neck biomechanics; a sudden, forceful MEP-induced contraction against this external resistance and altered alignment may increase the risk of forcing the mandibular condyle out of the joint space.

3.5. Alternative Mechanism Considered

TMJ dislocation can also occur during emergence from general anesthesia, typically related to wide mouth opening at extubation. Several features of this case argue against that mechanism here. Extubation was performed gently by an experienced anesthesiologist, with no abnormal clicking, resistance, or other findings suggestive of joint injury noted at that time, and the patient had no pre-existing history of chronic or recurrent TMJ dislocation that would predispose her to displacement with routine mouth opening. In contrast, she received eleven transcranial MEP stimulations over the course of the surgery, the first two at 325 V and the remaining nine at 300 V, providing repeated opportunities for forceful, involuntary masticatory muscle contraction against externally supported, flexed-neck positioning. While the precise temporal relationship between a specific stimulation and the onset of dislocation cannot be established retrospectively, we believe MEP-induced masseter contraction is the more probable mechanism in this case.

3.6. Prevention and Management Considerations

Reasonable, case-based precautions to reduce the risk of TMJ dislocation during prone spinal surgery with neuromonitoring include close communication with the neuromonitoring team to optimize MEP stimulation settings, careful attention to head and facial positioning and padding, and heightened perioperative awareness of this complication among surgical and anesthesia teams; none of these measures has established evidence of effectiveness specific to this complication. When TMJ dislocation does occur, the evidence-supported approach is prompt recognition, through vigilance for jaw pain, malocclusion, or restricted mouth

opening, followed by manual reduction performed by a facial plastic or maxillo-facial surgeon [8]. Imaging is not routinely required unless fracture or recurrent dislocation is suspected. Post-reduction, a soft or liquid diet is typically recommended to reduce joint strain and support healing, as in the present case.

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Author Contributions

Conceptualization, S. R. G. and K. N. R.; methodology, S. R. G.; validation, S. R. G., A. M. R., and M. S. S.; formal analysis, J. W.; investigation, J. W. and K. N. R.; resources, S. T. M. and B. M. R.; data curation, J. W.; writing—original draft preparation, J. W.; writing—review and editing, K. N. R., S. R. G., S. T. M., B. M. R., A. M. R., and M. S. S.; visualization, J. W.; supervision, S. R. G.; project administration, S. R. G.; funding acquisition, A. M. R. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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