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Case Report

Intraoperative Neuromonitoring: Case Report on Muscle Twitching-Induced Injuries

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ABSTRACT

During surgical procedures, intraoperative neuromonitoring (IONM) allows for real-time assessment of neural structures like the brain, spinal cord, and peripheral nerves. It enables continuous monitoring and early detection of potential damage during surgery. Adequate neuromonitoring is crucial in anesthesiology to maintain optimal brain function and neurological status during procedures. Muscle twitching during IONM is often associated with electromyography (EMG) or motor-evoked potentials (MEPs) and can indicate nerve activation or irritation. Two cases of patients undergoing posterior spinal fusion procedures experienced complications related to muscle twitching during surgery. In the first case, a 45-year-old male patient experienced damage to his lower lips due to muscle twitching in neuromonitoring. In the second case, a 36-year-old man suffered a tongue injury because a mouth guard shifted during surgery. IONM is a crucial component of modern surgical practices, but the cases presented highlight the potential for muscle twitching to cause patient injuries. Surgical teams must prioritize communication and the implementation of protective measures to safeguard against such occurrences. Future research may provide more comprehensive guidelines to enhance patient safety during IONM.

Introduction

During surgical procedures, intraoperative neuromonitoring (IONM) provides real-time assessment of the functional status of neural structures, such as the brain, spinal cord, and peripheral nerves. This technique allows for continuous monitoring and early detection of any potential damage to these critical structures during surgery [1]. Adequate neuromonitoring is essential in anesthesiologic practice because many anesthetic agents primarily affect the brain. Monitoring neural activity and responses allows anesthesiologists to maintain the patient's brain function and overall neurological status optimally during surgery or other procedures [2]. Muscle twitching during IONM is often associated with electromyography (EMG) or motor-evoked potentials (MEPs). This twitching is usually a sign of nerve activation or irritation.

In this case report, we aim to describe two cases that underwent IONM and experienced muscle twitching, resulting in injuries to their lips and tongue.

Case Report

Case 1

The hospital admitted a 45-year-old male patient for a posterior spinal fusion procedure, despite his

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insignificant past medical and drug history. His neurological physical examinations were normal. His other physical examinations were otherwise insignificant. We carried out a comprehensive set of laboratory investigations before the operation, all of which yielded normal results (Table 1).

He underwent general anesthesia (GA) induced by Propofol. Besides, he received muscle relaxants. After positioning and starting the surgery, no muscle relaxant was prescribed due to neuromuscular monitoring. We positioned the patient prone, intubated him, and inserted an oral airway. Cranial neurophysiologic monitoring was conducted during the operation, and it was completed without any peri-operative complications. After the surgery, we repositioned the patient to the supine position. Subsequent examination revealed that muscle twitching resulting from neuromonitoring had caused damage to his lower lip, as depicted in (Figure 1).

Case 2

A 36-year-old man with no significant medical history was admitted to the hospital for a posterior spinal fusion procedure. His physical examinations were normal. We conducted a comprehensive laboratory workup before the operation, but the results were insignificant. During the surgery, we placed a mouth guard to protect his tongue and administered general anesthesia (Propofol) along with muscle relaxants. Following the surgery, we discovered that muscle twitching caused the guard to shift, resulting in damage to his tongue.

Table 1- Shows the details of laboratory investigations

Laboratory investigations	First case	Second case	Normal range
White blood cell	8.796*10^3	6.54*10^3	4000-12000
Neutrophil%	68%	54%	50-75%
Lymphocyte %	25%	36%	20-60%
Eosinophil %	3.9%	1%	1-5%
Red blood cell	3.85*10^6	4.40*10^6	3.5-5.2 *10^6
Hemoglobin	13.5	134.5	12-16
Platelet	3.67*10^5	4*10^5	150,000-400,000
Potassium	3.7	3.9	3.5-5.2
Sodium	142	138	135-145
Calcium	9.5	9	8.5-10.2
Magnesium	1.9	2	1.7-2.2

Figure 1- Shows the damage to the patient's lower lip due to muscle twitching.

Discussion

In this case report, we described two patients who underwent neuromonitoring during surgery, and despite the administration of muscle relaxants and anesthetic agents, they developed muscle twitching that caused injuries. Both cases highlight the need for careful positioning and protective measures to mitigate risks associated with muscle twitching. These incidents stress the importance of thorough communication within the surgical team regarding the implications of neuromonitoring and the proactive steps necessary to protect patients from inadvertent injuries. Neurological injury is a devastating complication with significant social, medical, and economic implications [3].

During surgery, IONM provides real-time assessment of the function and integrity of neurons. The utilization of IONM has been shown to reduce the occurrence of neurological complications and deficits.

One phenomenon commonly observed during IONM is muscle twitching, which serves as a visible sign of neuromuscular activity, particularly when using modalities such as EMG or MEPs. Muscle twitching, while benign in most cases, can provide important diagnostic feedback, aiding in the prevention of permanent neurological damage [4-5].

Muscle twitching during neuro-monitoring arises from the electrical stimulation of motor neurons or nerve roots, leading to the contraction of the innervated muscles. During MEP monitoring, transcranial or direct cortical electrodes are used to apply electrical stimulation. This turns on the corticospinal tract. The generated action potentials propagate along motor neurons to peripheral muscles, causing the visible twitch [6-8].

Studies have shown that the majority of anesthetic agents, depending on their dosage, produce a reduction in synaptic activity. Studies have demonstrated that all anesthetic agents have an influence on MEP muscle responses and cortical potentials [9].

Due to the administration of anesthetic agents and muscle relaxants, muscle twitches rarely result in injury. However, in the cases presented in this report, despite taking precautions and using muscle relaxants, we observed severe muscle twitching that resulted in injuries.

Conclusion

In conclusion, it is crucial to consider muscle twitching during neuromonitoring. Failure to provide adequate guards, muscle relaxants, and anesthetics can lead to more harmful side effects. Furthermore, thorough patient monitoring during surgery is essential to promptly recognize and address any potential complications, thereby minimizing harm.

In summary, IONM is crucial for protecting neural function during spinal surgeries. This case report highlights unintended injuries to the lower lip and tongue in two patients due to muscle twitching during IONM. While IONM improves surgical safety by providing real-time assessments of neural integrity, anesthesiologists and surgical teams must remain vigilant about potential neuromuscular complications.

Data availability

Data is available on request due to privacy/ethical restrictions.

Ethical considerations

The patient provided written informed consent for the publication of the case and images. This study was ethically approved by the ethical committee of Shahid Beheshti University of Medical Sciences (date of approval: 16/08/2023).

Consent

Written consent was obtained from the patient. We thoroughly explained the entire examination process and the purpose of the article.

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