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Case Report and Review of the Literature

Tongue Bite Injury Resulting from Intra-operative Neuromonitoring during Posterior Scoliosis Corrective Surgery Not an Uncommon Complication: Case Report and Literature Review

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ABSTRACT

Tongue bite injuries (TBI) resulting from the use of intra-operative neuromonitoring (IONM) during spinal surgeries are not as uncommon a complication as previously thought, especially when using transcranial motor evoked potential (TcMEP). The incidence of bite injuries ranged from 0.14% to 0.63%, with TBI occurring four times more frequently than lip injuries, and of these, 0.15% of tongue lacerations required surgical repair. Through our literature search, we discovered that these injuries have never been reported in Malaysia; additionally, this is the first incidence encountered by our team. We are reporting a 20-year-old male who sustained a TBI during posterior scoliosis corrective surgery while using TcMEP. We report on its management and reviewed literatures to explain the causes and the recommendations for the prevention of this injury. In conclusion, TBI is an unpleasant complication in spinal surgery related to the use of IONM. Safety precautions need to be taken during surgical preparation, and we propose using two to three soft bite blocks (SBB) to aid in reducing the rate of this complication.

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Introduction

TBI resulting from the use of intraoperative neuromonitoring (IONM) during spinal surgeries are not as uncommon a complication as previously thought, especially when using transcranial motor evoked potential (TcMEP) [1]. Bite injuries were the most common non-neurologic complications in spinal surgery when using TcMEP, with incidence ranging from 0.14% to 0.63% [1-2]. Incidence of TBI was four times more frequent than lip injury, with 0.15% of tongue lacerations requiring surgical repair [2]. Literature search revealed these injuries have never been reported in Malaysia. In this case report, we highlight this type of injury and increase awareness of additional safety precautions needed during TcMEP monitoring.

Case Report

We report a 20-year-old male who presented with progressive spinal deformity noticed since 10-years-old. Physical examination revealed

leveled and symmetrical shoulders and pelvis, right thoracic hump, left lumbar prominence, the plumb line fell 1cm left of the gluteal cleft, and clinically, his neurology was intact. His major thoracic curve's Cobb's angle was 60 degrees. Adolescent Idiopathic Scoliosis was diagnosed, and corrective spinal surgery was planned, using multimodal IONM consisting of TcMEP, somatosensory evoked potential and free running electromyography.

Posterior spinal instrumentation with pedicular screws from T3 to L4 vertebrae was performed in prone position, with periodic use of high-voltage intra-operative TcMEP spinal cord monitoring. The duration of surgery was five hours and the estimated blood loss was 1.5litres. After surgery, upon repositioning from prone to supine, it was noticed that the patient's mouth was blood-stained. Careful examination of the oral cavity revealed two lacerations, a 1.5cm laceration on the dorsal surface and a 3cm laceration on the undersurface of the tongue (Figure 1). Surgical repair of these lacerations with VICRYL® 4/0 was done by the oral and maxillofacial surgeon before anaesthesia reversal. An antibiotic

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combination of Cefuroxime and Metronidazole was prescribed for 5 days. The patient was kept on a soft and cold diet, and regular DifflamTM gargle and chlorhexidine mouthwash were prescribed for one week to maintain good oral hygiene. Postoperatively, the patient experienced tongue pain during oral intake for three days. He was discharged well at day 5 post-surgery, the tongue sutures were removed at day 7 post-surgery and at six weeks post-surgery, the tongue laceration had healed well and no long-term complications were reported.



Figure 1: Tongue laceration was sutured with VICRYL® 4/0.

Discussion

There has been an increasing trend in the use of IONM during spinal surgery and this is related to safer surgeries and a greater role of medico-legal considerations [3]. IONM-related adverse events increased too, in keeping with this trend. This is the first TBI encountered by our team. To our knowledge, it has never been reported in Malaysia. Bite injuries are considered a rare complication in some literature, which makes them under-recognized [2, 4]. Bite injuries were emphasized by Yoshida *et al.* in recent literature as the most common non-neurologic complication of TcMEP monitoring [2].

TcMEP-induced jaw clenching occurs through three possible mechanisms: 1) direct temporalis and masseter muscle activation (especially with laterally located scalp electrodes), 2) activation of trigeminal nerve motor fibers due to deep penetrating current (which may occur with high-intensity stimulation and widely spaced electrodes), and 3) corticobulbar tract activation [1]. In our center, we use the C3-C4 scalp locations by default in our protocol (greater inter-electrode distance) to optimize the TcMEP responses. Widely spaced electrodes increases the strength of stimulation and direct activation of temporalis and corticobulbar pathways results in stronger jaw contractions [1]. Long surgical time in prone position causes tongue oedema and gravity-induced protrusion, which further triggers the occurrence of the injury [4]. Surgical repair was needed in our patient in view of the wide gaping wound and severe bleeding from the laceration. The tongue is a very vascularized organ with great healing potential; thus, a small laceration wound would heal without surgical intervention

[1]. Our experience from this incident caused unnecessary stress to the surgeon, the patient as well as the patient's parents. We never routinely discussed this complication during the pre-op, surgical consent as we have never encountered such an incident. When we explained the tongue injury and the need to take surgical consent for repair from the parents, it further elevated the parents' anxiety level.

There is currently no clear recommendation from evidence-based studies to prevent TBI when using TcMEP [5]. The use of one soft bite block (SBB), which is made using three standard anaesthetic gauzes rolled together, is the common practice of our anaesthetic team at our center. This SBB is placed between the incisor teeth in the anterior part of the oral cavity. This is probably not an ideal position as the sides of the tongue remain unprotected [5]. Furthermore, it may displace during TcMEP stimulation with jaw movement and gravity in prone position. This SBB placed anteriorly may also push the tongue laterally. Most literature has recommended two to three SBB, either via a "do-it-yourself" method or using commercially available ones [4-5]. These SBB are placed between the upper and lower molar teeth on each side. They need to be large enough to prevent contact between the teeth and tongue but should not cause excessive mouth opening. The third bite block is placed in the midline between the incisors and next to the endotracheal tube to prevent tongue protrusion and protect the endotracheal tube. The SBB should have long tails taped to the chin and held in place with two large transparent film dressings on both sides of the face [5]. Hard plastic bite blocks are not recommended as they increase the risk of tooth injury [4].

Lack of knowledge among anaesthetists in handling patients' that need TcMEP, led to inadequate precautions taken for the case. Surgeons who use TcMEP must always remind their anaesthetist colleagues to take special precautions and double-check the tongue position before surgery. Regular inspection of the oral cavity is impractical due to the sterile drapes and prone position. Therefore, we need to ensure the SBB and the endotracheal tube are well secured before positioning. We recommend that TBI be stated in the general anaesthesia-related complication section (verbal and written consent) for spine surgery that uses IONM.

In conclusion, TBI was a distressing complication for both the patient and the medical team. This complication is not uncommon in spinal surgery following the increasing use of IONM. We recommend that precautions need to be taken during surgical preparation by using two to three SBBs to reduce the occurrence rate.

Conflicts of Interest

None.

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