

SHORT SCIENTIFIC REPORT

Can tongue laceration caused by intraoperative neuromonitoring during spinal surgery in the prone position be prevented?

Assessment of a new management protocol which includes placement of a silicone dental guard

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Spinal surgery in the prone positions has increased in recent years, with a surge in the use of intraoperative neuromonitoring.¹ However, this monitoring technique has its own potential hazards, for example, tongue laceration because of patients biting themselves as a result of spinal nerve stimulation. Jaw muscle contractions during these stimuli are the leading cause of this injury. Several potential predisposing causes are present: the offset of the neuromuscular block; the prone position whereby gravity results in the tongue falling forward between the teeth; hinderance of venous and lymphatic drainage will aggravate tongue swelling, even with minimal trauma. Thus, in this report, we retrospectively reviewed the previous year's cases to assess the incidence of intraoperative monitoring-related complications and compared these with prospectively collected data after introduction of a management protocol, which included the use of an athlete's dental guard.

Data from all patients at our institution who had intraoperative neural monitoring during vertebral surgery in the prone position between December 2019 and December 2021 were included. Group I are patients from the 1-year period before our new protocol was introduced: after intubation, all group I patients had their oropharynx and mouth packed with gauze to

prevent kinking of and biting on the endotracheal tube.² Group II includes data from patients for the first year after our new protocol took effect, where, on top of gauze packing, an athlete's silicone dental guard was inserted (with size selection and correct fit ensured before anaesthesia induction). The dental guard was removed for induction, and after induction, it was carefully replaced after the oropharynx and mouth were packed (Fig. 1). In addition, after tracheal extubation, the oropharynx and tongue of all patients in group II were visually examined to identify and assess possible orolingual injuries.

All patients in both groups had same neurostimulation protocol. All relevant patient characteristics and perioperative data were collected and assessed in terms of complications.

In group I, 100 patients and in group II, 60 patients were assessed. The smaller number of patients in group II was the result of COVID-19 restrictions. Table 1 summarises the important data and complications observed. In group I, two patients had severe tongue lacerations, one of which required suturing by an otolaryngologist at the end of the procedure (Fig. 2). In both patients, the lacerations, detected during tracheal extubation, made airway management and extubation more difficult, with a

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FIGURE 1 (A) Ensuring the correct size and fit of the dental guard before induction of anaesthesia and (B) ensuring a meticulous placement of the dental guard after anaesthesia induction and packing of the oropharynx.



subsequent need for oral wound care, pain management, and solving oral feeding problems. These postoperative problems resulted in extended hospitalisation.

In group II, no patients had any bite-related injuries.

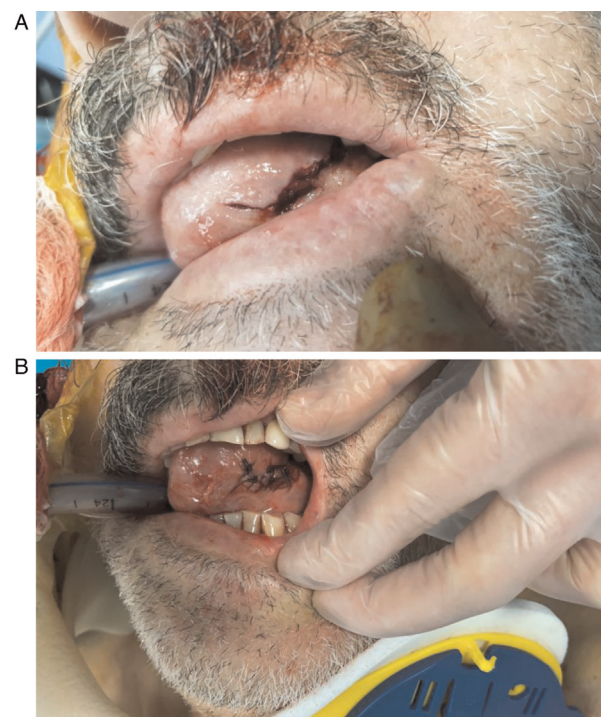
Prone positioning for spinal surgery is associated with several severe complications such as haemodynamic disturbance, ophthalmic injury, nerve compression and pressure ulcers.³ The prone position is also a risk factor

Table 1 Comparison of patient data in group I (before) and group II (after) introduction of an enhanced management protocol for tongue laceration

	Group I (n = 100)	Group II (n = 60)
Age (year)	57.3 ± 14	55.7 ± 15.6
Sex (male/female)	54/46	20/40
ASA physical status (1/2/3)	35/40/25	18/26/16
BMI (kg m ⁻²)	27.2 ± 5.2	28.1 ± 5.6
Surgical procedure		
Tumour	26	13
Stabilisation	74	47
Surgical level		
Thoracic	45	16
Lumbar	51	41
Sacral	4	3
Duration of surgery (min)	195.2 ± 63.4	209 ± 79.4
Tongue laceration	2	0
Haematoma	1	0
Suturation	1	0

Data are expressed as mean ± SD, and number.

FIGURE 2 (A) Tongue laceration and (B) Tongue after suturing.



for macroglossia because of neck flexion and lingual vein congestion.⁴ The neuromonitoring process can result in strong contractions of the biting muscles, with the potential for tongue injury.⁵ These biting-induced oral injuries are rare but concerning complications of the prone position with neuromonitoring.⁶

These injuries may require emergency surgical intervention and delay tracheal extubation. Tooth damage, mandibular fracture, and even bite damage to the endotracheal tube (which then requires replacement as an emergency) are described,⁵ although the incidence of these complications in group I seems to be low, it is possible that minor bruising or injuries with minimal bleeding may have been overlooked. Due to the risk of serious events, several approaches (e.g. the use of bite blocks, positioning of the head) have been described in the literature to prevent intraoral injuries during the use of neuromonitoring in the prone position.⁷

To minimise complications, we introduced the placement of a silicone athlete's dental guard, with the appropriate size selected while the patient was awake. As demonstrated in Table 1, since including this dental guard in our anaesthetic management, we have not encountered a single complication. However, in this short report, patient-specific factors that may affect the frequency of the complications (patient's BMI, dental health, coagulation status), are not discussed, and data on secondary outcomes, such as intubation conditions and patient satisfaction, were not collected.

We believe that preoperative verification that the dental guard fits properly while the patient is awake and

ensuring its correct placement after induction of anaesthesia, and oropharyngeal packing can prevent orolingual injuries and related complications.

In all patients operated on in the prone position with intraoperative neuromonitoring, measures to prevent intra-oral injuries, as well as a proper and detailed postoperative inspection before tracheal extubation should be performed.

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