Prevention of bite injuries with novel mouthpiece during intraoperative transcranial electric motor- evoked potential monitoring in spinal surgery

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Background and Goal pf Study

- Transcranial motor-evoked potential monitoring (Tc-MEP) causes bite injuries to the oral cavity including the endotracheal tube [1].
- We developed a mouthpiece to prevent these injuries, and reported its efficacy and safety [2] (Table 1). After a pilot study, we started to use the mouthpiece routinely for elective cases.
- The purpose of this study was to examine the efficacy of the mouthpiece in clinical setting.

Materials and Methods

- After obtaining approval from our institutional review board, patients undergoing spinal surgery under Tc-MEP in our institute during 2013-2016 were enrolled.
- Patients were fitted with a bespoke vinyl-silicone mouthpieces by dentists before surgery (Fig. 1). On induction of general anesthesia, the mouthpiece was attached to the upper and lower dental arches (Fig. 5). A lateral cervical X-ray was taken at the end of surgery to examine the condition of the endotracheal tube (Fig. 6, 7).
- Deformation of endotracheal tube was defined as the ratio of inside diameters of the most stenosed and normal part of endotracheal tube less than 90% (Fig. 2).
- The incidence of endotracheal tube deformation was compared with the patients in whom a conventional gauze bite block were used.

Fig. 1. Preparation of a bespoke vinyl-silicone mouthpieces 1 day before operation

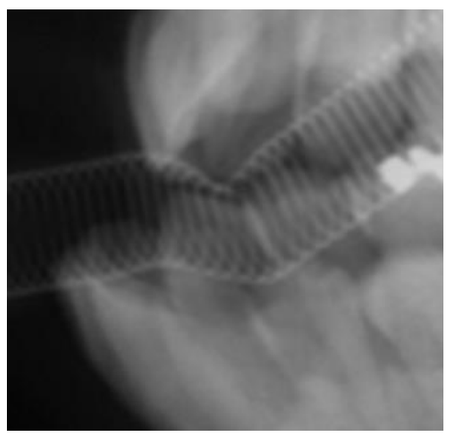

Fig. 2. Measurement and definition of endotracheal tube deformation

Table 1. Complication associated with mouthpiece

	Pre-operation (n=19)	POD 1-2 (n=15)
oral injury requires treatment	0/0	0/2
dental injury	2	2
dental luxation (I/II/III)	7 (2/5/2)	7 (2/5/2)
denture damage	2	2
jaw joint damage	0	0
Pain in mouth opening	0	0
mouth opening (mm)	47.0±4.4	42.0±7.7

"from Oshita et.al. [2]

"Before operation"

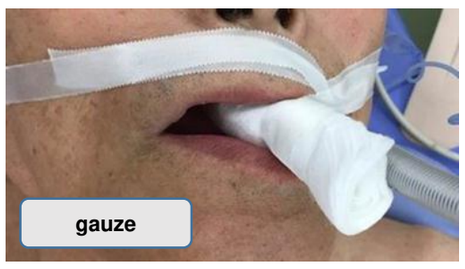

Fig. 3. bite block made of gauze

Fig. 4. custom made mouthpiece

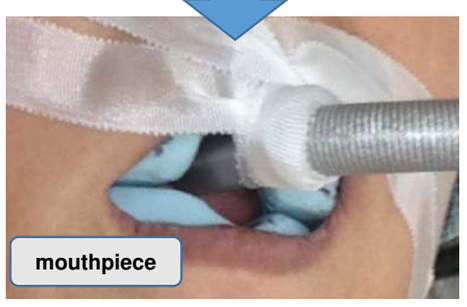

Fig. 5. mouthpiece in position

"After operation"

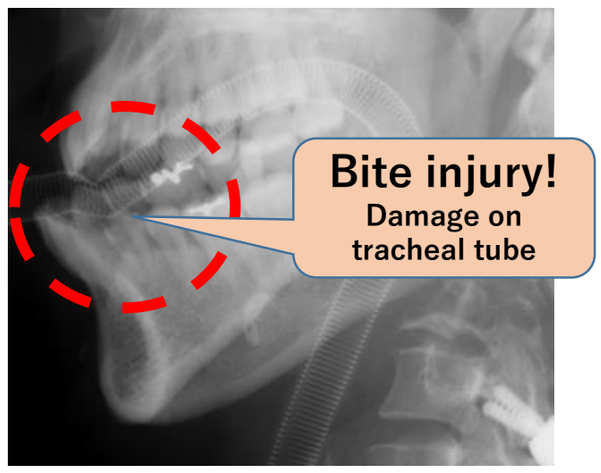

Fig. 6. tracheal tube deformation

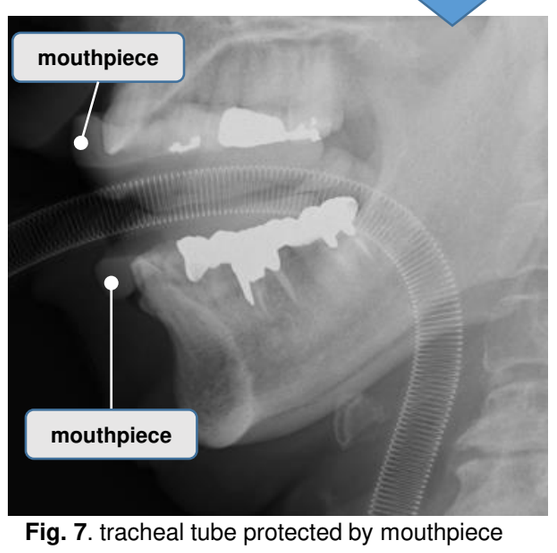

Fig. 7. tracheal tube protected by mouthpiece

Table 2. Effect of mouthpiece on tracheal tube deformation

		gauze (n)	mouthpiece (n)
Total		31	140
Deformation: NO	Class I	25	138
Deformation: YES		6 (19.4%)	2 (1.4%) #
	Class II	4	2
	Class III	2	0
	Class IV	0	0

Results and Discussion

- Of the 279 patients, 108 were excluded due to the X-ray imaging failure. Of the remaining 171 patients, 140 patients used the mouthpiece while 31 patients used a conventional gauze bite block.
- The incidence of tube deformation in the patients with the mouthpiece (2 of 140 patients, 1.4 %) was significantly lower than in those with the gauze bite block (6 of 31 patients, 19.4 %; $p < 0.001$) (Table 1). Conventional gauze bite block were used in toothless cases and emergency cases, while tube deformation was seen in emergency case.
- According to the present results, we should prepare this custom-made mouthpieces for those cases, or develop ready-made mouthpiece.

Conclusion

The incidence of damage to the endotracheal tube caused by intraoperative transcranial motor-evoked potential monitoring was reduced by a novel mouthpiece.

Refference

1. MacDonald, J Clin Physiol, 2002
2. Oshita K, et al: J Anesth 2016: 30(5); 850-854