Preoperative Motor Function Predicts Ability to Record Muscle Motor Evoked Potentials

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Background: Motor evoked potentials (MEPs) are commonly used during surgery for spinal cord tumor resection. However, it can be difficult to record reliable MEPs from the muscles of the lower extremities during surgery in patients with preoperative weakness due to spinal cord compression. In this study, motor function of patients' lower extremities and their association with intraoperative MEP recording were compared.

Methods: 89 patients underwent thoracic spinal cord tumor resection. MEPs were tested from 178 lower limbs of the 89 patients. Patients' motor function was checked immediately before the surgical procedure. Motor function of patients' lower extremities and their association with intraoperative m-MEP recording were compared.

Intravenous propofol, remifentanil, and rocuronium were used for induction. Rocuronium was not repeated after induction. Anesthesia was maintained by total intravenous anesthesia (TIVA) using a combination of propofol and remifentanil. Bispectral Index was maintained between 40 to 50. TOF was tested to check muscle blockade was total recovered with 4/4 twitches.

Electrical current was delivered though two corkscrews placed on C3' and C4' sites (international 10-20 system). Train of eight pulses, 300 to 500 volts, 75μs pulse width and 2 microsecond of inter-stimulus interval were used. Anodal stimulation was applied to trigger contralateral muscle MEP responses. MEP responses were recorded from paired needle electrodes placed bilaterally in the tibialis anterior and extensor digitorum brevis muscle, as well as hand muscles as control.

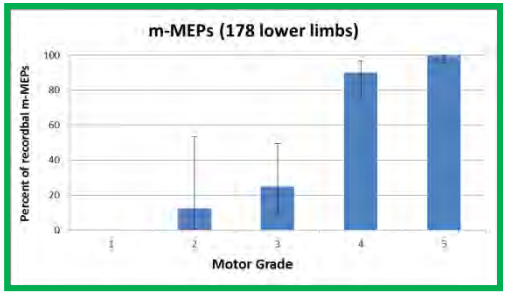
Table 1. Patients' population

Number of Patients	Gender (Male/Female)	Age Range (Y) (Average)	Height (cm)	Weight (kg)	Clinical Diagnosis	Surgical Procedure
89	54 / 35	18-60 (40)	166.6±7.5	65.8±10.6	Thoracic intraspinal tumor	Thoracic laminectomy / tumor resection

Table 2. % recordable m-MEPs upon motor grade

Motor grade	% Recordable MEP	Linear fit % recordable MEP	Step fit % recordable MEP
5	100	101	95
4	90	73	95
3	25	45	12.5
2	12.5	18	12.5
1	0	-10	12.5

Results: From 178 lower limbs of 89 patients, myogenic MEPs could be recorded from 100% (105/105) of the patients with 5 of 5 motor strength in lower extremity; 90% (36/40) from the patients with 4/5 motor strength; only 25% (5/20) with 3/5; and 12.5% (1/8) with 2/5 motor strength; none (0/5) were able to be recorded if the motor strength was 1/5.



Summary: The ability to record myogenic MEPs is closely associated with the patient's motor function. They are difficult to obtain if motor function is 3/5 motor strength in the lower extremity. They are almost impossible to record if motor function is worse than 3/5.