

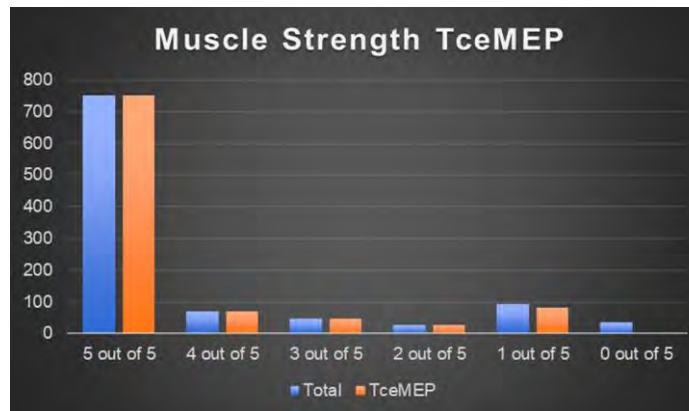
Effects of Pre-surgical Muscle Grade on Baseline TceMEPs

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- Objective:** Transcranial motor evoked potential (TceMEPs) monitoring offers a level of safety from iatrogenic harm that may result from a high risk spinal deformity corrective surgery (Zuccaro et al, 2017). Little evidence exists in the literature predicting ability to generate TceMEPs baselines based upon pre-surgical muscle grade testing. In this retrospective paper, the ability to generate robust TceMEP baseline recordings was compared to pre-surgical muscle grade testing.
- Methods:** After obtaining IRB approval, a retrospective quantitative analysis was performed on 1025-patients. Patients were categorized into one of six groups, based on pre-surgical muscle grade testing. TceMEPs baseline recordings consisted of pre motor cortex stimulation and recording from the following peripheral muscle sites: Abductor polices brevis, quadricep femoris, tibialis anterior, gastrocnemius, and Abductor hallicus. Subdermal electrodes were placed in the recording muscles listed and baseline potentials were recorded on a Caldwell cascade pro. Full total intravenous anesthetic protocol was implemented to ensure robust recordings in all muscle.

- Results:** Patients were categorized into the following groups: 5/5 strength (N=752), 4/5 strength (N=71), 3/5 strength (N=46), 2/5 strength (N=27), 1/5 strength (N=93), and 0/5 strength (N=36). The ability to produce TceMEPs baseline recordings was calculated as the following: 5/5 (100%), 4/5 (100%), 3/5 (100%), 2/5 (100%), 1/5 (82%), 0/5 (0%).
- Conclusion:** TceMEPs monitoring can decrease the risk of post-operative deficits, in addition to decreasing the number of stagnara wake up tests performed (Zuccaro et al, 2017). The results from this study suggest pre-surgical muscle grade testing may predict the ability to generate baseline TceMEP recordings. More specifically, 0/5 appeared to indicate no generated baseline recordings. This paper demonstrates TceMEPs are obtainable with a minimum muscle grade test of 2/5 100% of the time, when total TIVA anesthetic protocols are used.

muscle strength	Total	TceMEP	percent
5 out of 5	752	752	100.0%
4 out of 5	71	71	100.0%
3 out of 5	46	46	100.0%
2 out of 5	27	27	100.0%
1 out of 5	93	82	88.2%
0 out of 5	36	0	0.0%



Falkerson, D. H., Satyan, K. B., Wildwe, L.M., Riviello, J., J., Stayer, S. A., Whitehead, W. E., Curry, D., J., Dauser, R. C., Luersson, T. G., & Jea, A. (2011). Intraoperative monitoring of evoked potentials in very young children. *Journal of Neurosurgery Pediatric*, 7(4), 331-337.

Ferguson J, Hwang SW, Tataryn Z, Samdani AF: Neuromoni- toring changes in pediatric spinal deformity surgery: a single-institution experience. *J Neurosurg Pediatr* 13:247-254, 2014

Hwang SW, Malhotra NR, Shaffrey CI, Samdani AF: Intra- operative neurophysiological monitoring in spine deformity surgery. *Spine Deform* [epub ahead of print], 2012

Langeloo DD, Journée HL, de Kleuver M, Grotenhuis JA: Criteria for transcranial electrical motor evoked potential monitoring during spinal deformity surgery. *Neurophysiologie Clinique/Clinical Neurophysiology*, 37(6):431-439, 2007.

Schwartz, D. M., Auerbach, J. D., Doormans, J. P., Flynn, J., Drummond, D. S., Bowe, J. A., Laufer, S., Shah, S. A., Bowen, J. R., Jones, K. J., & Drummonds, D. S. (2007). Neurophysiological detection of impending spinal cord injury during scoliosis surgery. *Journal of Bone, Joint and Surgery Am*, 89(11), 2440-2449.

Schwartz DM, Sestokas AK, Dormans JP, Vaccaro AR, Hilibrand AS, Flynn JM, et al: Transcranial electric motor evoked potential monitoring during spine surgery: is it safe? *Spine (Phila Pa 1976)* 36:1046-1049, 2011

Thirumala P, Huang J, Brahmé IS, Thiagarajan K, Cheng H, Crammond DJ, Balzer J: Alarm criteria for motor evoked potentials. *Neurology India* 65 (4): 708-715, 2017.

Zuccaro M, Zuccaro J, Samdani AF, Pahys JM, Hwang SW: Intraoperative neuromonitoring alerts in a pediatric deformity center. *Neurosurg Focus* 43(4):1-7., 2017.