Transcranial Electric Motor Evoked Potential Alert Criteria

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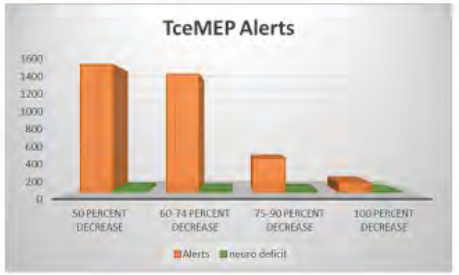
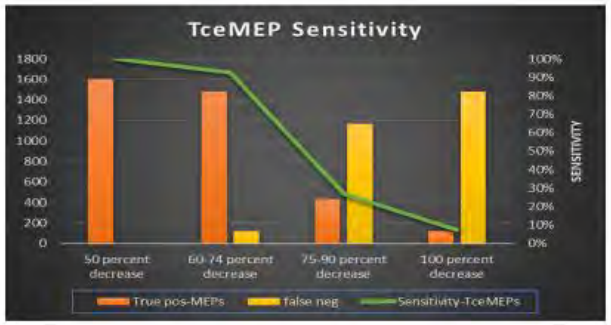
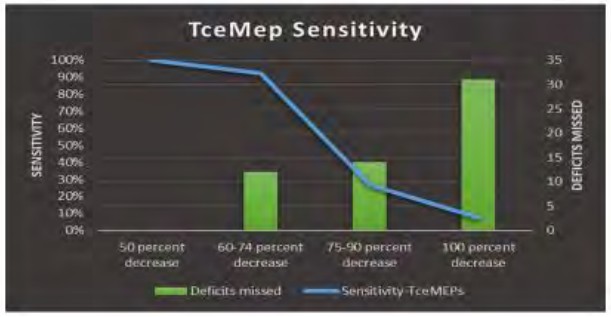
- **Objective**: Transcranial motor evoked potentials (TceMEP) and Somatosensory evoked potentials (SSEP) are part of Multimodality monitoring utilized during spinal deformity surgery, and may help to reduce post operative deficits that result from iatrogenic injury during surgery (Schwartz et al., 2007, Schwartz et al., 2011, Faulkerson et., 2007, Hwang 2012., & Zuccaro et al., 2017). Various alert criteria exist for TceMEPs throughout the monitoring community. Some of these alert criteria include: threshold increase (Clancy et al., 1998), amplitude decreases (Thirumala et al., 2007. , Langeloo et al., 2003, Schwartz et al., 2007), and morphology changes from baseline data (Langeloo et al., 2007). This paper examined the incidence of post operative deficits with the following different TceMEPs alert criteria: 0-49% decrease in amplitude, 50% decrease in amplitude, 60-74% decrease in amplitude, 75-90% decrease in amplitude, and 100% decrease in amplitude.
- **Methods**: After obtaining IRB approval, a retrospective quantitative analysis was performed on 992-patients (258-male, 734-female). All patients were diagnosed with scoliosis and undergoing spinal deformity correction surgery. TceMEPs were stimulated at the cortex and recorded from the following muscles through the use of subdermal electrodes; abductor polices brevis, quadricep femoris, tibialis anterior, gastrocnemius, and abductor hallicus. All baselines were obtained by a consistent neuromonitoring team using Caldwell cascade pro. Anesthesia for each patient consisted of a total intravenous anesthetic protocol and no neuromuscular blockade. Baselines were recorded prior to incision and were present bilaterally in all recording muscles. TceMEPs were recorded every 15-20 minutes throughout the entire procedure.
- **Results**: Total number of TceMEPs performed and recorded for the 992-patients was 36,713, with 1600 amplitude decreases identified. This number, performed/recorded TceMEPs , was categorized into one of the following: 0-49% decrease in amplitude (N=36,553), 50% decrease in amplitude (N=1600), 60-74% decrease in amplitude (N=1480), 75-90% decrease in amplitude (N= 430), and 100% decrease in amplitude (N=120). Post operative neurological deficits for each group were as follows: 0-49% decrease (0 deficits), 50% decrease (32 deficits), 60-74% decrease (20 deficits), 75-90% decrease(18 deficits), and 100% decrease (1 deficits). TceMEPs sensitivity was calculated for the following groups: 50% decrease (100%), 60-74% decrease (93%), 75-90% decrease (27%) and 100% decrease (8%).
- **Conclusion**: TceMEP offer an increase in patient safety from iatrogenic injury during surgery (Schwartz et al 2007). Various alert criteria exist for interpretation of TceMEP that result in post operative deficits. Results from this study indicated TceMEPs were most sensitive with the alert criteria in the range of 50-60% decrease in amplitude. Additionally, this study suggests using an all or none approach (100% decrease) may give a surgeon false information on postoperative neurological status of the patient.

	number	Neuro deficit	%MEP alerts	True pos-MEPs	true neg	false pos	false neg	Sensitivity-TceMEPs	Specificity-TceMEPs
total number of MEPs	36713								
amplitude changes:	1600		4.36%	1600	35113	0	0		
0-49 percent decrease	36553	0	0.00%	0	36553	0	0		
50 percent decrease	1600	32	4.36%	1600	35113	0	0	100%	100%
60-74 percent decrease	1480	20	4.03%	1480	35233	0	120	93%	100%
75-90 percent decrease	430	18	1.17%	430	36283	0	1170	27%	100%
100 percent decrease	120	1	0.33%	120	36593	0	1480	8%	100%

	number	Neuro deficit	P Value
total number of MEPs	36713		
amplitude changes:	1600		
0-49 percent decrease	36553	0	
50 percent decrease	1600	32	<0.005
60-74 percent decrease	1480	20	<0.005
75-90 percent decrease	430	18	<0.005
100 percent decrease	120	1	







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