

# Preventing Positioning-related Brachial Plexus Compression in Posterior Thoracolumbar Instrumentations: The Role of Upper Limbs SSEPs Monitoring

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## Introduction

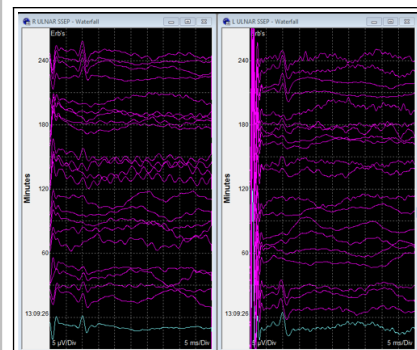
Peri-operative positional neurophysiological changes in the upper limbs as identified by somatosensory evoked potentials (SSEPs) monitoring have been more extensively studied in anterior surgical approaches to the cervical spine (1), with a reported incidence of approximately 1% of patients, and most commonly affecting the brachial plexus. However, the true incidence and exact clinical implications of positional SSEPs changes of upper limbs during posterior thoracolumbar instrumentation surgeries is unknown in the literature.

## Methods

Prospective analysis of neurophysiological traces during posterior thoracolumbar instrumentations performed between July 2014 and March 2015 in which intra-operative SSEPs monitoring of upper and lower limbs (either along or in conjunction with MEPs) were employed. ACNS Guideline 11B was referenced to record UE SSEP Peripheral (N9), Far Field (P14/N18) and Near Field (N20/P22) potentials along the Caudal Medial Lemniscal System

## Results

In 2/15 (13%) of cases of thoracolumbar fusions, intermittent changes in SSEPs in one of the upper limbs related to brachial plexus compression were identified. Although one case involved a long posterior instrumentation (T10 to sacrum) in a patient with severe scoliosis (> 35o of lumbar curve) and a BMI > 30, the other case involved a single level TLIF in a young non-obese patient. In both patients, the changes completely resolved after relieving the axillary pressure from the thoracic pad of the Jackson table and/or releasing the affected arm. No sensory or motor neurological changes were observed in the immediate post-operative period and at 6-month follow-up.



Waterfall Bilateral Erb's Point potential: Decrease in N9 ~ 60min recovery, decrease, and closing trace to baseline



1st row: Baseline traces showing bilateral N9 potentials in the Erb's derivation. 2nd row: Bilateral loss of peripheral signals and decrease in subcortical and cortical obligate peaks. 3rd row: After repositioning of the affected upper limb, peripheral potentials returned. However there was a persistent decrease in subcortical and cortical channels. 4th row: At close bilateral peripheral potentials were already back to baseline.

## Conclusions

Our data suggest that, although neurophysiological monitoring may not be necessary for every posterior spinal thoracolumbar instrumentation, in those cases in which it is employed (either for monitoring of pedicle screw placement or for monitoring of spinal cord function), placement of electrodes and continuous monitoring of upper limbs SSEPs (in addition to lower limbs) is recommended, as it may enable detection of early signs of brachial plexus compression, possibly reducing the rates of positioning-related surgical complications (2,3). Acute absence of Peripheral N9 potential coinciding with global decreases in subcortical and cortical signals constitutes a reliable alarm criteria for possible brachial Plexus/positional changes in intra-operative neuro-monitoring. According to our surgical experience, SSEPs monitoring of upper limbs may play an essential role in avoiding positioning-related complications not only in long thoracolumbar instrumentations and those involving prolonged intra-operative time or obese patients, but also in routine single-level fusions for degenerative conditions.

## Learning Objectives

- 1.To understand that the role of neurophysiological monitoring of upper limbs in preventing positioning-related complications during posterior spinal thoracolumbar instrumentations is not well characterized in the literature.
- 2.To acknowledge that, in posterior approaches to the thoracolumbar spine in which neurophysiological monitoring is employed, placement of needles and continuous monitoring of upper limbs (in addition to lower limbs) is recommended in order to avoid positioning-related complications related to brachial plexus compression.

## References

- 1Smith PN, et al. Intraoperative somatosensory evoked potential monitoring during anterior cervical discectomy and fusion in nonmyelopathic patients--a review of 1,039 cases. The spine journal : official journal of the North American Spine Society 2007;7:83-7.
- 2Kamel I, Barnette R. Positioning patients for spine surgery: Avoiding uncommon position-related complications. World journal of orthopedics 2014;5:425-43.
3. Chung I, Glow JA, Dimopoulos V, Walid MS, Smisson HF, Johnston KW, Robinson JS, Grigorian AA. Upper-limb somatosensory evoked potential monitoring in lumbosacral spine surgery: a prognostic marker for position-related ulnar nerve injury. Spine J. 2009 Apr;9(4):287-95.