



Alerts for Femoral Nerve Monitoring during Transpsoas Lateral Lumbar Interbody Fusion Procedure

Silverstein, J., Block, J., Ball, H. Madhok, R., Goldstein, M., Basra, S., Mermelstein, L., DeWal, H., Porter, D

ABSTRACT

Background Context: New neuromonitoring techniques (saphenous somatosensory evoked potentials [sSSEP] & transcranial motor evoked potential recordings from the quadriceps muscles (qMEP) are currently under investigation as multiple authors have described similar promising initial findings in transpsoas lateral lumbar interbody fusion (LLIF) procedures. **Purpose:** To review intervention methodology and surgical outcomes when neuromonitoring alerts suggesting femoral nerve compromise were reached. **Study Design:** A retrospective analysis of a case series was performed. **Methods:** Data was collected over the course of one year by two separate neuromonitoring groups servicing several surgical groups in New York and California. The data from 121 cases consisting of 156 lumbar surgical discectomy levels was retrospectively analyzed. Multi-modal neuromonitoring protocols included the use of sSSEPs, qMEP and EMG. The surgeon was notified with an alert if the sSSEP and/or qMEPs response amplitudes degraded significantly in amplitude from baseline values or if significant neurotonic discharges were observed on the free-running EMG recordings. Surgeons responded to these alerts in various ways including releasing and/or removing the retractor system until any degraded evoked potential responses recovered, increasing blood pressure, hastening the procedure or continuing with the procedure without any surgical interventions. **Results:** In this cohort we had 10 alerts (6%) due to observations of significant degradations in the evoked potential response amplitudes (sSSEP and/or qMEP) and no alerts from the EMG recordings. Surgeons were notified immediately when an alert was reached and choices for interventions were variable. Timely interventions appeared to be correlated with a rapid recovery of the degraded evoked potentials. Less timely interventions appeared to correlate with longer times for evoked potential recovery and no recovery was observed in the one case in our series where a postoperative femoral nerve deficit occurred (Table 1). **Conclusion:** Initial observations suggest that surgical retraction of the psoas can have variable effects on femoral nerve function. A significant degradation of the surgical side femoral nerve evoked potential recordings may mark a point in time where temporary reversible conduction block has occurred. It is suspected that the appearance of degraded femoral nerve evoked potentials might suggest a point at which surgical countermeasures

should be employed within a reasonable amount of time to avoid progressive neural injury. Our findings suggest that the femoral nerve may be somewhat resilient and able to tolerate periods of conduction block without post-operative sequelae however guidelines for intervention may be somewhat elusive as the effects of retraction on the femoral nerve are multifactorial and variable. More study is needed to investigate what constitutes a “reasonable” amount of time to employ surgical countermeasures following a neuromonitoring alert.

10 Cases with Neuromonitoring Alerts						
Patient	Spinal Level	Alert time (minutes after retractors were introduced)	Timely Intervention (<10 min from alert)	Retractor removal time after alert (minutes)	Recovery of evoked potentials	Post-Op Evaluation
1	L4-5	40	Yes	5	Yes - within 1 minute	No new femoral nerve deficits
2	L2-3	1	Yes	<1	Yes - within 1 minute	No new femoral nerve deficits
3	L4-5	35	Yes	<2	Yes - within 1 minute	No new femoral nerve deficits
4	L3-4	12	No	14	Yes – 7 minutes after retraction was removed	No new femoral nerve deficits
5	L3-4	10	No	19	Yes – 7 minutes after retraction was removed	No new femoral nerve deficits
6	L4-5	21	No	21	No	3/5 knee extension & medial thigh sensory complaints
7	L3-4	7	yes	<3	Yes	No new femoral nerve deficits
8	L4-5	23	Yes	<1	Yes -within 1 minute	No new femoral nerve deficits
9	L4-5	26	No	20	Yes – qMEPs return observed approx 60 min sSSEPs never returned	No new femoral nerve deficits
10	L3-4	33	Yes	<1	Yes – 4 minutes after retractor removal	No new femoral nerve deficits