Patient

54 year-old female who had undergone a previous lumbar decompression and fusion which resulted in nonunion. She was diagnosed with postlaminectomy syndrome, lumbar radiculopathy and nonunion. At the time of the procedure, she complained of pain and paresthesia in b/l lower extremities. Reports pain being worse in right lower extremity. Patient had a history of hypertension. She was scheduled for a revision of her previous fusion which would be performed in two stages: an L3-S1 ALIF (presented here) and a later lumbar PSF.

Methods

LE SSEP: PTN (60 mA, 0.3 ms, 2.1 Hz) C3'-C4', Cz'-Fpz, CS3-Fpz, PF bilaterally. UE SSEP: MN (30 mA, 0.3 ms, 4.47 Hz) C3'-C4', CS3-Fpz. EMG: VL, TA, BF, GN bilaterally. EMG: VL, TA, BF, GN bilaterally. TcMEP: 200 mA, 0.5 ms, 250 Hz, n = 9, recorded from hands (TH-HT), legs (TA and MGN) and feet (AH-ADM). TO4 was 4/4 during critical stages. EMG reported as quiet with no evidence of nerve root injury. TcMEPs were present from all recorded channels and remained stable throughout the procedure. All data recorded using EPWorks software and a Protektor 16 channel differential amplifier.

Results

Figure 1: Baseline SSEP Cortical SSEPs reported as monitorable from b/l PTN and UN. Subcortical SSEPs reported as monitorable from b/l UN and marginal from b/l PTN. There was a notable amplitude asymmetry in SSEPs from PTN, right being greater than left. Anesthesia: ABP: 113/73 (87) BT: 35.4 desflurane: 3.1/2.9 remifentanil: 0.125 mcg/kg/min.

Figure 2: LE SSEP Cortical Changes 1 hour and 23 minutes after setting baseline, a significant decrease of 0.5 μv was observed in the left PTN C3'-C4' SSEP channel. There was also a simultaneous increase of 0.3 μv observed in the left PTN Cz'-Fpz channel. Right PTN C3'-C4' remained unchanged while right PTN Cz'-Fpz saw an increase of 0.4 μv from baseline. L UN C3'-C4' decreased by 0.2 μv while right UN C3'-C4' decreased by 0.4 μv. Anesthesia: ABP: 116/77 (94) BT: 36.1 desflurane: 2.0/1.9 dexmedetomidine: 1 mg/kg/hr propofol: 150 mcg/kg/min remifentanil: 0.125 mcg/kg/min.

Figure 3: Closing SSEP 6 hours 56 minutes post baseline, left PTN C3'-C4' SSEP remains decreased in amplitude similar to that in figure 2. Left PTN C2'-Fpz is increased by 0.1 μv. Right PTN C3'-C4' is decreased by 0.1 μv while Cz'-Fpz remains unchanged. Left and right UN C3'-C4' are decreased by 0.5 μv and 0.4 μv respectively. Anesthesia: ABP: 126/77 (101) SPO2: 100 BT: 36.2 desflurane: 2.0/1.9 dexmedetomidine: 1.0 mcg/kg/hr propofol: 140 mcg/kg/min remifentanil: 0.125 mcg/kg/min.

Figure 4: Complete SSEP History From start of data collection to end of data collection, left PTN C3'-C4' SSEPs remain significantly (>50% amplitude) decreased while all other cortical channels remained within baseline parameters. Blue arrow indicates time that an impedance check run before change in left PTN was observed.

Discussion

Here we present evidence of a possible cortical dipole directional change observed during an ALIF procedure. Left PTN C3'-C4' SSEPs decreased significantly (>50%) from baseline following both an impedance check of the recording electrodes (Figure 3) and the introduction of dexmedetomidine and propofol into the anesthetic regime (Figure 2). Several events can cause changes similar to ones seen here. Localized cortical ischemia can cause one channel to decrease in amplitude while all others would remain within baseline. However, due to the use of a differential amplifier, the corresponding contralateral channel would show a change in its amplitude which was not observed here. Halogenated gases and narcotics like those used during this procedure can cause cortical SSEPs to decrease in amplitude, however this effect would be generalized to effect all cortical channels. A rapid decrease in a single cortical channel due to their use is not probable. Also, a technical issue with software (impedance check) or hardware may cause a single channel to decrease in amplitude. No significant effect on amplitude was seen in other corresponding SSEP channels at the time of the change in Figure 2 making this unlikely.

Future investigation into this phenomenon should focus on ruling-out the above plausible causes while also considering the effect certain anesthetic agents (i.e. dexmedetomidine and propofol) could have on dipole directional changes.

References