Cerebral oxygen saturation monitoring during spinal neurosurgery in prone position using near infrared spectroscopy (NIRS)

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BACKGROUND

- NIRS used intraoperatively can prevent postoperative complications like cognitive dysfunction and organ failure.
- The goal of the study was to determine whether prone position during spinal neurosurgery impacts cerebral oxygen saturation using NIRS.

METHODS

- 28 patients (mean age 56y) were scheduled for spinal surgery in prone position (transpedicular fixation(TPF)=15, microdiscectomy(MDE)=8, spinal tumor removal(spinal Tu)=4, laminectomy=1).
- Cerebral oxygen saturation (rScO₂) was continuously monitored using INVOS 4100.
- We also assessed blood loss, postoperative complications (stroke, organ dysfunction, wound infection, days spent in ICU) and cognitive dysfunction.
- Anesthesia methods: induction with fentanyl 0.1–0.2 mg, propofol 1–2 mg/kg, atracurium 0.5 mg/kg; maintenance - fentanyl 0.03–0.06 µg/kg/min, atracurium 0.3–0.6 mg/kg/h, sevoflurane to MAC 0.7–1.0, FiO₂ 0.5.
- All patients were extubated in the operating room.

RESULTS

- Significant changes in calculated mean rScO₂ values between supine and prone position during the surgery were not observed (Figure 1).
- Mean rScO₂ during the whole surgery was 73% for the right side (R), 73% for the left side (L). Lying supine during induction R72%, L71%, in prone position R74%, L74%, returning back to spinal position R73%, L73%.
- 11 out of 28 patients showed a slight to significant decrease in rScO₂ values in prone position (Figure 2).
- One patient with intraoperative blood loss (2000 ml) showed a rScO₂ decrease by 27% from baseline value (from rScO₂ 85% to 58% in prone position).
- One patient with stroke in anamnesis showed initial values before induction of anaesthesia 21% lower than average rScO₂ (57% compared to average rScO₂ 72%).
- Average blood loss was 308 ml (TPF=400 ml; MDE=175 ml; spinal Tu=200 ml).
- Average duration of operation was 110 min (TPF=112 min; MDE=125 min; spinal Tu=126 min).
- No incidence of stroke, organ dysfunction was observed. One patient was admitted to ICU due to blood loss.

Figure 1. Mean rScO₂ (%) values – supine and prone position (Supine1 – supine position during induction of anaesthesia; Supine2 – supine position at the end of the operation)

Figure 2. Mean intraoperative rScO₂ (%) decrease in prone position from baseline values observed in 11 patients

CONCLUSION

- Our first experience revealed, that the mean intraoperative cerebral oxygen saturation changes, during spinal neurosurgery, were not significant.
- 11 out of 28 patients showed a mild to moderate decrease in cerebral oxygen saturation in prone position.