Comparison of Nasal and Frontal BIS Monitoring in Neurosurgery. Does Site of Sensor Placement Effect BIS Values?

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Intraoperative awareness is a serious but preventable complication of general anaesthesia (I). Bispectral index (BIS) is the most widely used method to monitor anaesthesia depth. BIS monitoring require attachment of forehead sensors, posing a challenge when the surgical field involves the forehead.

Material and Methods: We aimed to compare the gold standard forehead position of BIS sensors with an alternative position across the nasal dorsum for neurosurgical procedures. Additionally, assuming that local surgical manipulation might affect BIS values in cranial cases, caseload was divided equally between cranial and vertebral procedures to be assessed.

After ethical committee approval and informed consent, 62 ASA I-III adult patients scheduled for elective neurosurgical operations were enrolled in this prospective observational study. In all patients both frontal and nasal BIS sensors were placed before anesthesia induction. Total intravenous anaesthesia with propofol and remifentanyl were used and guided by frontal BIS for depth of anesthesia in all. Frontal and nasal BIS scores were recorded before induction and repeated at 15 minutes intervals after intubation, during the intraoperative period and emergence.

Figure 1. Nasal and frontal BIS sensor placement

Results and Discussion: Patients’ characteristics are presented in table 1. The mean BIS value during the surgery from frontal versus nasal sensors were 49±22 and 49±21 respectively (n:62). These values were statistically correlated (ICC 0.78, p< 0.001) indicating that nasal BIS measurement does not reveal a disadvantage for routine use when needed.

Table 1 Patient Demographics

Age (yr)	46.25±15.36
Gender (F/M)	28/34
ASA I-III	29/33
Height (cm)	165.49±8.17
Weight (kg)	64.80±11.53
BMI (kg/m ²)	23.49±3.05
Operation (n: 62)	Spinal (31) and cranial (31)

Figure 2. Frontal and Nasal BIS values in cranial and spinal surgery.

Frontal and nasal BIS values were compared in all, but also separately according to the site of surgery in cranial (n:31) versus vertebral (n:31) cases.

Collected data were analyzed with the SPSS for Windows version 15.0. Descriptive statistics were given as mean±SD. Interclass correlation coefficients (ICC) were calculated.

A subgroup analysis regarding the site of surgery between cranial (frontal: 45±22 and nasal: 44±21) and vertebral (frontal: 54±21 and nasal: 53±21) procedures also did not revealed a significant change in the results. **Awareness:**None of the patient interviews indicated awareness. One patient reported dreaming.

Figure 3 Nasal and frontal BIS values in spinal surgery

Figure 4 Nasal and frontal BIS values in craniotomies

Conclusion: Our data reveal that for measuring anesthesia depth BIS sensor placement on nasal dorsum shows comparable efficiency in comparison to standard frontal measurement, regardless of site of neurosurgical procedure either cranial or vertebral. Thus, in situations like some cranial surgeries where sensor positioning may interfere with surgical site, nasal dorsum can be a good and safe alternative.