Section A-Research

A STUDY OF NEUROPHYSIOLOGICAL INTRAOPERATIVE MONITORING IN INFANTS UP TO 12 MONTHS

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ABSTRACT

Introduction: Intraoperative neurophysiological monitoring (IONM) helps assess the integrity of neural structures and consciousness during surgical procedures. It includes both continuous monitoring of neural tissue as well as the localization of vital neural structures.

Aims: 1) Screening for Auditory Impairment in infants up to 12 months of age who are at risk.2) Assessment of perceived stress on mother.

Materials and method: The present study was an Analytical, Observational study. This study was conducted for a period of 12 months at R. G. Kar Medical College and Hospital, Kolkata. Total 85 subjects were included in this study.

Result: We found that, most of the patients belong to Lower Socioeconomic Class [37 (43.5%)] which was statistically significant (p.02444). (Z=2.2469).

Conclusion: We concluded that Perceived stress scale was positively correlated with BERA wave changes in infants attending neurophysiology laboratory at R.G.Kar medical college which is a tertiary care centre.

Keywords: Intraoperative Neurophysiologic Monitoring and Evoked Potential.

INTRODUCTION

Intraoperative neurophysiological monitoring (IONM) helps assess the integrity of neural structures and consciousness during surgical procedures. It includes both continuous monitoring of neural tissue as well as the localization of vital neural structures. The goal of IONM is to identify intraoperative neural insults that allow early intervention to eliminate or to significantly minimize irreversible damage to the neurological structure and prevent a postoperative neurologic deficit. The use of neurophysiological monitoring during surgical procedures requires specific anesthesia techniques to avoid interference and signal alteration due to anesthesia.

Different modalities of intraoperative neurophysiological monitoring (IONM) are available, each monitors a specific neural pathway, and they are:

1. Evoked potentials including somatosensory evoked potential (SSEP), motor evoked potential (MEP), brainstem auditory evoked potential (BAEP), visual evoked potential (VEP)
2. Electroencephalography (EEG)
3. Electromyography (EMG)

Multimodal intraoperative neuromonitoring (IONM) is recommended as an effective way to avoid permanent neurologic injury during surgical procedures. [1]

Intraoperative neurophysiological monitoring (IOM) is now an integral part of many surgical procedures. The first use of intraoperative neurophysiological testing dates back to the 1930s, when direct cortical stimulation was performed in order to identify the motor cortex of patients with epilepsy; however, it was only with the development of the commercial IOM machine in the early 1980s that the technique became widely used. [2] The 1990s saw transcranial motor evoked potentials (Tc-MEPs) popularized as a method for monitoring corticospinal tract activity [3]as well as for predicting postoperative motor deficits [4]. Technological advances in the last 15 yr have allowed monitoring techniques to greatly evolve. The widespread availability of computer networks and integrated communication systems have allowed IOM to be performed from a remote site; this evolution has increased the potential application of the technique and contributed further to the popularity of IOM.

Neuromonitoring has long been used during spinal surgery to assess the function of the spinal cord in an effort to prevent intraoperative injury. Although its use is widespread, no clear benefit has been demonstrated. Some evidence suggests that intraoperative monitoring is a cost-effective component of spinal surgery that provides critical information enabling the surgical team to give the patient optimal postoperative neurologically functional outcomes. There are other reports in the literature that demonstrate a failure of neuromonitoring to predict postoperative outcome. The exact efficacy of the utilization of intraoperative neuromonitoring is not well understood.[5] Patient outcomes and improvement following surgical procedures is paramount, and testing whether intraoperative neuromonitoring aids in this regard is critical. Our goal in this study was to interrogate the value of intraoperative neuromonitoring to decrease the severity and rate of neurological injury during and after spinal surgery. Here we describe our experience of 121 patients who underwent spinal cord procedures utilizing intraoperative neuromonitoring, to determine its ability to be specific and sensitive for the accurate diagnosis of neurological deficit in this setting.

MATERIALS AND METHODS

Study was commenced after getting ethical clearance from Institutional Ethics Committee, R. G. Kar Medical College and Hospital, Kolkata

Study type-Analytical, Observational

Study design- Cross-sectional

Sampling Design-Availability or Convenience sampling at R.G.KAR MEDICAL COLLEGE AND HOSPITAL, KOLKATA

Study Area-Department of Physiology

Study population-Infants up to 12 months of age along with their mothers attending Neurophysiology Laboratory, Department of Physiology at R.G.KAR MEDICAL COLLEGE AND HOSPITAL for conduction of BERA test

Inclusion criteria –

A. Infants upto 12 months of age
B. Either gender
C. Mother and her consent
D. Parents or guardians who give consent

Exclusion criteria-

A. Infants suffering from URTI,LRTI,ASOM or CSOM
B. Congential anomalies including microtia

C. Infants whose parents or guardians will not give consent.

RESULT AND DISCUSSION

The present study was an Analytical, Observational study. This study was conducted for 12 months at R. G. Kar Medical College and Hospital, Kolkata.85patients were included in this study.

Nachiketa RO et al [6](2010) found that it is crucial to understand factors which delay the commencement of aural habilitation in children. The family members, mostly mothers, suspected hearing loss in the child at a mean age of 1.5 years when the children did not respond to name-call, clap and vehicle horns. However the parents consulted any doctor primarily a specialist by an average age of 2.4 years. As many as 21% of the doctors during the first visit assured the parents not to worry as the child would learn language with age and only 33.4 % were referred for aural rehabilitation. The average age at which children were brought to an audiologist for the first time was 9.3 years yet 95% of parents did not perceive delay in the initiation of aural rehabilitation.

Kaffashi F et al [7](2013) showed that skin-to-skin contact (SSC) promotes physiological stability and interaction between parents and infants. Temporal analyses of predictability in EEG-sleep time series can elucidate functional brain maturation between SSC and non-SSC cohorts at similar post-menstrual ages (PMAs). Sixteen EEG-sleep studies were performed on eight preterm infants who received 8 weeks of SSC, and compared with two non-SSC cohorts at term (N=126) that include a preterm group corrected to term age and a full term group. Two time series measures of predictability were used for comparisons.

Gouri ZU et al [8](2015) showed that to screen the newborn by Transient evoked Otoacoustic emission and to assess the incidence of hearing damage and associated risk factors. This longitudinal prospective observational study was conducted at a tertiary care hospital in India. A total of 415 babies were included in the study. All the newborns were evaluated with Transient evoked Otoacoustic emission (TEOAE) which was done by age of 1–3 days. Auditory brain stem response audiometry (AABR) was performed at the age of three months for confirming the hearing loss in the neonates those who failed the TEOAE screening.

In our study, out of 85 patients, most of the patients were 21-30 years of age [63 (74.1%)] which was statistically significant (p< .00001). (Z=8.3818).

We found that, most of the patients were belong Lower Class [37 (43.5%)]which was statistically significant (p.02444). (Z=2.2469).

Boskabadi H et al [9](2018) found that hyperbilirubinemia is a common neonatal problem with toxic effects on the nervous system that can cause hearing impairment. This study was conducted to assess the risk factors for sensorineural hearing loss and other coexisting problems in icteric infants. Blood group and Rhesus (Rh) incompatibilities between mother and child and G6PD deficiency are important known causes for hearing impairment due to jaundice.

Our study showed that, more number of patients had A+ blood group [37 (43.5%)] but this was not statistically significant (p.1556). (Z=1.4204).

Banerjee S et al [10] (2020) found that the main consequence of hearing loss, especially in children, is the impact caused by sensory deprivation in the development of auditory and language skills and learning. Any degree of hearing loss can result in significant damage, as it interferes with perception and understanding of speech sounds. This proposed descriptive cross sectional study tries to compare BERA parameters between normal and delayed speech/language impairment children. Study also examines possible abnormalities in BERA in children with speech and language impairment.

Hajare P et al [11] (2021) showed that babies in Neonatal Intensive Care Units (NICU) have an additional risk for hearing loss due to various risk factors like, prematurity, low birth weight, mechanical ventilation, hyperbillirubinemia, ototoxic drugs, low APGAR score etc. as compared to the babies from well-baby nursery (WBN) who, poses risk factors mostly family history, syndromic deafness. Further BERA was done at the 3rd month of corrected age where 6 out of 11 showed positive responses from NICU and 3 babies from WBN had profound hearing loss. Data analysis revealed that family history of deafness, anemia and hypertension in ANC, TORCH in mother, low Apgar score and hyperbillirubinemia in newborns were a major risk factor for hearing impairment.

Yadav RL et al [12] (2022) examined that neonatal hyperbilirubinemia leads to neurological damages including encephalopathy and hearing loss. This study aimed to screen and evaluates the hearing loss in neonates after recovery from hyperbilirubinemia using the Brainstem evoked response audiometry (BERA) test. This cross-sectional comparative study was conducted in Physiology Department at Chitwan Medical College, Nepal. It included 20 age and sex-matched neonates recently recovered from hyperbilirubinemia and 20 normal healthy controls. The external acoustic canals of subjects were checked for any blockage or collapse before BERA testing. The BERA recordings were performed after the neonate's natural sleep following a standard lab protocol explained by Taylor's Evoked Potential in Clinical Testing.

It was found that, the mean BMI of patients was [25.9647± 1.9843.], PSS of patients was [7.6235± 4.5197], Bera Wave V Latency of patients was [7.3373± .7678.] and Bera Wave I-V Interpeak Latency of patients was [5.2362± 1.1550.].

The positive correlation was found Perceived stress scale vs Bera Wave V Latency which was statistically significant.

The positive correlation was found Perceived stress scale vs Bera Wave I-V Interpeak Latency which was statistically significant.

CONCLUSION

- In our study, out of 85 subjects, most of the patients were 21-30 years of age which was statistically significant.
- We found that, most of the patients belong Lower Socioeconomic Class which was statistically significant.
- Our study showed that, more number of suubjects had A+ blood group but this was not statistically significant.
- It was found that, the mean BMI of patients was [25.9647± 1.9843.], PSS of patients was [7.6235± 4.5197], Bera Wave V Latency of patients was [7.3373± .7678.] and Bera Wave I-V Interpeak Latency of patients was [5.2362± 1.1550.].
- The positive correlation was found between Perceived stress scale and Bera Wave V Latency which was statistically significant. The positive correlation was also found between Perceived stress scale and Bera Wave I-V Interpeak Latency which was statistically significant.

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Table: Distribution of mean of Bera Wave V Latency

	Number	Mean	SD	Minimum	Maximum	Median
Bera Wave V Latency	85	7.3373	.7678	6.3000	8.9400	7.6700
Bera Wave I-V Interpeak Latency	85	5.2362	1.1550	3.6000	9.9800	5.2600