Letter To The Editor

There is no correlation between Nerve Conduction Study, Motor Evoked Potential, Somatosensory Evoked Potential, and Magnetic Resonance Imaging findings as well as Clinical Motor and Bladder Recovery in Tethered Cord Children

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Dear Editor,

We read with interest an article published on intraoperative monitoring during awake craniotomy published by Wan Nazaruddin recently in *Malaysian Journal of Medical Sciences, Volume 20, Issue 5, 2013* (1). We would like to report a prospective cohort preliminary study on intensive intraoperative monitoring for children with tethered spinal cord syndrome with the intention to avoid more neurological deficits post-operatively.

The tethered cord syndrome (TCS) is an uncommon disease caused by an abnormal stretching of the spinal cord, reported incidence of 0.05 to 0.25 per births untethering of the tight filum terminale. Spinal dysraphism is associated with tethered cord, which includes malformations like myelomeningocele, lipomyelomeningocele, tight filum terminale, split cord malformation, and dermoid sinus. Once the symptoms have developed, the patient has a TCS. These symptoms may either be neurological, urological, orthopedic, or pain. The goal of surgery is to detether the cord by disconnecting its aberrant tightening attachments, and to relieve the cord from continuous stretching forces. Per-operatively it can be difficult to distinguish between functional neural tissue and these non-functional tethering structures. Permanent neurological complications were reported in about 4.5% of patients, and this was high as 10.9% when transient complications were taken into account (2–5). The use of intraoperative neurophysiological monitoring (IONM) may contribute to the safety in tethered cord surgery. We report a series of 15 patients with a wide variety of morphology of spinal dysraphism (5). All patients were operated for reasons of a tethered cord with the pre-operative use of IONM. The usage of IONM in the different age groups and its potential contribution to the safety of the procedure are investigated. This will further aid in prognosticating the neurological outcome of patients undergoing tethered cord surgery. This study assisted us in evaluating the importance of IONM in tethered cord surgery.

The objective of this study was to determine if intra-operative neurophysiological monitoring is helpful in identifying which patients will have worsening symptoms after surgery. It was also to observe the motor response thresholds before and after detethering. Helping in early identification of the motor response via neurophysiological monitoring in comparison to clinical motor scoring with qualitative prediction of somatosensory evoked potential (SSEP) and motor evoked potential (MEP).

This was a prospective cohort study involving patients with tethered cord associated with lipomyelomeningocele of age 6 months to 12 years old. This study is conducted in Hospital Queen Elizabeth Sabah from Jun 2011 to October 2013. The follow-up was done at the third month or sixth month from the date of discharge of the recruited patients, which ended on October 2013. The candidates that had underwent tethered cord release were included in the study, however those of age less than 6 months and older than 12 years of age and those children who has tethering of cord post-myelomeningocele repair was excluded in the recruitment. Parents needed to sign a consent form which has been prepared in either English or Bahasa Malaysia. To be aware of the usage of the monitoring device intraoperatively and knowing that the device has no side effects to the spinal cord neither has it anything to do with change in the surgical treament it merely aids in identification of nerve tissue during the surgery. Free running electromyography of selected lower limb muscles; with the aid of subdemal needle electrodes inserted in the following muscles quadriceps (L2–L4), tibialis anterior (L4–L5), gastrocnemius (S1–S2), additionally needles are also inserted at the external sphinter . These needles were inserted after patient anesthetised and secured with tape. Two needle electrodes were placed on the head subcutaneously at the anatomical location C3 and C4 (Electroencephalography 10–20 system). TES–MEP recordings were done prior to and during the course of surgical intervention for detection of functional neural elements. The monopolar probe is used applying voltage pulses of 50–100 mA prior to and after detethering. The anesthetic technique preferably used was total intravenous anesthesia (TIVA) with remifentanil 0.2–0.5 mg/kg/min infusion and 2% propofol infusion. Neuromuscular blocking agents were not used after induction. However, there were two cases that we could not proceed with TIVA inview of one case having renal disease stage 3 and the other patient.

Patients were subjected for nerve conduction study prior to the operation and post-operatively after three months or six months. Post-operatively retethering was followed up with magnetic resonance imaging (MRI) spine after three to six months. Data were recorded using a data collection sheet. The results of pre-operative nerve conduction study (NCS), intraoperative SSEP, and MEP and post-opererative three month and or six months NCS were recorded. Data were entered into SPSS software. Non-parametric test was used for analysis because of small number of patients.

A total of 15 patients in this study, age ranging from six months to twelve years old (mean, five years). Motor improvement occurred in three patients (14.3%) and improvement in bladder function in two patients (28.6%). No post-operative neurological worsening occurred. The post-operative follow-up was available for 15 patients ranging from three to six months. Intraoperative MEP and SSEP done was inconsistent and with the MEP of five patients showed descriptively that there improvement in amplitude of the waveform and reduced in latency of conduction , however , there was no statistical significant correlation with SSEP changes and clinical outcome, the motor (*P* value > 0.95) and bladder function improvement (*P* value = 0.500).The post-operative nerve conduction test, urodynamic study and MRI lumbar were done, and there was improvement in conduction amplitude and latency in three patients with correlation to clinical outcome however these were not statistical significant.

In conclusion, there was no clinical deterioration post-surgical untethering. There could be a role of IONM instigating safer surgery, however we could not find any correlation in our study between nerve conduction study NCS, MEP, and SSEP with MRI radiological findings in motor and bladder recovery amongst tethered cord children.

Based on this preliminary study IONM may prevent worsening of signs and symptoms during surgery and post operatively but no concrete prognostication can be based on IONM pre-, intra, and post-operatively as spinal cord recovery is unpredictable (4).

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