Archives of Anesthesiology and Critical Care (Supplementary 2023); 9(5): 460-462.

Available online at http://aacc.tums.ac.ir

Case Report

Total Intravenous Anaesthesia for Intraoperative Neuromonitoring in a Child With Tethered Cord: A Case Report

Krunal Suryavanshi*, Neha Panse

Department of Anaesthesiology, Smt. Kashibai Navale Medical College and General Hospital, Narhe, Pune, India.

ARTICLE INFO

Article history:
Received 08 August 2022
Revised 29 August 2022
Accepted 14 September 2022

Keywords:
Anaesthesia;
Neuro-monitoring;
Paediatric case;
Spine surgery;
Total intravenous anaesthsia

ABSTRACT

Paediatric spine surgeries are quite frequently performed these days on patients with congenital spinal anomalies. Correction of congenital spinal deformities, at this early age of life can cause lifestyle modifying changes in young patients, which will help them to live a comparative healthy and disease free life. Spine surgeries are often performed in prone position with aid of Total Intra-Venous Anaesthesia which are better supplemented with Intra-Operative Neuro-Monitoring as they help in improving the desirable outcome of surgeries in children. Here, we report a case of Total Intra-Venous Anaesthesia for release of tethered cord aided with Intra-Operative Neuro-Monitoring, which was managed meticulously without any detrimental complications.

Introduction

Spine surgeries are quite common in paediatric patients with congenital spinal anomalies. Prone position and general anaesthesia are the prerequisites.

Tethered cord is a persistent rope like filum terminale anchoring with conus medularis at the level of second lumbar vertebra or below that results in development of neurological signs like tingling numbness in dermatomes of lower lumbar and sacral nerve innervations, urinary and rectal complaints like incontinence [1].

With the increasing use of Intra Operative NeuroMonitoring (IONM) the outcome of neurosurgeries has dramatically improved [2]. Such improvement is desirable in paediatric patients. To facilitate neuromonitoring Total IntraVenous Anaesthsia (TIVA) is the gold standard, but TIVA in paediatric patients undergoing surgery in prone position is challenging.

In this report, we present a case of tethered spinal cord release surgery in a 2-year-old patient under TIVA and challenges encountered.

Case Report

A 2-year-old female weighing 10 Kgs, a diagnosed case of spinal cord dysraphism, was brought to hospital by mother with complaints of repeated urinary tract infections (UTI) with urinary incontinence since 6 months.

Patient was previously operated for swelling over lumbo-sacral region 6 months ago under local anaesthesia, of which details are not available. Presently there is complaint of fluid discharge from previously operated scar. Previous MRI lumbar spine suggested low-lying spinal cord at L5 level with developmental defect at L3 which had dorsal dermal sinus tract connection and sacral agenesis with neurogenic bladder. Micturating urogram also suggested neurogenic bladder. Ultrasonography of Kidneys and urinary bladder showed irregular and thickened urinary bladder wall suggestive of neurogenic bladder.

The authors declare no conflicts of interest.
*Corresponding author.
E-mail address: dr.krunalasuryavanshi@gmail.com

Patient's routine labs like Complete Blood Count, Renal Functions Tests, Liver Function Tests, coagulation profiles were all within normal limits. Urine culture reports demonstrated Escherichia Coli growth.

After a detailed discussion with the surgeon, a plan of TIVA was finalized in order to facilitate IONM and avoid any iatrogenic damage to spinal cord.

A written informed consent was taken from parents. Intravenous access was secured with 22G cannula. Patient was sedated with and Inj Ketamine 10mg IV in pre-operative room and then shifted to operating room. All standard monitors i.e. Pulse oximeter, ECG, Non Invasive Blood pressure were connected and baseline parameters noted.

After pre-oxygenating with 100% O2 for 3min and pre-medicating with Inj Midazolam 0.1mg/kg, Inj Ondansetron 0.2mg/kg and Inj Fentanyl 2mcg/kg IV patient was induced with Inj Propofol 2mg/kg. Inj Atracurium 0.5mg/kg IV was used to facilitate intubation. Patient was intubated with uncuffed endotracheal Tube No 4.5. Oral throat packing was done and all essential electrodes for neuro-monitoring were placed. Proper eye care with chlormyecetin jelly and adequate padding was taken care of. Patient was turned prone with appropriate padding, keeping the abdomen free and maintained on intermittent positive pressure ventilation with appropriate tidal volume and respiratory rate.

Infusions of Inj Propofol (0.5%) 100mcg/kg/min i.e. at rate of 12ml/hr and Inj Dexmeditomidine 0.2mcg/kg/hr at rate of 2mcg/hr were started to initiate TIVA. Muscle relaxant was not used and sevoflurane was used with Minimum Alveolar Concentration (MAC) between 0.5-0.7 Adequate plane of surgical anaesthesia was maintained with the agents and appropriate intra-operative Motor Evoked Potentials (MEPs) were recorded as a part of IONM. Two episodes of tachycardia (HR>150) and raised peak airway pressures were noted which were managed by increasing the rate of infusions. Surgery lasted for about 190 minutes without any untoward complications such as bradycardia and hypotension.

Near completion of surgery infusion agents were tapered and stopped. Patient was turned supine and after adequate spontaneous ventilation, extubated and shifted to Paediatric Intensive Care Unit (PICU) for post-operative monitoring.

Figure 1- Prone position post induction

Discussion

Spine surgeries are performed quite often in paediatric age group for various underlying pathologies of which most common ones are tethered spinal cord, diastematomyelia and syringomyelia [1]. Frequently the kyphoscoliosis correction surgeries are operated under TIVA but these comprise of adolescent age group and administering TIVA is comparatively less challenging.

Our patient was a 2 year old child weighing 10 kgs to be operated in prone position and there are very few reports in the existing literature regarding the administration of TIVA in such young infants for spine surgeries. Hoving et al have reported a study about IONM in tethered cord syndrome patients but the mean age in their study was 22years [2].

The plane of surgical field being in close proximity of various spinal nerve roots of mostly lumbosacral plexus, needed adequate precautions to avoid iatrogenic nerve damage to lumbosacral roots hence monitoring Motor evoked potentials was the most crucial step in managing such cases of spine surgeries [3]. In paediatric patients MEPs are preferred as they are more sensitive to hypo-perfusion and hypoxia and change more rapidly than other modalities to detect any impending damage earlier [4].

Maintaining a deep plane of anaesthesia in prone position using titrated dose of propofol and dexmeditomidine was challenging. Earlier ketamine was used in paediatric cases for TIVA but it was shown to increase MEP amplitudes [5]. Now dexmeditomidine has taken an important place in TIVA as it negligibly interferes with the amplitude and latency of any of the IONM modalities. Propofol and dexmeditomidine provide a very favorable combination to allow MEP monitoring [6].

Though, the risk of intraoperative awareness cannot be ruled out as the inhalational agents are used in minimal concentration of 0.4- 0.6 and may also contribute to emergence delirium in children [7].

While using an uncuffed tube in prone position, the risk of accidental slipping, kinking or extubation could never be overemphasized.

Maintaining spinal perfusion pressures (mean arterial pressure) was challenging as a drop in this may cause reduction in the amplitude of MEPs whilst the surgeon demanding hypotensive anaesthesia [8].

Hypothermia was another concern which needs to be addressed in infants undergoing long duration surgeries as it may lead to hypo perfusion and vasoconstriction again altering the MEP recordings. We used warming blanket to take care of hypothermia.

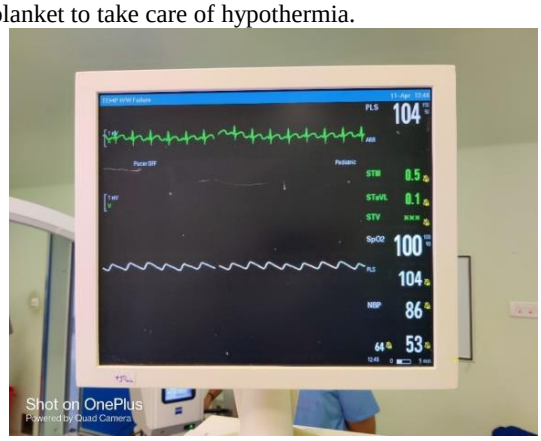

Figure 2- Intra Operative stables haemodynamics

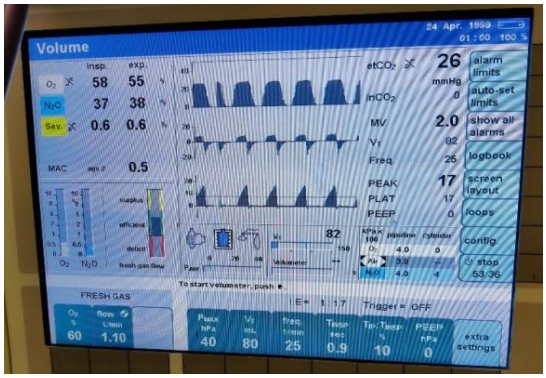

Figure 3- Intra Operative ventilator settings

Conclusion

TIVA for IONM in young children is challenging and needs thorough titration of drugs and collaboration with neurophysicist and surgeon to administer safe and adequate anaesthesia to these patients.

References

[1] Hoving EW, Haitsma E, Oude Ophuis CM, Journée HL. The value of intraoperative neurophysiological monitoring in tethered cord surgery. Childs Nerv Syst. 2011; 27(9):1445-52.

[2] Levin DN, Strantzas S, Steinberg BE. Intraoperative neuromonitoring in paediatric spinal surgery. BJA Educ. 2019; 19(5):165-171.

[3] Yamada S, Colohan AR, Won DJ. Tethered cord syndrome. J Neurosurg Spine. 2009; 10:79–80.

[4] Schwartz DM, Auerbach JD, Dormans JP, Flynn J, Drummond DS, Bowe JA, et al. Neurophysiological detection of impending spinal cord injury during scoliosis surgery. J Bone Jt Surg Am. 2007; 89:2440-9.

[5] Frei FJ, Ryhult SE, Duitmann E, Hasler CC, Luetschg J, Erb TO. Intraoperative monitoring of motor-evoked potentials in children undergoing spinal surgery. Spine. 2007; 32:911–7.

[6] Souter MJ, Rozet I, Ojemann JG, Souter KJ, Holmes MD, Lee L, et al. Dexmedetomidine sedation during awake craniotomy for seizure resection: effects on electrocorticography. J Neurosurg Anesthesiol. 2007; 19: 38-44

[7] J Gaynor, BM FRCA, J M Ansermino. Paediatric total intravenous anaesthesia, BJA Education. 2016; 16(11):369–73.

[8] Lewis SJ, Gray R, Holmes LM, Strantzas S, Jhaveri S, Zaarour C, et al. Neurophysiological changes in deformity correction of adolescent idiopathic scoliosis with intraoperative skull-femoral traction. Spine (Phila Pa 1976). 2011; 36(20):1627-38.