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Improving the perioperative compliance and quality care in obstetric and paediatric anaesthesia: Challenges and anodynes

Lalit Mehdiratta, Kousalya Chakravarthy¹, Smriti Anand²

Anaesthesiology, Critical Care and Emergency Medicine, Narmada Trauma Center, Bhopal, Madhya Pradesh, ¹Department of Anaesthesiology, Modern Government Maternity Hospital, Petlaburj, Osmania Medical College, Hyderabad, Telangana, ²Department of Anaesthesiology and Intensive Care, Maharishi Markandeshwar Medical College and Hospital, Solan, Himachal Pradesh, India
E-mail: Lalitmehdiratta9@gmail.com

Obstetric and paediatric medical sciences are like the two sides of a coin, always attached to each other but still appearing different. Both obstetric and paediatric anaesthesiology have evolved tremendously as super specialities and their scope is expanding beyond the confines of perioperative care to the role of pain anodynes!! The conduct of paediatric anaesthesia poses considerable challenges right from pre-medication and induction to extubation as well as post-operative qualms. An added difficulty is the narrow margin of error in paediatric patients requiring greater expertise and high precision in the safe delivery of anaesthesia. As we write this editorial, several perioperative issues which we have faced during our anaesthesia practice come into our mind and many of these are very eloquently described by authors in their respective manuscripts in this issue of the Indian Journal of Anaesthesia (IJA)

Obstetric anaesthesia though having evolved significantly, remains an “Anaesthesiologist’s niggles” due to the responsibility of saving two lives! The unique anatomical, physiological, and pharmacological adaptations during pregnancy requires extra vigil and prudent antenatal, natal, and postnatal planning. Labour analgesia has progressed from archaic non-pharmacological methods evolving into ether administration by Simpson and undergoing further refinements to chloroform, entonox and neuraxial techniques. The present day obstetric anaesthesia and analgesia embraces various facets of maternal care ranging from labour analgesia to caesarean delivery; non-obstetric surgeries in obstetric patients to intrauterine foetal surgeries, all requiring prudent planning and surveillance with a multidisciplinary

approach involving the obstetrician, foetal medicine team, neonatologist, anaesthesiologist, physician and surgeon.

Good perioperative care should include pre-operative optimisation, plan of anaesthesia, intraoperative care and post-operative pain management. Anticipation of the problems and making a plan to prevent the complications improves the care, patient satisfaction and quality of life on returning home. The foeto-maternal safety should be ensured in all the cases by maintaining normal physiology of pregnancy, avoiding aortocaval compression and optimising uteroplacental perfusion. The Global Sustainable Development Goals (SDGs) and Ending Preventable Maternal Mortality, aims not only to decrease the maternal deaths but also to ensure overall maternal health and well-being.^[1] The Academy of Medical Royal College’s report ‘Quality improvement - training for a better outcome’ recommends the use of methodology framework and training as a fundamental competence in practice for quality improvement efforts. The epidural labour analgesia response time and the accidental dural puncture rate are among the Six Domains of Health Care Quality in obstetrics.^[2] With the increase in the incidence of high-risk obstetrics and obstetric patients on anticoagulants, planning for labour analgesia and anaesthesia should be based on the timing of anticoagulants, coagulation status and the overall clinical condition of the parturient.

Postpartum haemorrhage (PPH) still remains the most common cause of preventable maternal mortality despite many advances in the field of obstetrics and obstetric anaesthesia.^[3] Uterine atony contributes to 70–80% of the causes of PPH. Oxytocin has always

been the first-line drug for prophylaxis and treatment of postpartum haemorrhage but at the cost of its own side effects. The quest for finding the right dose of oxytocin with minimal side-effects is going on since several years. In fact, a thought-provoking editorial on 'Are we using the right dose of oxytocin?' was published some years back in our very own IJA.^[4] Hence, the emphasis currently is on using low doses of oxytocin to achieve the desired effects.

The Royal College of Obstetricians and Gynaecologists (RCOG), American College of Obstetricians and Gynaecologists (ACOG) and the World Health Organization (WHO) recommend prophylactic oxytocin for all deliveries. In low risk mothers (a singleton pregnancy, less than four previous deliveries, unscarred uterus and absence of PPH history), RCOG recommends prophylactic oxytocin 5IU or 10 IU by intramuscular injection after normal vaginal delivery and a slow intravenous bolus dose of 5 IU for caesarean delivery. WHO and ACOG recommend prophylactic oxytocin 10 IU intramuscular injection or 10 IU as dilute intravenous infusion.

The oxytocin requirement differs depending upon the oxytocin receptor expression and density in the myometrium which in turn varies between labouring and non-labouring women. Studies have documented that the ED₉₀ of oxytocin for caesarean delivery is 0.35 units in non-labouring elective cases^[5] and 2.99 units in labouring women posted for caesarean delivery after oxytocin augmentation. The requirement of oxytocin for prevention of PPH in labouring women exposed to oxytocin was found to be 9 times the requirement of non-labouring women^[6] Kovecheva *et al.* conducted a randomized controlled trial of 'Rule of Three' algorithm versus continuous infusion of oxytocin. The authors recommended an initial 3 units of IV bolus dose of oxytocin over 15 seconds with an additional 3 units to be repeated after each 3-minute interval of assessment of uterine tone. An intravenous maintenance dose (3IU/L at 100 ml/h) and a second line uterotonic agent were recommended in situations of inadequate tone after a third bolus of oxytocin.^[7]

A similar study is published in the present issue of the IJA by Joseph *et al.*^[8] The authors conducted a randomised double blind trial on 90 mothers of 37 to 41 weeks, posted for elective caesarean delivery. The subjects were divided into three groups that received oxytocin bolus of one, two or three units diluted in a 10 ml syringe and given over 15 seconds. The

uterine tone was assessed at 2 min after oxytocin administration. This was followed by 10 units of oxytocin infusion in 500 mL normal saline commenced at 125 mL/h. In groups A and B, 66% and 83.3% of the participants, respectively, had an adequate uterine contraction while in group C, the outcome was 100%. The authors have concluded that in elective caesarean sections, a bolus oxytocin dose lower than three units is inadequate for attaining optimum uterine contraction.

Although the 'Rule of Threes' algorithm can be recommended for oxytocin use during elective caesarean deliveries, IV bolus dose of oxytocin is not without its adverse effects. A rapid bolus dose of 3–5 units can cause haemodynamic compromise resulting in maternal mortality.^[9,10] The slow administration of bolus oxytocin requires appropriate dilution and delivery of the drug via a syringe pump over 15–30 seconds. A Cochrane review demonstrated that there is no difference in the efficacy of oxytocin given over intravenous and intramuscular routes.^[11] The WHO recommendation of oxytocin 10IU intramuscular or as slow intravenous infusion as a prophylactic measure to prevent postpartum haemorrhage is safe and effective with minimal adverse effects and stands good in varied situations.

An extremely debilitating condition in obstetric patients is the occurrence of post-dural puncture headache (PDPH) as an aftermath of central neuraxial techniques for anaesthesia or labour analgesia. PDPH carries a high risk of medical liability. Nevertheless, Ali *et al.*^[12] and Prakash *et al.*^[13] have attempted to shed some light on PDPH through their studies in the present issue of IJA.

Quality improvement initiatives in paediatric anaesthesiology have been shown to improve outcomes and the delivery of efficient and effective care at many institutions. Successful quality improvement initiatives utilise cognitive aids such as checklists and have been shown to optimise paediatric patient experience and anaesthesia outcomes and reduce perioperative complications.^[14] Difficult paediatric airway is one of the biggest nightmares of the anaesthesiologist because if not resolved in time it can have catastrophic consequences. Moreover, the anatomical and physiological aberrations of paediatric patients leave a small corridor to undertake corrective measures, should conventional strategies fail. A careful assessment, identification and thorough knowledge of paediatric airways appended with the

familiarity of innovations and algorithms to manage the same, is the norm. Availability of age-appropriate difficult airway gadgets is invaluable to manage those potentially catastrophic scenarios and they should be available at all times.

Application of gadgets for securing the paediatric airway has been evaluated in a randomised clinical trial by Maniranjan *et al.*, where in the authors have compared the time taken for intubation and first attempt intubation success rate between a non-channelled blade of KVL and conventional direct laryngoscope, in infants <1 year of age.^[15] The trial has shown that the time taken for intubation and the first attempt intubation success rate were similar between the study groups. It is needless to mention here that the ease of tracheal intubation varies with the experience of the paediatric anaesthesiologist. The National Emergency Airway Registry for Children (NEAR4KIDS) reveals 1.4% cardiac arrests during intubation in the Paediatric intensive care unit (PICU).^[16] As morbidity increases with each failed attempt at endotracheal intubation, the role of video-laryngoscopy for paediatric airway management may be redefined in the near future: It is already used in predicted difficult airway algorithm in paediatric patients.^[17]

Apart from airway management, the concerns in paediatric anaesthesia range from tackling the anxiety, management of concomitant disease, risk reduction for adverse events and pain management of paediatric patients. Halanski *et al.*, have summarised the overall perioperative care of paediatric patients in their retrospective chart review – ‘Perioperative management of children with spinal muscular atrophy’.^[18]

Renewal of interest in regional anaesthesia techniques is one of the important accomplishments in paediatric anaesthesia. Combined general and regional anaesthesia techniques reduce the exposure to volatile agents and intravenous anaesthetics thereby reducing their side effects like nausea, vomiting and sedation. With the advent of ultrasound guided blocks, the regional anaesthesia techniques in the paediatric patients have become prudent and precise.^[19] The safety profiles of levobupivacaine and ropivacaine have further augmented the reliability of regional anaesthesia techniques in children. There has been a recent surge in administration of peripheral nerve blocks in the paediatric population to provide postoperative analgesia. Perioperative pain control should be aimed to facilitate enhanced recovery and early return to normal

activity and prevention of chronic pain and anxiety. Regional anaesthesia techniques with ultrasound guided blocks and opioid-free analgesia give better pain management with few adverse effects in the paediatric age group. The article on ultrasound directed rhomboid intercostal block in the present issue of IJA provides good insight into paediatric pain relief.^[20]

Another compelling challenge to the paediatric anaesthesiologists is an encounter with a syndromic child!! Although many of the syndromes are now better understood because of advancements in knowledge of the genetic assembly, the anaesthesiologists may still face unreported difficulties and hurdles. There is no dearth of case reports and Letters to Editor on anaesthetic management of syndromic children.^[21-24]

This issue is therefore a compilation of various topics designed to provide fascinating and engrossing snippets of information that will aid the anaesthesiologists involved in obstetric and paediatric care. The aim is to captivate the readers with a pot-pourri of interesting succinct of common and uncommon obstetric and paediatric challenges and their appropriate anaesthetic management.

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