Editorial

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# Category I caesarean delivery and preferred mode of anaesthesia: Dilemma persists

Research in obstetric anesthesiology over the past decade has spanned multiple areas, and many have contributed to refining of regional anaesthesia approaches for caesarean delivery (CD), with a substantial reduction in anaesthesia-related morbidity and mortality.

The rates of CD have increased world over with a global average increase from 6.7% in 1990 to 19.1% in 2014, while in some countries the rates exceed 30% (Latin America and the Caribbean, North America and Oceania), and in the United States an increase in CDrates as high as 65% has been reported.[1] These spiralling rates of CD have placed increasing demands on the obstetric anaesthesiologists to provide high-quality, safe anaesthesia for both elective and emergency caesarean sections.

Spinal anaesthesia (SA) has been considered as the first choice for uncomplicated elective caesarean deliveries, whereas general anaesthesia (GA) is typically considered in emergent indications for CD or in women with contraindications for neuraxial anaesthesia. In category I CD for cord prolapse, placental abruption, or antepartum hemorrhage, where there is an immediate threat to the life of the mother or baby, GA remains the first choice. In scheduled CD, the incidence of GA has been found to be 11.3% while 88.7% received neuraxial anaesthesia.[2] The rate of GA usage was 5.8% of all CDs and 14.6% of emergent CD, as reported in National Anesthesia Clinical Outcomes Registry (NACOR) dataset,[3] while the 30-year update from the Anesthesia Workforce Survey has reported a slight increase in emergent GA use from 15% to 19%.[4]

Several randomised controlled trials have compared neonatal outcomes with different anaesthetic techniques for CD, focusing on Apgar scores at 1 and 5 min after delivery.[5,6] A Cochrane review that pooled the results of 22 studies and was updated in 2012 reported no difference in Apgar scores at 5 min and concluded that superiority of neuraxial over GA could not be conclusively proven. Since 2012, there have been reports that prove SA to be superior to GA with respect to fetal acid–base status and Apgar scores.[7,8]

Recently, Kim *et al*.[9] compared maternal and fetal outcomes associated with four different anaesthetic techniques for CD through a network meta-analysis. Randomised trials reported outcomes based on the following: Apgar at 1and 5 min, umbilical arterial pH(<7.2), umbilical venous pH, and neonatal scores at 2–4 h. They concluded that SA was significantly superior to GA in terms of Apgar scores at 1 and 5 min; umbilical venous pH was better with epidural when compared with SA and GA; and umbilical arterial pH with all three neuraxial techniques was significantly lower than GA. Another significant study by Abe *et al*.[2] studied the influence of the mode of anaesthesia on elective CD and concluded that GA was associated with a 2.6-fold increased odds of severe maternal morbidity compared with neuraxial anaesthesia. The GA group was more at risk of sepsis with increased odds of red blood cell or plasma transfusions.

There is little good quality evidence about the ideal anaesthetic technique for patients requiring emergency CD, and therefore it is imperative to determine what type of anaesthesia is associated with less adverse outcomes for the mother, foetus and the neonate, in an emergency. In a study published, in this issue of the *Indian Journal of Anaesthesia*, Thangaswamy *et al*.[10] have investigated whether the mode of anaesthesia used for emergent CD influences the maternal and neonatal outcomes. All parturients undergoing category I CD who had a fetal heart rate (FHR) <100,

persistent deceleration pattern of FHR, suspected maternal coagulopathy, maternal sepsis, severe cardiovascular disease, or eclampsia received GA. Of the 51 parturients who had adverse neonatal outcome, 27.4% received SA, whereas 72.5% received GA. The 1- and 5-min Apgar scores were significantly lower in the GA group, as also neonatal intensive care unit admissions, duration of stay, and mortality in this group were significantly higher than the spinal group. Of the variables studied, only the type of anaesthesia, preoperative FHR, and gestational age had a *P* value <0.2 in univariate analysis. However, of the three predictor variables, only the mode of anaesthesia and gestational age were statistically significant. Thus, the GA group had 2.9 times more chances of having an adverse neonatal outcome when compared with the spinal group.

It is very difficult to avoid bias in such studies, as prospective randomisation into either spinal or GA, to study the potential impact of anaesthesia type on maternal morbidity in the obstetric setting, would not be ethically justified. The effect of general anaesthetic agents, influencing neonatal outcome, following placental transfer in an already compromised foetus, preexisting maternal comorbidities, affecting the foetus, can all contribute significantly to adverse maternal and neonatal outcomes.

Apgar scores at 1 and 5 min are considered as poor indicators of asphyxia and do not have a prognostic value for neonatal well-being; instead, the umbilical arterial base deficit is considered a more specific and more valid index for prognosis in the neonate.[11]

Umbilical arterial pH is influenced by variations in maternal ventilation, which alters umbilical venous pH and subsequently the umbilical arterial pH, thus limiting its value as an indicator of neonatal acid–base status. Apart from neonatal admission in intensive care unit and their outcome, breastfeeding success, maternal variables such as hypotension, postdural puncture headache, conversion to GA, airway problems, birth weight, gestational age, decision-to-delivery intervals, surgery duration, uterine-incision-to-delivery intervals are all known to influence the supremacy of one anaesthesia technique over the other.[10]

Fetal bradycardia on FHR monitoring and severe acidosis as diagnosed in the post delivery umbilical artery blood sample is a typical warning sign of severe acute intra partum fetal asphyxia, seen during category I CD for umbilical cord prolapse.[12] If it stays undiagnosed and untreated, it can lead to a critical time-dependent progression to irreversible fetal brain injury. Although Royal College of Obstetricians and Gynaecologists mandates a decision-to-delivery interval of ≤30 min, such clinical situations require a much shorter decision-to-delivery interval.[13]

Acute intrapartum fetal compromise can reduce the umbilical artery buffer base by 1 mmol every 2–3 min.[14] The risk for irreversible neonatal motor or cognitive impairment rises from 20% in the 30–34 mmol range of umbilical artery buffer base to an 80% risk in <22 mmol.[14] Thus, to avoid severe fetal compromise, we need to deliver the foetus urgently under GA with a rapid sequence induction. In the 7th Annual Report on Confidential Inquiry into Stillbirths and Deaths in Infancy in the UK, 11 of 25 cases where anaesthesia significantly contributed to neonatal death were associated with prolonged attempts at establishing regional anaesthesia.[15]

The need for category 1 caesarean section in the presence of an unfavourable airway is a highly challenging scenario, which is occasionally faced by inexperienced anaesthetists working alone with inexperienced staff and at an unearthly hour.[16] Although our primary concern is the mother and ultimately maternal safety takes precedence over fetal well-being, nevertheless all therapeutic approaches in this situation have to balance both maternal and fetal risk and weigh the pros and cons for mother and child safety. An interesting study data suggests that on comparing a rapid sequence induction time (100s), with 6.3 min for SA and 9 min for awake fibre optic intubation, it is always better to resort to a rapid sequence intubation, as this decision would give a fair chance of fetal survival, because the risk to mother is just 21:100,000.[16]

Undertaking clinical research in obstetric anaesthesia is a potentially challenging process. Published studies have played an important role in advancing our understanding of challenging situations and risk factors influencing maternal and neonatal outcomes, and in charting new directions for interventions that may reduce the occurrence of adverse outcomes. The challenge that lies ahead is to incorporate these data in development of practices and system-based changes that would bring about meaningful reductions in the occurrence of untoward events. Decision for mode of anaesthesia in category I CD should finally be left to

the discretion of the individual clinician, to estimate how an informed decision can affect the mother and foetus in a particular situation.

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