

Present Status of General Anaesthesia in Caesarean Deliveries

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ABSTRACT

Central neuraxial block is the established gold standard for caesarean sections & has been one of the major contributors to improvements in quality & safety of obstetric anaesthesia along with reduction in anaesthesia related maternal mortality & morbidity. Therefore, where does general anaesthesia stands in caesarean deliveries?

Should it be best avoided?

What are the steps to be taken to make regional successful?

If unavoidable then what should be the strategy?

Let us try to reason out

KEY WORDS: CAESAREAN DELIVERY, REGIONAL, GENERAL, ANAESTHESIA.

INTRODUCTION

In our subcontinent regional anaesthesia, to be specific spinal anaesthesia is exclusively used for caesarean deliveries. In India c section rate as per NFHS-4 (national family health survey) 2015-16 at population level seems to be 17.2%. According to FOGSI (federation of obstetric & gynaecological societies of India) there is vast discrepancy between urban & rural, private & public sector. The current birth rate for India in 2021 is 17.377 births per 1000 people. According to "National centre for health statistics" USA, percent of all deliveries by caesarean section are 31.7% with 1,186,397 sections performed every year. If we consider above figures, then many women undergo caesarean section every year. The use of GA for c section is declining unless regional is absolutely contraindicated. The common indications for GA are-

- Urgency
- Maternal refusal of RA

- Inadequate or failed regional
- Contraindications to regional

In terms of urgency, it is classified into the following groups (4)

1. Immediate danger to the mother and fetus' lives
2. Non-life threatening maternal or foetal discomfort.
3. There is no risk to the mother or the fetus, but the baby must be delivered quickly.
4. Delivery at a time that is convenient for both the woman and the crew

Failed intubation, aspiration of gastric contents, increased blood loss, and awareness are the main problems with GA in c section. Difficult intubation is 10 times more in these patients than their non-obstetric counterparts. The incidence of unsuccessful intubation was reported to be 1:312 in a recent multicenter observational analysis of over 2500 caesarean births. The researchers characterized "difficult airway" as failure to intubate the trachea, more than two attempts by a senior anaesthetist, or written evidence of difficult intubation in the medical record by the provider. Furthermore, distinctive physiological changes in the obstetric patient's respiratory system (decreased functional residual capacity, increased minute breathing, and increased resting metabolic rate) make airway management more difficult, with the possibility of quick onset profound hypoxemia.

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Is it best to avoid GA?: In past the mortality with GA was reported to be 17 times more than regional. Recently it seems that the case fatality rate between the two techniques have converged to become statically indistinguishable. The possible explanation is use of CNB in high-risk obstetric cases. Guglielminotti J et al has put forward the following observations from an analysis of a billing data emphasising the importance of case selection.

- The use of potentially avoidable general anaesthesia in these patients is associated with an increased risk of anaesthesia-related complications, surgical site infection, and venous thromboembolism, but not death or cardiac arrest • 44 percent of caesarean sections in New York State are performed without a clinical indication for general anaesthesia A low hospital-level use of neuraxial techniques during labour was one of the strongest predictors of potentially avoidable use of general anaesthesia for caesarean delivery.
- Anaesthesia-related problems, severe anaesthesia-related problems, surgical site infection, and venous thromboembolism all increased by 62%, 289%, 74%, and 92 percent, respectively.

This study adds to the growing body of evidence linking general anaesthesia to increased postoperative pain, delayed mobilization, poor nursing success, infant respiratory depression, and a lower Apgar score. With a well-conducted neuraxial aesthetic, it is best to avoid general anesthetic if possible. The overall rate of general anaesthesia for caesarean deliveries should be less than 5%, according to “The Society for Obstetric Anaesthesia and Perinatology” (SOAP) (12). The “Royal College of Anaesthetists” recommends a rate of less than 1% for elective caesareans and fewer than 5% for emergent caesareans. In most cases, category 1 C sections (placental abruption, cord prolapse, prenatal placental hemorrhage, and non-reassuring foetal tracing) will be performed under general anaesthetic. Thangaswamy et al. (14) have investigated whether the mode of anaesthesia used for emergent CD influences the maternal and neonatal outcomes.

All parturient undergoing category I caesarean delivery who had a foetal heart rate (FHR) <100, persistent deceleration pattern of FHR, suspected maternal coagulopathy, maternal sepsis, severe cardiovascular disease, or eclampsia received GA. Out of these the 51 parturient who had adverse neonatal outcome, 27.4% received SA, whereas 72.5% received GA. The GA group had considerably lower Apgar values at 1 and 5 minutes. In addition, admissions to the neonatal intensive care unit, length of stay, and mortality were all considerably greater in this group than in the spinal group. The variables that were investigated were:

1. the anesthetic method
2. FHR prior to surgery.
3. the gestational age of the baby.

In univariate analysis, the P value was 0.2. Only the style of anesthetic and gestational age were statistically significant among the three predictive factors. When compared to the control group, the GA group had 2.9 times the likelihood of having a bad neonatal outcome.

In a network metaanalysis, Kim et al. (15) examined maternal and fetal outcomes linked with four different anaesthesia procedures for caesarean delivery. The following criteria were used to report the results of randomized trials:

- Apgar at 1 and 5 minutes;
- pH of umbilical arterial blood (7.2);
- The pH of the umbilical venous system, and
- 2–4 h neonatal scores

They concluded that SA was considerably superior to GA in terms of Apgar scores at 1 and 5 minutes; that epidural was superior to SA and GA in terms of umbilical venous pH; and that all neuraxial methods had significantly lower umbilical arterial pH than GA. The use of general anaesthesia for caesarean deliveries has decreased overall. General anaesthesia is no longer a factor in maternal mortality caused by anaesthesia. As a result, more possibilities to decrease its use should be highlighted. To assist minimize needless general anesthetic, it is critical to enhance knowledge in identifying situations and people at risk.

The concept of rapid sequence rapid sequence spinal (RSS): When the time element is critical, it should be considered for category 1 portions. This approach, which was first published in 2003, streamlines the procedure in order to eliminate the hazards associated with general anaesthesia (17,18,19,20). Steps that are not required for spinal anaesthesia placement are skipped, allowing for quick delivery of surgical anaesthetic with skin incision permitted as long as the aesthetic goal is a T4 dermatomal block. This notion, which is currently gaining popularity, is routinely implemented in our installations.

Minimizing the need for GA though always a backup: Proactive role of anaesthesiologist in educating patient, & all stakeholders like obstetrician, paediatrician, & midwives. Early involvement of anaesthesiologist right from antenatal counselling to labour ward to have a “situational awareness”, timely decisions & early placement of epidural catheter (most relevant in COVID pandemic) (21,22).

COVID CONCERN: In view of COVID pandemic it becomes more relevant to resort to regional anaesthetic techniques. The post-operative pulmonary complications with increased mortality & morbidity are associated with COVID. The aerosol generation & spread of infection also puts the theatre staff at increased risk despite following the protocol for testing & protection as well.

Does early labour analgesia grantee timely & effective surgical anaesthesia?

The answer is no.

Recognize dysfunctional epidural catheters early. The safe and effective management of the failed conversion from labour epidural analgesia to caesarean anaesthesia is still controversial. For successful conversion, initiate neuraxial labour analgesia with a combined spinal epidural (rather than an epidural). The availability of an obstetric anaesthesia fellowship trained anaesthesiologist on site matters a lot for success.

The failure can be predicted if-

- An increased need for caesarean delivery due to an increase in the number of epidural boluses given during labor.
- A non-obstetric anaesthesiologist is providing care.
- The parturient is asking analgesic redosing on a regular basis.

As a result, if in doubt, maintain the epidural catheter replacement threshold low. Epidural catheters with patchy or one-sided analgesia can be identified with regular examinations of dermatomal level and analgesic response. Replacement of neuraxial labor analgesia will increase maternal comfort and satisfaction during the postpartum period. It also lowers the chances of general anaesthesia and possibly anaesthesia-related problems (e.g., high neuraxial block if de novo spinal).

Prompt detection of failed/ incomplete block in OT: This will prevent pain and suffering during the procedure, as well as the need for general anaesthesia due to maternal discomfort. Assess the block level, (dermatomal level T4) by touching or pinpricking it. To local anaesthetics, add neuraxial opioids (short and long acting). This will ensure appropriate intraoperative analgesia as well as long-term postoperative analgesia. Nonopioid analgesic adjuvants such as neuraxial clonidine (30) or dexmedetomidine (31) or intravenous ketamine may also be beneficial. Supplemental analgesia, sedation, & decision to convert to general anaesthesia is a tight rope walk better left to the discretion of team involved.

General anaesthesia an all-time back up, & the safe strategies for future:

The obstetric airway-

In the obstetric population, procedural complexity, problems, and failures are more common than in the general population. Pregnant women face increased morbidity during extubation, emergence, and recovery, in addition to a higher chance of problematic intubation. Extubation failure is uncommon in the non-pregnant population, although making a comparison between the two is challenging due to differences in criteria and the quantity and types of databases examined. Over the last four decades, opportunities for training in obstetric anaesthesia airway management have declined. According to a retrospective audit at a single UK institution, the usage of general anaesthesia for caesarean delivery has decreased from 76 percent in 1982 to 7.7 percent in 1998, and then to 4.9 percent in 2006.

With these low rates becoming more widespread around the world, many residents/trainees are expected to graduate without administering a general anaesthesia to a pregnant patient. This could be one of the contributing elements to the problem. To some extent, simulation and advanced instructional modalities can help. Simulation drills can help to foster multidisciplinary communication and teamwork, both of which are advantageous.

Always remember: Proper head position/ ramped /head elevating pillows are helpful & should be pre planned. Preoxygenation along with continued oxygenation during intubation will prevent fast desaturation. Cricoid pressure should be used judiciously & should be released if obstructing intubation but being on guard about aspiration. Supraglottic airway devices & video laryngoscopes are accepted in this situation.

Post-operative pain & its repercussions on maternal health after GA:

Post GA caesarean pain may be worst or difficult to treat. Neuraxial anaesthesia with opioids has been found to be superior to systemic opioids. The early recovery of bowel function, early ambulation, and shorter length of stay are all advantages of neuraxial anaesthesia. (40) Although truncal block procedures such as transversus abdominal plane block and quadratus lumborum plexus block may provide better analgesic effects than parenteral or oral opioids, they cannot compare to CNB's analgesic efficacy. Postpartum depression has been linked to persistent discomfort that lasts longer than expected.

Accidental awareness during GA-

The factors contributing to AAGA in the obstetric patient.

The patient:

- Young age
- Female sex
- Obesity
- Difficult airway

The organisational factors:

- Inexperienced anaesthesiologist
- Odd hours
- Urgency of surgery

Technical factors:

- Inadequate doses of induction agent
- Rapid sequence induction
- Use of muscle relaxants
- Avoiding using opioids in induction for fear of respiratory depression of new-born

A short duration of awareness mostly occurred at or shortly after induction of anaesthesia when the effect of iv agent is wearing off & the volatile agent has not taken over, what we call iv- inhalational interval. Because of the higher cardiac output in late pregnancy, an i.v. bolus of induction agent has a shorter duration of action and takes longer to generate an effective

partial pressure of volatile agent. The interval between induction of anaesthesia and the initial surgical incision is brief in a Category 1 Caesarean section. As a result, maximum surgical stimulation may occur at a time when anaesthetic depth is insufficient. Any problems with airway management will cause the administration of the volatile chemical to be delayed.

Women's anxiety levels are generally high before having a Caesarean section, which may predispose them to AAGA. Furthermore, certain physiological changes associated with pregnancy (e.g., tachycardia) may make detecting clinical indications of inadequate anaesthesia more challenging. An experienced anaesthesiologist keeping low threshold for suspecting AAGA with full understanding of the above facts can avoid this complication & prevent consequence which can be catastrophic, like post-traumatic stress disorder, sleep disturbances, and interference with activities of daily living. Taking into consideration the problems with GA we need to do some changes in our approach as it is an all-time back up for failed neuraxial block.

The choice of induction agent: Thiopentone is still popular in obstetric anaesthesia. It can be used with little higher doses, 5mg/kg in healthy parturient instead of >4mg/kg. One must be careful with haemodynamically unstable parturient. Thiopentone has the advantage of being familiarity with old generation anaesthesiologists. It is relatively cardio stable as compared to propofol & more is known about its neonatal effects than other agents. New generation anaesthesiologists are unfamiliar with the use of thiopentone. Therefore, propofol for induction has been suggested. Propofol is commonly used for non-obstetric cases amounting to familiarity. Overdose (MBRRACE-UK report) & underdose with thiopentone has been reported leading to haemodynamic instability & AAGA, respectively. Propofol does not need remixing & there is no risk of swapping syringe with that of antibiotic. Also, there is no evidence that propofol has more adverse effects on neonates as compared to thiopentone.

Use volatile agents & nitrous oxide: To avoid infant sedation and blood loss due to uterine relaxation, a 0.5 minimum alveolar concentration (MAC) of volatile agent was previously recommended. Higher MAC has been found to be unrelated to newborn sedation and to decrease the iv-inhalational gap. Use over pressure method i.e., high initial concentration of volatile anaesthetic with high fresh gas flow. With this method one needs to be watchful about uterine tone & use appropriate uterotonic. Nitrous oxide addition as a carrier gas can reduce the amount of volatile agent. Nitrous oxide has no effect on uterine tone, but its safe concentration needs to be investigated especially in case of compromised foetus.

Use of opioids: The reason for withholding opioids in RSI was their placental transfer & fear of respiratory depression of new-born. At the same time fear of delayed awakening of patient in case of failed intubation &

abandoning the GA. There is no evidence in support of this argument. In fact, it may help in reducing i.v.-inhalational gap with added advantage of providing analgesia for airway handling & skin incision which are the powerful stimulants for haemodynamic fluctuations.

Always maintain anaesthesia while managing difficult airway: This is to avoid awareness owing to delay in delivery of volatile agents. It is better to have a good action plan. Always keep induction agent syringe ready if you have decided to continue with GA.

Monitoring the depth of anaesthesia: It is not commonly done. & controversial. The gold standard is clinical assessment.

Succinylcholine verses rocuronium for RSI: Succinylcholine for RSI is a regular feature in our country. The dose is 1.5mg/kg. It has rapid onset & offset enabling quick intubation & return of spontaneous respiration. Even then life threatening desaturation has been observed before recovery of neuromuscular function. Succinylcholine has also been linked to adverse effects such as muscle aches and anaphylaxis. It has also been observed that in difficult intubations involving succinylcholine, the neuromuscular block may have begun to wear off by the time further attempts at laryngoscopy are made, resulting in a decline in the quality of the intubating circumstances. Rocuronium in dose of 1.2mg/kg is included in RSI. The onset time & intubating conditions are comparable to succinylcholine in obstetric population. The problem is sugammadex, the drug which reverses the action of rocuronium in a mean 2.9 min (SD 1.7) which is faster than scoline, is not available freely in India.

Also, dose is 16mg/kg which needs the drug to be drawn from multiple vials where time counts a lot in emergency. Desaturation has been observed to occur faster in non-obstetric population with succinylcholine as compared to rocuronium during difficult intubation which may be attributed to fasciculations. The need for category 1 caesarean section with unfavourable airway is extremely challenging situation especially when faced by an inexperienced anaesthesiologist, working alone with inexperienced staff at odd hours. Although the mother is our initial concern, and maternal safety takes precedence over foetal well-being, all treatment interventions in this situation must balance both maternal and foetal risk and consider the benefits and drawbacks for both mother and child safety. According to an interesting study, when comparing a rapid sequence induction time (100s) to 6.3 minutes for SA and 9 minutes for awake fibre optic intubation, it is always better to employ a rapid sequence intubation because the danger to the mother is only 21:100,000. Different studies on general anaesthesia were reviewed.

To conclude: General anaesthesia is the option at one point of time with no other go. All time availability of expert obstetric anaesthesiologist is mandatory.

Simulation drills to maintain the skills of general anaesthesia in obstetric are the need of the hour. A well-informed consent including explanation about awareness must be obtained.

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