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**A Review Article in:**

## **Anesthesia in Cesarean Section**

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**Submitted by: Mnars Kanaan Abd. Ali**

**Supervised by: Ass. Prof. Dr. Nameer Fadhel Ghaib**

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(أَمَّنْهُ هُوَ قَانَتْ أَنَاءَ اللَّيْلِ سَاجِدًا وَقَائِمًا يَحْذَرُ الْآخِرَةَ وَيَرْجُو رَحْمَةَ رَبِّهِ ۗ

قُلْ هَلْ يَسْتَوِي الَّذِينَ يَعْلَمُونَ وَالَّذِينَ لَا يَعْلَمُونَ ۗ إِنَّمَا يَتَذَكَّرُ أُولُو الْأَلْبَابِ)

صدق الله العلي العظيم

من سورة الزمر الآية 9

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## **Abstract**

Cesarean section is the most common done surgery in the obstetrics and gynecology. Its estimated that 15% of all births in the world is completed by caesarean section, of which 40% in developing countries. Thus, it's very important to pay more attention to the anesthetic consideration of the surgery including the type of anesthesia , the pre-operative preparations and the possible complications. Anesthesia for cesarean delivery can be achieved either through general anesthesia (GA) or regional anesthesia (RA) such as spinal anesthesia (SA), epidural anesthesia (EA), or combined spinal-epidural anesthesia (CSE). The regional anesthesia now considered the method of choice because it is more safe and less risky than general anesthesia. Hypotension, headache remain the most common noted complications. The general anesthesia is done when regional anesthesia is contraindicated. It has faster rate of induction and lower risk for hypotension but it is more risky in terms of asphyxia and apnea.

**Keywords:** Anesthesia, Cesarean section, regional anesthesia, general anesthesia.

## **Introduction**

Cesarean section is the most common obstetrical operation. It can be done as an elective or as an emergency procedure. In both industrialized and developing countries, the proportion of women giving birth through cesarean delivery is increasing, either at the request of the woman or as a result of problems (1). According to estimates, caesarean sections are used in 15% of all births worldwide, with 40% of those in underdeveloped nations. Cesarean section is associated with a tenfold increase in maternal mortality as compared to vaginal birth. Traditionally, general anesthesia is used for this type of operation (2). Due to the increased use of neuraxial

anesthesia, the mortality rate of pregnant women who had a caesarean section has decreased in recent decades. The type of anesthesia used is determined by various criteria, including the urgency of the surgery, the patient's overall health and comorbidities, difficulties during pregnancy or childbirth, and the fetal status (3). The safety and health advantages to the mother and fetus are an important consideration when choosing an anesthetic approach for cesarean birth. Although anaesthetic techniques have improved throughout time, procedures have gotten safer and more secure, there is still significant maternal and fetal morbidity. (4). The goal of cesarean delivery anesthesia is to ensure the safe birth of the fetus with minimal or no complications for the mother. As a result, it's crucial to compare the fetal and maternal results of regional anaesthetic against general anesthetic (5).

Anesthesia for cesarean delivery can be achieved either through general anesthesia (GA) or regional anesthesia (RA) such as spinal anesthesia (SA), epidural anesthesia (EA), or combined spinal-epidural anesthesia (CSE).

### **Aim of study**

To identify the preoperative preparation, intraoperative anesthetic issues, postoperative complications and how to manage them.

### **Pre-anesthetic evaluation**

A preoperative visit establishes the potential mother's trust and confidence. The majority of pregnant women are young and healthy, but the physiological changes that occur during pregnancy make them vulnerable to quick and unexpected decline. Pregnancy is classified as ASA Physical Status II by the American Society of Anesthesiologists (ASA). (6) Before undergoing any anaesthesia operation, a thorough

maternal history and examination are required. Any important obstetric or anaesthetic risk factors should be looked for during the preanaesthetic evaluation, which necessitates a previous consultation between the attending obstetrician and anaesthesiologist. As heart diseases, particularly mitral stenosis, manifest for the first time during the third trimester of pregnancy, any new onset dyspnea should be properly investigated. A thorough review of allergies, medications, previous anaesthetic exposure, recent food and liquid intake, and blood pressure records should be completed and documented. A list of comorbidities should be made, including spinal deformities, obesity, and coagulation disorders. There should be no contraindications to spinal anaesthesia (SA), and the patient should be extensively examined for an alternate management plan (7). Because the course of pregnancy is linked to changes in Mallampati classification, airway assessment during preoperative evaluation is critical (8).

Changes in the soft tissues of the airway mucosa, swelling and engorged breasts, and complete teeth may all contribute to the increased incidence of problematic airway in parturients. As a result, it's critical to try to predict if an airway will be problematic or not ahead of time. Many features of perioperative care have improved obstetrical outcomes. Anesthetic-associated obstetric mortality has dropped to seventh place on the list of causes of maternal mortality in the United States, with rates of 1–3 maternal deaths per million births in both the United States and the United Kingdom (9).

A thorough understanding of the physiologic changes involved with pregnancy, labor, and delivery is required to provide a safe and efficient anesthetic method for Cesarean delivery. These changes are caused by changes in the maternal hormone balance, biochemical shifts associated to

the fetus' and placenta's increased metabolic demands, and mechanical forces from the gravid uterus (10). Supine positioning causes maternal hypotension because the gravid uterus compresses the aorta and vena cava, lowering cardiac preload and output. Furthermore, up to 15% of pregnant women experience substantial supine hypotension (defined as a fall in mean arterial pressure (MAP) of 15 mmHg with an increase in heart rate (HR) of 20 bpm). Supine placement is avoided with any anesthetic delivery after mid-gestation to avoid hypotension (11).

In terms of both mother and fetus, preventing aortocaval compression by the gravid uterus is critical. The gravid uterus compresses the aorta and inferior vena cava in the supine posture, causing hypotension due to decreased preload. Blood becomes hypercoagulable during pregnancy due to an increase in clotting factors. Although this helps to reduce surgical blood loss, it also raises the risk of deep venous thrombosis. In an otherwise healthy patient, a Cesarean delivery doubles the risk of venous thromboembolism (1 in 500) compared to a vaginal delivery. The evidence from randomized studies is insufficient to assess the benefit of preventive anticoagulation, however a prudent approach often includes the use of pneumatic compression devices and/or subcutaneous heparin. Following Cesarean delivery, 0.8–1.0 l of blood is typically lost, but the contracting uterus autotransfuses 0.5 l blood. With Cesarean delivery, the need for blood transfusion is infrequent (12).

Following induction of anesthesia, women past mid-gestation are at an increased risk of regurgitation and pulmonary aspiration. The stomach and pylorus are pushed upward by the gravid uterus, which places the intra-abdominal part of the esophagus intrathoracic. Increased progesterone and estrogen levels reduce the esophageal sphincter's competence, resulting in additional tone reductions. The larger uterus increases gastric pressure, and

gastrin released by the placenta stimulates stomach acid output, lowering gastric pH. Maternal acid reflux becomes more common as the pregnancy progresses, affecting the majority of pregnant women.. In addition, gastric emptying is decreased during labor, increasing the risk of aspiration with induction of general anesthesia in a patient who has been laboring. In retrospective analysis of patients undergoing general anesthesia, mortality from an aspiration event can range from 5 to 15% (13-14).

### **Intraoperative care and the choice of anesthesia**

The type of anesthesia chosen is based on a number of factors, including the urgency of the surgery, the mother's and fetus' overall health, the woman's comorbidities, and her agreement to the proposed anesthetic procedure. For a caesarean section, general anesthesia is used. Because of airway problems, neuraxial anesthesia is increasingly replacing the widely utilized general anesthesia. General anesthesia is only used in the case of a cesarean section with a level 1 urgency, in pregnant women who are hemodynamically unstable, and in instances when neuraxial anesthesia is contraindicated (3). To prevent regurgitation and aspiration of stomach contents, "rapid-sequence induction" (RSI) is performed after antacid prophylaxis, aorticaval compression prevention, and obligatory 100 percent oxygen preoxygenation. For induction, any intravenous hypnotic can be used safely. The method used by Sellick to prevent aspiration is debatable (15).

Succinyl-choline is still the most popular relaxant, while rocuronium is becoming more popular. Rocuronium, at a dose of 1-1.2 mg/kg, should only be utilized if sugammadex can be used to reverse neuromuscular blockade in the event of a failed intubation. Patients who received magnesium sulfate should expect nondepolarizing muscle relaxants to have a long-lasting effect, therefore neuromuscular monitoring is recommended

in this instance (15). The presence of awareness under general anesthesia for a caesarean section is a regular issue. Because volatile anesthetics, which are utilized to maintain anesthesia, might produce dose-dependent uterine atony and potentiate bleeding, they are employed in low concentrations, resulting in insufficient anaesthetic depth (16). General anesthesia has the following advantages over neuraxial anesthesia: quick induction, regulated ventilation and thus improved oxygenation of the fetus, and a reduced degree of hypotension, making it the technique of choice in hemodynamically unstable patients (placenta praevia accreta, and percreta). In the case of a breech presentation, general anesthesia provides the advantage of allowing the fetus to be extracted more easily due to the use of muscle relaxants (17).

Failure of intubation and ventilation, the risk of aspiration of gastrointestinal contents, and drug-induced newborn depression are all disadvantages of general anesthesia. General anesthesia, as opposed to neuraxial anesthesia, is associated with significant intraoperative blood loss and a lower Apgar score in the first minute. General anesthesia is associated with a higher rate of maternal death than neuraxial anesthesia due to difficulties with the airway (3).

Regional anesthesia has become the default method for anesthesia for cesarean delivery. The advantages of regional anesthesia are (18):

1. Avoidance of the airway. There is a risk of not being able to intubate the patient's trachea with general anesthesia, or that the patient would reflux and aspirate gastric contents, resulting in pneumonia.
2. Greater safety for the mother. Maternal mortality due to anesthesia has decreased, owing to the elimination of the airway risk. This pattern is linked to a rise in the usage of regional anaesthetic..



3. Parental bonding. All Mothers want to be awake fast to see their newborn. They also want to share the experience with their partners.
4. Less blood loss. Less blood loss and fewer transfusions are associated with regional anesthesia.
5. Postoperative analgesia. The patient can receive neuraxial opioids for postoperative analgesia via localized methods.
6. Less drug toxicity to the baby. Because of medication transmission from the mother, babies are mildly depressed after general anesthesia. With localized anesthetic, there is less drug transmission.

The main contraindications include infections, coagulopathy, patient refusal and active neurological disease (18).

In terms of neonatal intensive care admission and length of hospital stay, there was no statistically significant difference between the methods of anesthetic used in the emergency and elective categories. In the emergency category, spinal anaesthetic scored higher than general anesthesia, but there was no significant difference in the elective category. After regional anesthesia, more diclofenac sodium and paracetamol were utilized, and less opioids were used than after general anesthesia. With epidural anesthesia, patient satisfaction was higher (19).

## **Post-operative anesthetic complications**

### **Complications of regional anesthesia**

A common consequence of neuraxial blockage is post-dural puncture headache (PDPH). The largest risk category is parturient, with documented incidences ranging from 0% to 30% in these patients. PDPH is linked to the size and type of spinal needles used, and it is gradually reduced with the use of thinner Quincke-type spinal needles (20). Fortunately, serious neurological consequences from regional anaesthesia are uncommon. After

Central neuroaxial block, the risk of permanent or temporary neurologic sequelae is estimated to be between 1/1,000 and 1/1,000,000. At the level of the spinal cord, nerve root, or peripheral nerve, direct trauma to the neural tissue can occur. The epidural needle or spinal needles may touch the nerve roots or may directly injure the spinal cord (21).

Epidural abscess is a rare but dangerous CNB consequence. An infection in the body seeding the epidural space is the most common cause of epidural abscess. Sympathetic inhibition induces a considerable decrease in venous return due to dilation of the resistance and capacitance veins, resulting in hypotension after neuraxial blockade. Pre-loading with crystalloids to prevent hypotension is contentious since it causes peripheral vasodilation and hypotension by inducing atrial natriuretic peptide release. Coload, or supplying liquids during the process, is a more reasonable technique. Ephedrine has been recommended as the vasopressor of choice for the hypotensive obstetric patient. However, evidence-based research suggests that ephedrine and adrenergic agonists (phenylephrine) are also effective (22).

Cardiac arrests occur far more frequently after spinal anaesthesia than after epidural anaesthesia. It has been observed that for every 10,000 spinal anaesthetics, seven occurrences of cardiac arrest occur, compared to one case for every 10,000 epidural anaesthetics. Cardiac arrest during neuraxial anaesthesia has been linked to three different causes, including respiratory, cerebral, and circulatory. High spinal blocks have been found to cause more sedation (23). Catheter failure: Epidural catheters can break or rip in rare cases. The patient should be told if a portion of a catheter is left in their body. However, unless there are persistent neurologic symptoms, no surgery or attempts to retrieve the catheter are necessary (24).

When the critical brain tissue concentration of local anaesthetic is exceeded, convulsion develops. This is almost always the result of an unintentional intravascular injection. Previously, the incidence was reported to be 0–0.5 percent, but it is now one in 5,000–9,000. For a better prognosis, early detection and care are critical (25).

### **Complications of general anesthesia**

Anoxia and aspiration of stomach contents are possible side effects of general anaesthesia. Because of the risk of obstetric general anaesthesia, regional methods are used whenever possible. General anaesthesia is now only utilized in true emergency situations where there isn't enough time to apply a regional method. General anaesthesia, on the other hand, provides the advantages of quicker induction, less hypotension, cardiovascular stability, and improved airway and breathing management. The difficulties in airway control (failed intubation) and acid aspiration are the main issues with general anaesthesia in the obstetric population. Aside from awareness and drug toxicity, there are a few other risks linked with general anaesthesia (26).

### **Special anesthetic considerations of repetitive C/S**

The perioperative management of patients who have had a repeat cesarean operation but do not have symptoms of a morbidly adherent placenta is nearly identical to that of patients who have had a first cesarean surgery. Patients with aberrant placentation, particularly those with placenta accreta, should be identified early as a risk group for excessive hemorrhage, peripartum hysterectomy, and other problems. For the treatment of these patients, extended monitoring, invasive radiography, cell-selvage, and all other additional facilities for managing excessive bleeding must be present and ready. For the prevention of maternal

morbidity and even mortality, a multidisciplinary approach and the development of an institutional procedure are both essential (27).

## **Conclusion**

The general anesthesia now decreased because of the risks and side effects and the regional anesthesia had become the standard method of anesthesia in cesarean section. The choice of anesthetic method should be based on patients risk factors, the available facilities and the experience of the staff involved in the procedure.

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