REVIEW ARTICLE

ANESTHESIA FOR CESAREAN DELIVERY

Naitik Patel

Assistant Professor, Department of Anesthesia, Gujarat Adani Institute of Medical Science, Bhuj, Gujarat.

ABSTRACT:
Anesthetic techniques currently available for caesarean delivery are general and regional anesthesia. Regional anesthesia is used for 95 percent of planned caesarean deliveries in the United States. It is the preferred option as far as balancing risks and benefits to the mother and her fetus is concerned. Spinal anesthesia for caesarean section is advantageous due to simplicity of technique, rapid administration and onset of anesthesia, reduced risk of systemic toxicity and increased density of spinal anesthetic block. Both spinal and epidural techniques are shown to provide effective anesthesia for caesarean section. Spinal anesthesia has a shorter onset time, but treatment for hypotension is more likely if spinal anesthesia is used.
Key words: Anesthesia, Spinal Anesthesia, Epidural Anesthesia, General Anesthesia.

Corresponding author: Dr. Naitik Patel, Assistant Professor, Department of Anesthesia, Gujarat Adani Institute of Medical Science, Bhuj, Gujarat.

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INTRODUCTION

In recent years, the frequency of cesarean delivery has increased markedly. In 1965, the incidence was 4.5%.[1]Since then there has been a steady increase in cesarean delivery rate driven by both an increase in the percentage of all women having a first cesarean and a decline in the percentage of women delivering vaginally after a previous cesarean. As per Center for Disease Control, Atlanta, USA, the cesarean delivery rate in USA in 2005 was 30.2%. The rate of cesarean delivery varies across the world with England, 23% in 2004, Brazil 47% (some health districts with 85%), and India (Delhi 19–35%). In Sweden, Denmark, and Netherlands, the cesarean delivery rate is still close to 10% with some of the world's lowest maternal and perinatal mortality rates.[2,3] Successful anesthesia for cesarean delivery can be accomplished in a number of ways. Common to all is the need for expert technical skills and understanding of maternal and fetal physiology, pathophysiology of associated diseases, and pharmacology. The two major anesthetic approaches are regional and general anesthesia. Discussion of regional anesthesia will include three techniques spinal, epidural, and combined spinal epidural anesthesia. The use of anesthesia makes a Cesarean delivery possible. Various forms of anesthesia have been used to perform this surgery. However, the use of general anesthesia has fallen dramatically in the past few decades and now accounts for only about 5 percent of Cesarean deliveries in the United States and United Kingdom. In the sub-saharan Africa, 80 - 90% of the Cesarean sections are performed under spinal anesthesia.[4]Although spinal analgesia is now the mainstay of anesthesia in countries like India and parts of Africa, excluding the major centres, current usage of this technique is waning in the developed world, with epidural analgesia or combined spinal-epidural anesthesia emerging as the techniques of choice where the cost of the disposable 'kit' is not a challenge.

PRE-OPERATIVE VISIT[5]

The essence of preoperative evaluation of the pregnant woman is in order to delineate the potential difficulties in the line of the anesthetic management and; allay any anxiety associated with the procedure. The paradigm of preoperative assessment is now shifting from predicting risk or anticipated difficulty to actively managing it.

HOW TO CHOOSE ANESTHESIA

General goals in choosing anesthesia are:

- the safety of the mother
- the safety of the baby
- the comfort of the mother
- the ability to perform the surgery under that anesthetic technique.

There are two general categories of anesthesia for Cesarean section - general anesthesia and regional anesthesia. Regional anesthesia includes both spinal and epidural techniques. General anesthesia is usually reserved for patients that must have anesthesia "right away" because their surgery is being done for a true emergency. In these situations, regional techniques may take too long to perform. It is also performed when contraindications for regional anesthesia are present.

REGIONAL ANESTHESIA FOR CESAREAN SECTION

Although regional anesthesia has several advantages such as preservation of consciousness, avoidance of neonatal depression that occurs with general anesthesia, and avoidance of airway manipulation, it is contraindicated in conditions of hypovolemia, coagulopathies, infection at the site of injection and when the patient rejects the procedure.[6] Some complications have been associated hypotension, post dural puncture headache (if spinal anesthesia is used) local anesthetic toxicity (involving central nervous system, cardiovascular system), high spinal, total spinal anesthesia (if inadvertent injection occurs during epidural injection), bradycardia and failed block.

A) SPINAL ANESTHESIA: Spinal anesthesia or spinal involves the placement of an anesthetic into the spinal sac located within the spinal column. A "spinal" is usually performed at the level of the lower back (lumbar vertebrae). Once the anesthetic is injected into the spinal sac it affects the conduction of the spinal cord and spinal nerves at the site. Typically patients cannot feel or move areas that are treated.[7]

A spinal anaesthetic involves inserting a fine needle in the lower back and passing it beyond the epidural space through the dura in order to enter the subarachnoid (spinal or intrathecal) space within which is contained the spinal nerves and cerebrospinal fluid. Local anaesthetic drugs such as bupivacaine are typically injected through the spinal needle into the subarachnoid space. Following injection, the spinal needle is removed.[8]

Proper positioning is essential for a successful conduction of spinal anesthesia. This is often done either while the patient is in sitting or the lateral position. In the lateral, the patient is positioned with their back parallel with the side of the operating table. Thighs are flexed up, and neck is flexed forward. Patient should be positioned to take advantage of the baricity of the spinal local anesthetic. In the sitting position, the patient's feet are placed on a stool while she sits up straight, her head flexed, arms hugging a pillow. In the administration of the local anesthetic for subarachnoid block, the size and type of needle are of vital importance. The most frequently used needle is the pencil tip.[8] The Quincke needle inflicts more damage to the dural sheath at the point of entry and leads to post-dural puncture headache. Following aseptic protocols, the predetermined dose of the local anesthetic for the subarachnoid injection is drawn up and tagged.

COMPLICATIONS ASSOCIATED WITH SPINAL ANESTHESIA: It may be classified as minor or major. Minor complications consist of limited, transient (if treated) alterations in physiological status of the patient. Minor complications include arterial hypotension (autonomic block),[9] nausea and vomiting, excessive cephalad spread leading to respiratory insufficiency, post-lumbar puncture headache (PLPH; more common with larger needles and younger patients), and back pain. Major complications include isolated nerve injuries, meningitis, cauda equine syndrome and other neurological dysfunctions, but these occur infrequently. Although minor complications occur more commonly, they are in general, easily managed.[9] Some complications may result from the introduction of needles, drugs or foreign material into the subarachnoid space.[10]

FOLLOW-UP: As with any anesthetic complication, the details should be documented fully in the notes, and the patient provided with a full explanation after operation. Giving the patient a written summary of events for presentation to a future anesthetist can be very helpful, although care should be taken to prevent medico-legal recourse. Therefore, it may be appropriate to look for symptoms and signs of post-operative complications, and involve an anesthetist if there is

any suspicion of these being present. As has already been noted, much wider consideration of the possibilities, supported by very detailed investigation, is needed.

B) **EPIDURAL ANESTHESIA:** An epidural anesthetic typically involves inserting a larger diameter needle than a spinal needle in order to allow epidural catheter placement. The epidural needle passes through the same tissues as a spinal needle but stops short of penetrating the dura. The tip of the epidural needle is thus positioned in the epidural space which lies just before the dura and subarachnoid space. An epidural catheter is often passed through the epidural needle which is then removed. The epidural catheter can then be used for injecting local anaesthetic medications to allow caesarean section to take place comfortably for the mother and for the administration of pain-relieving medications postoperatively.[11]

The standard procedure for the administration of epidural anesthesia is essentially the same for subarachnoid block. Asepsis must be maintained throughout the procedure. Following the cleaning draping of the parturients' back, a subcutaneous wheal at the midpoint (at the planned puncture site) between two adjacent vertebrae is raised using a local anesthetic. This area is infiltrated deeper in the midline and paraspinously to anesthetize the posterior structures. A puncture at the site is done using a 19G needle. The epidural needle is inserted in to the skin at this point, and advanced through the supraspinous ligament, with the needle pointing in a slightly cephalad direction. It is then advanced into the interspinous ligament until distinct sensation of increased resistance is felt as the needle passes into the ligamentum flavum. The end point of the procedure is the loss of resistance to either air or fluid (saline or local anesthetic). Other methods of identifying the epidural space include the use of Epidural balloon (Fyneface-Ogan&Mato, 2012)[12], Episure syringe (Riley &Carvalho, 2007)[13] and the Bidigital pressure method (Carden&Ori, 2006)[14]. Occasionally, false loss of resistance may cause some difficulty with placing an epidural. Once the needle enters the ligamentumflavum, there is usually a distinctive sensation of increased resistance, as this is a dense ligament with a leathery consistency.

ANESTHETIC USED AND DOSE SELECTION: The actual dose chosen will depend on the specific local anaesthetic used, the baricity of that solution, the patient's subsequent posture, the type of block intended, and the anticipated duration of surgery. Thus, knowledge of the factors influencing intrathecal drug spread and clinical experience with any particular local anaesthetic preparation are important guides to choosing an effective dose.[15] However, hyperbaric bupivacaine is most widely used in obstetric surgery because of its rapid onset and predictable duration of sensory blockade. The correct dose and volume of subarachnoid bupivacaine should be injected at the appropriate level. Most units administer 9 - 12 mg of hyperbaric 0.5% bupivacaine (1.8 - 2.4 ml) with 10 - 20 μg of fentanyl at the L3/4 interspace, using a 25G pencil point spinal needle. Injection at or above L2/3 may rarely result in damage to the conusmedullaris of the spinal cord, with the development of a syrinx and permanent neurological injury.[16]

Although the medications used in both spinal and epidural techniques are similar, approximately ten times the volume of anaesthetic is required for an epidural technique to achieve a similar level of anesthesia for caesarean section compared to spinal anesthesia. As well as local anaesthetics, other analgesic medications such as fentanyl are sometimes added to enhance the duration and quality of both spinal and epidural anesthesia. The spinal or epidural medications act on nerves supplying the uterus, abdominal wall and lower chest, thus allowing caesarean section to be performed without discomfort while the mother is awake (Bridenbaugh 1998).[17]

COMBINED SPINAL EPIDURAL ANESTHESIA[11]: The CSE technique has been popularized by a group from Sweden. The authors suggested the following advantages of CSE technique: (1) speed of onset; (2) superior surgical analgesia and muscular relaxation; (3) lesser need for supplementary analgesics, sedatives, and antiemetics; (4) lower incidences of hypotension; (5) lower dose of local anesthetics in the mother and fetus; (6) blocking of sacral nerve roots due to use of hyperbaric local anesthetic; (7) CSE block appears to combine the reliability of spinal block and the versatility of epidural block. If the CSE block is

properly performed, this technique may be associated with all of the advantages.

Combined spinal epidural anesthesia especially in elective Cesarean section, which affords time to perfect the analgesia with the epidural if necessary, provide exceptional standards of analgesia. There is no standard CSE or epidural technique. Compared with epidural, CSE provides faster onset of effective pain relief from time of injection, and increases incidence of maternal satisfaction. Combined spinal epidural anesthesia appears to be safe as an anesthetic technique for severe pre-eclampsia/eclampsia.

LOCAL INFILTRATIVE ANESTHESIA: Local infiltrative anesthesia is not a common technique of anesthesia for Cesarean section. This form of anesthesia is often practiced in poor resource settings. It is frequently carried out by the surgeon. The use of local infiltrative anesthesia has been used in very poor clinical state such as eclampsia (Fyneface-Ogan&Uzoigwe, 2008)[18]. It is safe and is beneficial for the mother and child in the following ways: • Can be a life saving procedure • Recovering time is less • None or very little side effects • Economical (for both mother & Government) • Post operative care is relatively easy • Fetus will be in a good condition • Makes surgical intervention easily available, accessible and affordable. A hand on experience is essential. It is contraindicated in the following: • Two previous Cesarean sections • Associated adnexial pathology • Obese patient • Placenta previa • Apprehensive cases.

GENERAL ANESTHESIA FOR CESAREAN SECTION

The use of general anesthesia for Cesarean section is declining world-wide. Although there are few, if any, absolute contraindications to general anesthesia, regional anesthesia appears to be the preferred method in order to avoid the risk of airway challenges. As early bonding immediately after delivery is being encouraged, increasingly parturients are choosing to remain awake to witness the birth of their babies. General anesthesia requires the production of unconsciousness, provision of adequate analgesia and muscle relaxation. The administration of this form of anesthesia offers some advantages such as uterine relaxation for extracting difficult breech presentation, removing retained placentas and conduct uterofetal surgeries. Other advantages of this form of anesthesia include rapid induction, less hypotension (appropriate in settings of acute maternal hypovolemic state), better cardiovascular stability, better control of the parturient's airway, and found to be useful in patients with coagulopathies, pre-existing neurologic or lumbar disc disease or infections.

The advantages of general anesthesia include the following: 1. Airway is secured electively: Awake intubation by using either a laryngoscope or fiber-optic technique after anesthetizing the oral cavity with local anesthetic is the method of choice. Awake laryngeal mask insertion and endotracheal intubation is an alternative. 2. One can avoid the complications of regional anesthesia (accidental intravascular or subarachnoid injection). The following are disadvantages of general anesthesia: 1. It might take a longer time; hence, it may not be ideal in acute fetal distress situations. 2. Maternal discomfort while airway is being secured before general anesthesia. A major problem with general anesthesia for cesarean delivery is the incidence of maternal awareness and unpleasant recall associated with the use of small doses and low concentrations of anesthetics to minimize neonatal effects. Incidences of recall have been reported to range from 17% to 36%. The use of low concentrations of potent volatile anesthetic agents will successfully prevent awareness and recall without adverse neonatal effect or excessive uterine bleeding.139 As stated above, desflurane 4.5% or sevoflurane 1.5% in 50% nitrous oxide has been shown to assure BIS scores.

CONCLUSION: Anesthesia for Cesarean section continues to be one of the most commonly performed world-wide. Regional anesthesia has become the preferred technique for Cesarean delivery. Compared to general anesthesia, regional anesthesia is associated with reduced maternal mortality, the need for fewer drugs, and more direct experience of childbirth, faster neonatal-maternal bonding, decreased blood loss and excellent postoperative pain control through the use of neuraxial opioid. However, it is important to prevent aorto-caval compression and promptly treat hypotension during regional anesthesia for Cesarean section. The advantages of general over regional anesthesia are well known to include a more rapid induction, less hypotension, less maternal anxiety

and its application in situations where there is a contraindication to regional anesthesia. Although literatures available indicate that both techniques are safe. Loss of airway control has been associated with severe morbidity and mortality during general anesthesia. The need for proper preoperative evaluation and airway assessment, the availability of an assistant, a backup plan for failed tracheal intubation, quick airway access and adequate oxygenation during general anesthesia for Cesarean section cannot be overemphasized.

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