PRACTICE GUIDELINES FOR OBSTETRIC ANESTHESIA

- A Summary -

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The pain of childbirth is one of the most severe types of pain a woman will endure in her lifetime. Conflicting ideas about pain relief from childbirth pain were rooted in the bible and continued throughout the middle ages and Renaissance. "In Sorrow thou shalt bring forth children" (Genesis 3:16). Fifteenth century midwives were burned at the stake for offering pain relief during labor. The modern era of anesthetics began in 1847 when James Young Simpson, a Scottish obstetrician, administered chloroform to a woman during childbirth. In 1853, Queen Victoria asked John Snow to administer chloroform for the delivery of her eighth child, Prince Leopold. Obstetric anesthesia had the Royal blessing ("chloroform à la reine"), and medical and religious acceptance soon followed.

Practice guidelines are systematically developed recommendations that assist the practitioner and patient in making decisions about health care. They can be modified in concordance with the evolution of medical knowledge. The purpose of these guidelines is to improve the quality of anesthetic care for obstetric patients, in order to reduce the incidence and severity of anesthetic complications, and also to increase patient satisfaction.

The following guidelines are summary of practice guidelines published in the Anesthesiology Journal[1].

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Guidelines

I – Perianesthetic evaluation

History and physical examination

Before proceeding with anesthesia, a maternal anesthetic and obstetric history should be taken, in addition to a complete physical examination which includes a baseline blood pressure, and an airway, lung and heart assessment. Prior to performing neuraxial anesthesia, patient back should be examined. Also, a communication system is recommended to encourage early and ongoing contact between obstetrician, anesthesiologist and other members of the team.

Intrapartum platelet count

In healthy parturient routine platelet count is not necessary; it is clinically relevant in case of pregnancy-related hypertensive and coagulopathy disorders. The decision to order it should be individualized to each patient. A specific platelet count predictive of neuraxial anesthetic complications has not been defined.

Blood type and screen

A routine blood cross-match is not mandatory in healthy parturients scheduled for vaginal or operative delivery. Blood type and screen or cross match are performed whenever hemorrhagic complications (e.g. placenta previa, previous uterine surgery) are anticipated, in the presence of a relevant maternal history, or as per local institutional policies.

Perianesthetic recording of fetal heart rate

Fetal heart rate should be monitored by a qualified individual before and after neuraxial analgesia for labor. Continuous electronic recording of fetal heart rate may not be necessary in every clinical setting.

II – Aspiration prevention

Clear fluid

Modest amounts of clear liquids may be allowed orally for uncomplicated laboring patients. The uncomplicated parturient undergoing elective cesarean delivery may have modest amounts of clear fluid up to 2 hours before induction of anesthesia. Oral intake may be restricted in patients with additional risk factors for aspiration (e.g. morbid obesity, diabetes mellitus, difficult airway) or at increased risk for operative delivery (non-reassuring fetal heart rate pattern).

Solids

During labor, solid food should be avoided. A fasting period for solids for 6-8 h is mandatory for patients undergoing elective surgery (e.g. scheduled cesarean delivery or postpartum tubal ligation).

A national survey to examine current policies on oral intake during labor among 740 hospitals throughout United States in 1998, have shown that oral intake during labor is limited primarily to clear liquids, although hospitals with fewer deliveries allow significantly more oral intake during latent phase than do hospitals with large services[2]. Nonclear liquids or solid foods are uncommon in either phase of labor, regardless of hospital size.

### Antacids, H2 receptor antagonists, and metoclopramide

Administration of nonparticulate antacids, H2-receptor antagonist and/ or metoclopramide is recommended before surgical procedures (cesarean delivery, postpartum tubal ligation) for aspiration prophylaxis.

An obstetric anesthetics association-approved postal survey of 250 United Kingdom lead consultants obstetric anesthetists was conducted in 2004 to establish the current practice of acid aspiration (AA) prophylaxis in labor. It showed that there have been a decrease in the routine use of AA prophylaxis in 32% of units, an increase in use of AA prophylaxis in "at

risk group" (previous cesarean delivery, multiple pregnancy, preeclampsia, diabetes mellitus, primigravida, grand multigravida, unfavorable fetal position) to 61%, and a decrease in the number of the units never using prophylaxis to 7%[3]. Oral ranitidine, given 6 h before, is the most common practice with little use of proton pump inhibitors[3] (Fig. 1).

Fig. 1
Comparison of UK policies for antacid prophylaxis in 1994[8], 2000[9] and 2004
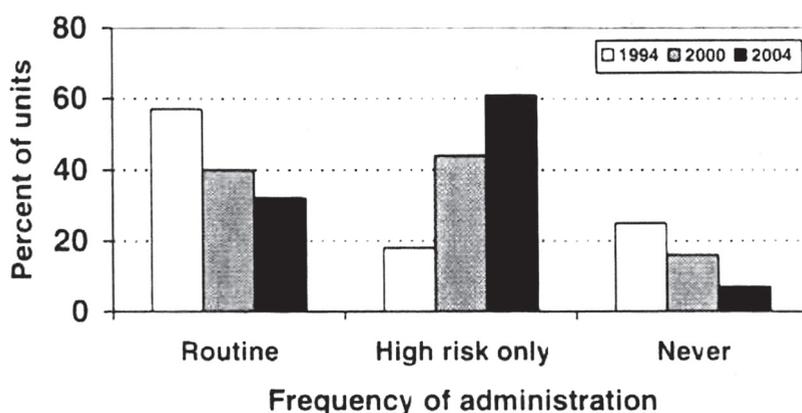
III – Anesthetic care for labor and vaginal delivery

Maternal request represents a sufficient justification for pain relief. Also, maternal medical and obstetrical conditions may sometimes warrant the provision of neuraxial techniques to improve maternal and neonatal outcome.

Timing of neuraxial analgesia and outcome of labor

Metanalysis of the literature has shown that timing of neuraxial analgesia does not affect the incidence of cesarean delivery nor delivery outcomes (spontaneous or instrumental), and that early initiation of epidural analgesia (cervical dilation less than 5 cm) improves analgesia. Therefore, patients should not be deprived neuraxial analgesia on the basis of achieving an arbitrary cervical dilation and they may be reassured that the use of neuraxial analgesia does not increase the incidence of cesarean delivery.

In 1994, Chestnut et al. conducted a randomized study where they compared the effect of early and late administration of epidural analgesia on obstetric outcome in nulliparous women who are in spontaneous or induced labor. They found no difference in labor outcome (duration and incidence of cesarean delivery, incidence of oxytocin augmentation) in both spontaneous and induced labor[4,5].

In another study, Luxman et al. evaluated the effect of early administration of epidural bupivacaine (0.25%) on the progression and outcome of labor in 60 nulliparous patients. Women were randomized to receive epidural analgesia prior to or after 4 cm cervical dilation. They found no difference between the two groups in rate of cervical dilation, duration of second stage of labor, number of instrumental deliveries or cesarean deliveries, or Apgar at 1 and 5 minutes.

Neuraxial analgesia and trial of labor after previous cesarean delivery

Early placement of neuraxial catheters in patient attempting vaginal delivery after previous cesarean delivery can be used later for labor analgesia or anesthesia in case of repeat operative delivery.

Early insertion of epidural catheter for complicated parturients

When obstetric (e.g., preeclampsia, multiple gestations) or anesthetic (difficult airway, obesity) complications are anticipated, early insertion of neuraxial catheter with later administration of analgesia should be considered, in order to reduce the incidence of general anesthesia for emergent procedures.

Continuous Infusion Epidural Analgesia (CIEA)

CIEA versus parenteral opioids analgesia on the progress of labor.

In 1998, Halpern et al. conducted a meta-analysis to review effects of epidural vs parenteral opioids analgesia on cesarean delivery rates. They

extracted data from 10 trials enrolling 2369 patients. Data Synthesis showed that the risk of cesarean delivery did not differ between patients receiving epidural (8.2%) vs parenteral opioid (5.6%) analgesia, and that epidural patients had longer first (42 min) and second (14 min) labor stages, more likely to have instrumental delivery, lower pain scores during first and second stages of labor. Odds of dissatisfaction were lower with epidural analgesia. Also, neonates were less likely to have low 5-min Apgar scores or to need naloxone after epidural analgesia[6].

In another report, Liu et al. conducted a systematic review to assess the rate of cesarean delivery and instrumental vaginal delivery in nulliparous women after low concentration epidural infusions or opioid analgesia. Seven randomized controlled trials comparing low concentration epidural infusion with parenteral opioids were selected. They showed that epidural analgesia using low concentration epidural infusions of bupivacaine is unlikely to increase the risk of cesarean delivery but may increase the risk of instrumental vaginal delivery. Although epidural patients had longer second stage of labor, they had better pain relief[7].

Continuous Infusion Epidural (CIE) with or without opioids

The Comparative Obstetric Mobile Epidural Trial compared the obstetric outcomes of traditional epidural anesthesia (0.25% bupivacaine) with two low-dose "mobile" techniques, combined spinal-epidural (2.5 mg bupivacaine combined with 25 µg fentanyl) and low-dose infusion (0.1% bupivacaine with 2 $\mu g.mL^{-1}$ fentanyl). Both mobile techniques reduced the risk of instrument-assisted vaginal delivery. Cesarean delivery rate did not differ between the traditional and low-dose techniques. Interestingly, the quality of pain relief, as perceived by the women, was the same with all the methods; thus the researchers concluded that the benefit achieved by the low-dose techniques does not compromise pain relief[8].

One of the keys to reducing concentration of local anesthetic in epidural infusion is the addition of an opioid. Although fentanyl has slight benefits when added to 0.25% bupivacaine, it appears to have more

significant benefits when added to more dilute solutions of bupivacaine. Adding fentanyl can reduce bupivacaine dose by 50%.

Although epidural infusion of plain bupivacaine 0.25% has been found to provide successful analgesia, they are associated with motor block. Lower concentration of bupivacaine while not associated with motor block, did not provide adequate analgesia unless an opioid was added. Avoiding motor block while providing adequate analgesia for uncomplicated labor and delivery can be achieved by using dilute concentration of local anesthetic with opioids. In most patients, a bupivacaine infusion concentration $\geq$ 0.125% is unnecessary for labor analgesia.

Patient-controlled epidural analgesia (PCEA)

The Cyprane inhaler, a modification of the Duke inhaler, was used for self-administration of trichloroethylene, or Trilene, during the first and second stages of labor. The device, which was attached to the patient by a wrist band, literally put the management of pain in the hands of the patient. As she inhaled and felt the effects of the analgesia, the weight of the inhaler would pull it away from her face until she again had the need or strength to lift it. This technique which was popular in the 1950s and '60s was the first technique of patient-controlled analgesia (PCA).

PCEA is an effective and flexible approach for the maintenance of labor analgesia. In 2002, M. Van der Vyver et al. reviewed 640 patients in a meta-analysis that compared PCEA versus continuous infusion for labor analgesia. Results showed significant reduction in need for clinical interventions and less local anesthetics and motor blockade in PCEA group. No difference regarding incidence of obstetrical intervention or neonatal outcome was noted between the two groups[9]. Parturients appreciate the control they have over the analgesia received throughout labor.

Although most studies show no benefit of an additional background infusion for PCEA, preliminary results indicate that it may be helpful in some parturients.

Combined Spinal-Epidural Analgesia (CSE)

CSE may be used to provide effective and rapid onset of analgesia for labor. The Cochrane review (2007) stated that there is little basis for offering CSE over epidurals in labor with no difference in overall maternal satisfaction despite a slightly faster onset with CSE and less pruritus with epidurals. There is no difference in the ability to mobilize, obstetric or neonatal outcome. However, the significantly higher incidence of urinary retention and rescue interventions with traditional techniques which use 0.25% of bupivacaine or higher, would favor the use of low-dose epidurals (less than 0.25% bupivacaine concentration).

IV – Removal of retained placenta

Patient should receive aspiration prophylaxis. If patient is hemodynamically stable and epidural catheter is already in place, an epidural anesthesia is advisable. For uterine relaxation, nitroglycerine, terbutaline, and halogenated agents might be used.

V – Anesthetic choices for cesarean delivery

A well trained support team should be available. The labor and delivery operating suite should be equipped with everything needed to handle complications like difficult airway, severe hemorrhage, respiratory depression, vomiting, etc…

General anesthesia, epidural, spinal, or CSE for cesarean delivery

Neuraxial techniques are preferred to general anesthesia for most cesarean deliveries, but the decision to use a particular technique is influenced by patient preference, anesthesiologist judgment, and anesthetic, obstetric, and fetal risk factors (e.g. elective vs emergency). In case of urgent cesarean delivery, general anesthesia is the most appropriate technique. The onset of anesthesia given by a preexisting indwelling catheter is comparable to that of spinal anesthesia for urgent cesarean delivery.

VI – Intravenous fluid preloading

Maternal hypotension is a frequent complication of spinal anesthesia for cesarean delivery. Intravenous fluid preloading may reduce its occurrence, but spinal anesthesia should not be withheld until fluid preloading is complete. Hypotension associated with spinal anesthesia is caused by increase in venous capacitance and reduction in systemic vascular resistance. Reduced uterine blood flow with a potential compromise in fetal oxygenation and maternal nausea and vomiting may occur.

In 2001, Morgan et al. conducted a qualitative systematic review (23 articles) where they evaluated the efficacy of increasing central blood volume on incidence of hypotension after spinal anesthesia for elective cesarean delivery: Crystalloid preload was inconsistent in preventing hypotension; colloid appeared to be effective but is associated with additional risk and costs; leg wrapping and thromboembolic stockings decreased incidence of hypotension compared with leg elevation or control. Few differences in fetal outcomes or maternal nausea and/or vomiting were reported. Increasing central blood volume by using colloid and leg wrapping decreases but does not abolish incidence of hypotension before spinal anesthesia for elective cesarean delivery[10].

VII – Ephedrine or phenylephrine

There is no difference between ephedrine and phenylephrine for the management of maternal hypotension during neuraxial anesthesia. Since it is associated with improved fetal acid-base status, phenylephrine is preferable in the absence of maternal bradycardia.

In 2002, Lee et al. performed a quantitative systematic review (seven randomized controlled trials) to compare efficacy and safety of ephedrine with phenylephrine for prevention and treatment of hypotension during spinal anesthesia for cesarean delivery. For management of hypotension, there was no difference between phenylephrine and ephedrine. Maternal bradycardia was more likely to occur with phenylephrine than with ephedrine. Women given phenylephrine had neonates with higher umbilical arterial pH values than those given ephedrine. There was no difference between the two vasopressors regarding the incidence of true fetal acidosis or Apgar Scores < 7 at 1 and 5 min[11].

VIII – Neuraxial opioids for postoperative analgesia

For postoperative analgesia for cesarean delivery, neuraxial opioids are preferred to intermittent injections of parenteral opioids.

Dahl et al. conducted in 1999 a metaanalysis that demonstrated excellent efficacy of intrathecal morphine doses of 0.1 to 0.2 mg but no additional pain relief with doses larger than 0.2 mg. Median time to first request for supplemental analgesics was 27 h. Doses less than 0.1 mg had little effect on pain relief. Incidence of pruritus, nausea, and vomiting increases as morphine doses increases from 0.05 mg to 0.25 mg. Significant respiratory depression is rare with intrathecal morphine[12].

In 2000, Palmeret et al. performed one randomized dose-response study that allowed patients free access to intravenous PCA after epidural administration of saline or 1 of 4 doses of morphine (1.25, 2.5, 3.75, or 5 mg). Quality of analgesia improved as dose of epidural morphine increases to 3.75 mg. Beyond that, there was no difference in analgesic effect as measured by intravenous PCA use. All women given epidural morphine experienced pruritus, with no correlation with dose. Analgesia lasted for 18-26 h[12].

IX – Post partum tubal ligation

Patient should have no oral intake for 6-8 h before surgery. One should keep in mind that gastric emptying will be delayed with opioids administration during labor, and aspiration prophylaxis should be considered. Neuraxial techniques are preferred over general anesthesia, with an epidural more likely to fail with longer post-delivery time interval.

X – Management of obstetric and anesthetic emergencies

Hemorrhagic emergencies

Cell salvage can be considered if severe hemorrhage occurs without available allogenic blood, or patient refusal of allogenic transfusion (Table 1).

Table 1

Suggested Resources for Obstetric Hemorrhagic Emergencies

- Large-bore intravenous catheters
- Fluid warmer
- Forced-air body warmer
- Availability of blood bank resources
- Equipment for infusing intravenous fluids and blood products rapidly. Examples include, but are not limited to, hand-squeezed fluid chambers, hand-inflated pressure bags, and automatic infusion devices

The items listed represent suggestions. The items should be customized to meet the specific needs, preferences, and skills of the practitioner and health-care facility.

Airway emergencies

A strategy for managing difficult intubation should be prepared ahead of time. Ventilation with face mask and cricoid pressure or with laryngeal mask airway (LMA), combitube, or intubating LMA should be considered for maintaining airway and ventilating the lungs when tracheal intubation fails. Surgical airway is the last resort (Tables 2 and 3).

Table 2

Suggested Resources for Airway Management during Initial Provision of Neuraxial Anesthesia

- Laryngoscope and assorted blades
- Endotracheal tubes, with stylets
- Oxygen source
- Suction source with tubing and catheters
- Self-inflating bag and mask for positive-pressure ventilation
- Medications for blood pressure support, muscle relaxation, and hypnosis
- Qualitative carbon dioxide detector
- Pulse oximeter

The items listed represent suggestions. The items should be customized to meet the specific needs, preferences, and skills of the practitioner and health-care facility.

Table 3

Suggested Contents of a Portable Storage Unit for Difficult Airway Management
for Cesarean Delivery Rooms

- Rigid laryngoscope blades of alternate design and size from those routinely used
- Laryngeal mask airway
- Endotracheal tubes of assorted size
- Endotracheal tube guides. Examples include, but are not limited to, semirigid stylets with or without a hollow core for jet ventilation, light wands, and forceps designed to manipulate the distal portion of the endotracheal tube
- Retrograde intubation equipment
- At least one device suitable for emergency nonsurgical airway ventilation. Examples include, but are not limited to, a hollow jet ventilation stylet with a transtracheal jet ventilator, and a supraglottic airway device (*e.g.*, Combitube®, Intubating LMA [*Fastrach*™])
- Fiberoptic intubation equipment
- Equipment suitable for emergency surgical airway access (*e.g.*, cricothyrotomy)
- An exhaled carbon dioxide detector
- Topical anesthetics and vasoconstrictors

Cardiopulmonary Resuscitation

Basic and advanced life-support equipment should be immediately available in the operative area of labor and delivery units. If cardiac arrest occurs during labor and delivery, standard resuscitative measures should be initiated with maintenance of uterine displacement. Cesarean delivery should be performed by the obstetric team if resuscitation is not successful within 4 min after the arrest.

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