

DIFFICULT AIRWAY IN OBSTETRIC ANESTHESIA

Sonia Vaida

Anesthetic management of parturient patients is a challenge, as it involves simultaneous care of two lives. Studies from the USA and United Kingdom have consistently shown that maternal mortality is greater with general anesthesia than regional anesthesia. Most of the deaths were due to hypoxia, secondary to difficult or failed intubation or to pulmonary aspiration of gastric contents.^{1,2} Failed endotracheal intubation and ventilation are still a major concern of anesthesia-related maternal mortality occurring during cesarean deliveries.³ The incidence of difficult airway in the pregnant population is eight times higher than in the non-pregnant population or about 1 in 250-300 patients.³⁻⁵ The morbidity associated with difficult intubation is about thirteen times higher than the general population.⁴ The trend is to perform lower and lower rates of general anesthesia for cesarean delivery, which accounts for the relative inexperience with the obstetric airway. A major challenge facing obstetric anesthesiologists is teaching general anesthesia to new trainees. With the steady decrease in the use of general anesthesia, residents may go through their training without administering general anesthesia for a Cesarean section.

Difficult airway in obstetric anesthesia is mostly attributable to: airway edema, weight gain during pregnancy and preexisting anatomical deformities.⁶

Airway edema

Airway edema results from hormonally (progesterone) induced fluid retention during pregnancy, and it can be amplified by pregnancy-induced hypertension, fluid overload, head-down position, oxytocin infusion (fluid retention due to the antidiuretic effect), prolonged Valsalva efforts during delivery, and β -adrenergic tocolytic therapy. Using photographs taken in

a standardized fashion, Pilkington et al. showed that the Mallampati classification of the airway changed between the first and third trimesters.⁷

Vascular engorgement of the respiratory tract and oro-pharyngeal mucosa during pregnancy accounts for reduced internal diameter of the trachea and increased risk of bleeding during airway manipulation.

Weight Gain

Obesity is frequently encountered during pregnancy; the parturient can gain 20 kg or more during pregnancy. In the morbidly obese parturient the cesarean delivery rate exceeds 50%. Difficult intubation in the obese patient may be due to a short neck or large tongue and breasts, which make laryngoscopy and intubation laborious. Chest compliance is often poor, and mask ventilation may prove to be difficult.

Preexisting anatomical deformities

Examples of conditions involving the airway: facial and upper airway abnormalities, airway tumors, immobile cervical spine, surgical induced deformities, and selected systemic diseases.

Risk of hypoxia

Pregnant women become hypoxemic more rapidly than non-pregnant women during episodes of apnea because of: reduced functional capacity, (resulting in airway closure and an increased alveolar-arterial oxygen gradient during normal tidal respiration) higher oxygen consumption, decreased cardiac output in supine position. (aorto-caval compression). Therefore, the pregnant woman requires more efficient denitrogenation and preoxygenation prior to induction of general anesthesia.

Risk of Aspiration

Gastrointestinal system also undergoes significant change and every parturient should be considered at risk of aspiration during induction of general anesthesia. The pressure from the enlarging uterus increases intragastric pressure. The lower esophageal sphincter tone decreases secondary to the hormones of pregnancy. As a result, barrier pressure (lower esophageal

pressure minus intragastric pressure) decreases and reflux occurs.⁸ Among the hormonal factors, increased gastrin, secretin and progesterone and decreased secretion of motilin are responsible for the delay in gastric emptying.⁶

Pharmacologic prophylaxis usually consists of intravenous administration of an H2 receptor antagonist and metoclopramide combined with oral administration of a clear, non-particulate antacid before induction.

Cricoid Pressure

These changes emphasize the need for the application of cricoid pressure before the patient loses consciousness in order to prevent aspiration or regurgitation during induction of general anesthesia. Cricoid pressure is applied directly over the cricoid cartilage, the only solid structure in the larynx, with the intent of applying pressure on the esophagus and preventing regurgitation into the oropharynx. However, the effectiveness of cricoid pressure has been questioned. Additionally, the technique of cricoid pressure is often inappropriately applied. Appropriate application of cricoid pressure in an upward and backward direction may improve the view at laryngoscopy.^{7,8}

PREPARATION FOR GENERAL ANESTHESIA

Vigilance is the key along with back-up plan and the availability of necessary equipment.

Positioning of operating room the table: should be adjusted to the level of the laryngoscopist intercostals margin, and tilted 15 degree to the left, to avoid aortocaval compression.

Patient position: appropriate neck flexion is facilitated by placing several pads or blankets under the shoulder an upper back, thereby flattening the kyphotic curvature of the thoracic spine. The head also must be extended on the neck (extension of the atlanto occipital joint) to bring the oral axis in line with the pharyngeal and laryngeal axis (Magill or Sniffing position).

MANAGEMENT OF THE DIFFICULT AIRWAY – DECISION MAKING

Management depends on whether surgery is elective or urgent, the condition of the fetus, and whether a difficult airway is predicted.

Recognized difficult airway

Airway assessment

Preparatory efforts enhance success and minimize risk to the patient.

Have a strategic plan in place for every patient.

It is necessary to apply a variety of criteria to identify potential difficult airway. The positive predictive value of the difficult airway is improved if combinations tests are used. (Mallampati classification, mouth opening, sternomental/ thyromental distance, atlanto-occipital extension, evaluation of teeth, etc).

Identify cricothyroid membrane

If there is any doubt regarding the ability to maintain airway patency during general anesthesia, consider:

1. Regional anesthesia
2. Awake fiberoptic intubation

Regional anesthesia is the best choice for cesarean section in most cases of anticipated difficulty with endotracheal intubation.¹⁻⁹ However, the anesthesiologist should understand that regional anesthesia itself does not solve the problem of a difficult airway, anticipate potential complications (e.g., failed anesthesia, total spinal anesthesia), and be fully prepared to administer general anesthesia. Spinal anesthesia is preferred over epidural anesthesia because of: higher success rate, faster onset, lower risk of total spinal anesthesia and local anesthetic toxic reaction. A combination spinal-epidural anesthesia (CSE), a relatively new technique, has gained popularity.

Awake fiberoptic intubation. Although awake intubation can be time-consuming, there are several convincing reasons to perform the procedure in a patient with a recognized difficult airway: 1) the natural airway is better maintained in an awake patient; 2) adequate muscle tone helps maintain the natural separation of the upper airway structures, which facilitates the identification of anatomical landmarks and 3) induction of general anesthesia and muscle paralysis results in anterior movement of the larynx, which impedes visualization of the larynx during direct laryngoscopy.^{1,6,10}

The Unrecognized Difficult Airway

The Patient Who Cannot Be Intubated but Can Be Ventilated by Mask with no Fetal Distress - Awake the patient! Cricoid pressure should be maintained until the patient is fully awake. Further management: regional anesthesia vs awake intubation.

The Patient Who Cannot Be Intubated but Who Can Be Ventilated by Mask with Fetal Distress Present

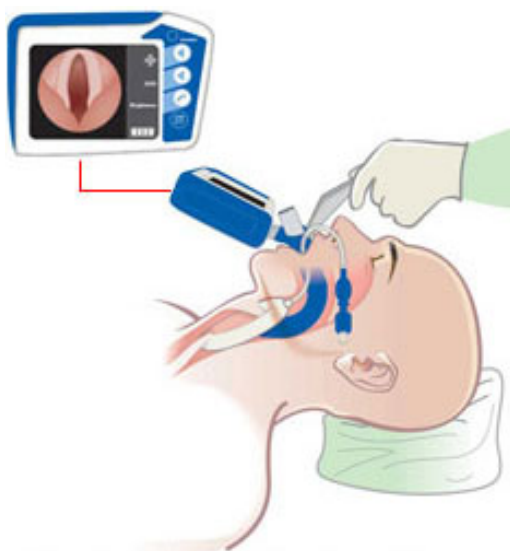
Management options:

- Awaken the patient
- Continue anesthesia via mask ventilation while an assistant maintains cricoid pressure

- Laryngeal Mask (does not provide effective protection from aspiration, problematic with cricoid pressure) An endotracheal tube can also be inserted through an LMA, either blindly or with the aid of a fiberoptic.

- Proseal (a new laryngeal mask device with a modified cuff and a drainage tube designed to isolate the airway from the digestive tract)

- Intubating Laryngeal Masks (Fastrach)
- LMA Ctrach
- Combitube



The Patient Who Cannot Be Intubated or Ventilated by Mask (Cannot Ventilate, Cannot Intubate)

Life threatening situation!!!

Consider:

- LMA, Proseal, Intubating Laryngeal Mask, Combitube

- Transtracheal jet ventilation (TTJV).

TTJV is used when other modalities of ventilation, including LMA and

Combitube, fail or are not available. It consists of a simple I.V. plastic cannula (14 or 16 gauge) inserted through the cricothyroid membrane. A jet injector provides ventilation with oxygen pressurized to 50 pounds per square inch (psi).

The major risk of TTJV is barotrauma, which may occur if the inflation pressure was not controlled by a pressureregulator, and emptying of the lungs is

not fully allowed by maintenance of an inspiration to expiration ratio of at least 1:3.¹⁻⁶ Compared with emergency surgical cricothyrotomy or tracheostomy, establishment of percutaneous TTJV is quicker and simpler.

- Cricothyroidomy. Seldinger type needle and wire technique, over which a guide and then a single one-step dilator is passed.

SUMMARY

1. Assume that every parturient has a potentially difficult airway.
2. Evaluate the airway of every parturient; have a back-up plan for every patient.
3. Have difficult airway equipment available.
4. When faced with a difficult intubation, practitioners should choose the device they are most experienced using. Do what you do best.
5. Optimize patient's position for intubation.
6. Provide adequate muscular relaxation.
7. Don't start surgery if oxygenation and ventilation are unsatisfactory.
8. Choose regional anesthesia whenever possible.

REFERENCES

1. Department of Health and others. Why mothers die 1997-1999. The Confidential Enquiries into Maternal Deaths in the United Kingdom. London: RCOG Press; 2001.
2. Hawkins JL, Koonin LM, Palmer SK, Gibbs CP. Anesthesia-related deaths during obstetric delivery in the United States, 1979-1990. *Anesthesiology* 1997;86:277-84.
3. Kuczkowski KM, Reisner LS, Benumof JL. The difficult airway: Risk, Prophylaxis, and Management in Chestnut DH. *Obstetric Anesthesia: Principles and Practice*. 3rd Edition. Mosby Inc 2004. p. 535-62.
4. Hagberg CA: *Handbook of Difficult Airway Management*. Philadelphia, Churchill Livingstone, 2000, p 301-18
5. Barnardo PD, Jenkins JG. Failed tracheal intubation in obstetrics: a 6-year review in a UK region. *Anaesthesia*. 2000;55:690-4.
6. Ezri T, Szmuk P, Evron S, Geva D, Hagay Z, Katz J. Difficult airway in obstetric anesthesia: a review. *Obstet Gynecol Surv*. 2001;56:631-41.
7. Pilkington S, Carli F, Dakin MJ, et al. Increase in Mallampati score during pregnancy. *Br J Anaesth* 1995;74:638-42
8. Douglas J. General anesthesia and obstetrics: a deadly combination? *Can J Anaesth* 2004;51:R1-R4
9. Davies JM, Weeks S, Crone LA, Pavlin E: Difficult intubation in the parturient. *Can J Anaesth* 1989;36:668-74.
10. Munnur U, Suresh MS. Airway problems in pregnancy. *Crit Care Clin*. 2004;20:617-42.