Airway Disasters in Obstetrics
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Anesthesia causes remain on the list of top 10 direct causes of maternal mortality, and airway-related deaths lead that category. Airway disaster in an obstetric patient is the most frightening event on the labor floor, as the lives of both the mother and the fetus may be compromised by such event. The potentially high maternal and fetal morbidity and mortality associated with poor management of the unanticipated difficult airway in obstetric patients warrants more attention to this possible catastrophe.

The incidence of difficult intubation in obstetric patients is 1.3–16.3%, and that of failed intubation is 1:250 to 1:300, at least 10 times more than in the general surgical population. Despite the declining use of general anesthesia in obstetrics and advancement in airway tools, the rates of perioperative airway complications in obstetric patients have relatively remained constant.

An airway catastrophe in an obstetric patient could lead to serious medicolegal and psychological consequences for the anesthesiologist. The American Society of Anesthesiologists closed claims analysis (1990-2003, n=426) revealed that general anesthesia accounted for 41% of liability claims for maternal death/brain damage. The most common anesthetic causes in such claims were critical events such as difficult intubation (25%), inadequate ventilation and oxygenation (4%), aspiration of gastric contents (4%) and airway obstruction (4%).

The reasons for the difficulty in managing the obstetric airway are manifold:

a) Obstetric emergencies are unique as they involve two patients and frequently require intubation and general anesthesia;

b) Even the healthy mother undergoes anatomical and physiological changes of pregnancy, including those to the maternal airway;

c) The increasing incidence of pregnancy related conditions such as pre-eclampsia and changing demographic characteristics, i.e., increasing maternal age and body weight – both identified as risk factors for difficult airway management – warrant early identification of such cases;

d) The fetus may be stressed by innumerable issues including immaturity and intrauterine growth retardation;

e) The factors specific to the obstetric arena add to the common stressors of an emergency situation such as extreme time pressure, lack of availability of skilled assistance, anxiety about outcome and poor team communication;

f) The current infrequency of administration of general anesthesia in normal obstetric practice further limits clinical competency.

After the pioneering attempts by Tunstall et al at developing a specific obstetric “failed intubation drill” in 1976, there have been many other proposed algorithms for airway management in obstetrics with various modifications and evolutions. However, these algorithms do not address the unique situation of two patients and possible specific clinical variations, which relate to elective and semiurgent situations, or fetal and maternal emergency situations. One should remember that any maternal emergency has a very high likelihood of soon becoming a fetal emergency too (i.e., a combined maternal and fetal emergency).
Recently, our group has developed an algorithm for unanticipated difficult airway in obstetrics, outlining the management of six generic clinical situations of “can and cannot ventilate” possibilities in three clinical contexts: a) elective cesarean section (CS), b) emergency CS for fetal distress, and c) emergency CS for maternal distress (Balki et al, Anesthesiology 2012; 117:887). This represents only six generic situations under which most of the clinical variations of CS under general anesthesia can be categorized.

A) Three (elective, fetal distress and maternal distress) of the six generic “cannot ventilate” situations lead to a transtracheal airway and to immediate CS.

B) The three other generic situations (below) are “can ventilate” ones and provide two alternative pathways: proceed without an endotracheal tube or awaken the patient (then choose awake intubation or regional).

i. Elective CS should be handled by awakening the mother.

ii. The situation of fetal emergency may present an ethical conundrum regarding risking the mother’s life to allow for the delivery of a distressed fetus. In this case, if the mother can be ventilated, there are two options: one may proceed with unprotected airway for sake of fetus or if mother is at higher risk than usual for aspiration, desaturation or subsequent failure to ventilate or loss of airway (recent large meal, morbidly obese, airway significantly traumatized in failed intubation attempts etc.), one may choose to awaken the mother and proceed to regional anesthesia or awake airway. This latter course of action may clearly put the fetus at great risk but follows the principle of “Mother comes first”.

iii. The situation of “maternal distress and can ventilate” is complex, as the mother is unstable and there will be impending fetal distress. Therefore, CS should proceed for the sake of both patients. If maternal instability persists after fetal delivery, then a definitive airway should be reconsidered using a different approach.

All cases, including semi-urgent, must be classified as ‘urgent’ or ‘elective’ type cases for the purposes of subsequent management decisions. A rapid and focused interdisciplinary exchange must take place between the anesthesiologist and the obstetrician. It is likely that in most cases of semiurgent fetal compromise, maternal safety would be considered a priority, and the mother would be woken up and an awake intubation done or regional reconsidered. In a circumstance where pending maternal decompensation is feared, proceeding with bag and mask ventilation or LMA (classic, proseal etc.) may well be justifiable for both the mother and the fetus. However given the possibility of maternal decompensation, extra skilled help should be called for immediately (e.g. a third anesthetist, a second anesthesia assistant, the ICU access team etc.).

Some other issues regarding airway management in obstetrics that warrant discussion are:

1. Application of cricoid pressure is considered the standard of practice, however, it should be released if thought to be impairing visualization of the larynx during intubation or impeding ventilation by bag and mask or with LMA. LMA was used in a series of 1067 patients undergoing elective CS, and was found to be effective and probably safe, as long as cricoid pressure is maintained throughout the operation (Han TH et al, CJA 2001:48: 1117). This study is reassuring, however, it should be noted that the patients were fasted and low-risk, and the cases were elective. Another study (Yao WY et al, CJA 2012:59; 648) in 700 parturients undergoing CS (576 elective, 124 urgent) demonstrated similar effectiveness of supreme LMA in maintaining adequate ventilation with minimum complications. Oxygenation of the patient should take priority under the circumstances of difficult airway management, and LMA is the most effective tool if bag and mask ventilation is inadequate.

2. There is no consensus regarding the number of intubation attempts that can safely be tried before stopping and choosing an alternative airway device. In the current Report of the Confidential Enquiries into Maternal Deaths in the United Kingdom 2006–2008, an airway-related death involved
persistence at intubation even though oxygenation was achieved through an intubating LMA. Among the seven difficult intubation injuries that occurred between 1991 and 1998, as per ASA closed claims analysis, these claims involved multiple intubation attempts leading to progressive difficulty with ventilation. Canadian Airway Focus Group (1998) recommends only 2 attempts at intubation in the pregnant patient (vs. 3-4 attempts in other recommended algorithms). However, we suggest that if the airway has not been traumatized, good oxygenation is being well maintained and there is a high likelihood of success at a third attempt, then a third attempt may be reasonable. It should be noted any successive attempts should be done after optimizing head position and that different techniques/equipment (bougie, intubating LMA, glidescope, fiberoptic intubation etc.) are tried for each of the successive attempts.

3. Anesthesia management details should be at the discretion of the anesthesiologist, bearing in mind their own practice and preference and any patient or obstetric issues unique to each case: a) additional doses of succinylcholine or return to spontaneous ventilation, b) choice of maintenance anesthetic agents, and c) elective change to LMA or other supraglottic devices even if bag and mask ventilation remains easy and effective.

4. Safe extubation strategies should be considered in patients with difficult intubation including administration of oxygen supplementation postoperatively, adequate supervision and postoperative respiratory monitoring after general anesthetic, and consideration of airway exchange catheters, especially in morbidly obese, those with OSA, preeclampsia and periglottic edema.

Finally, early anesthesia consultation in cases of anticipated difficult intubation and prophylactic epidural placement in such cases, availability of skilled help and difficult airway cart, and proper communication with the team members is the key to successful outcome of such cases.

References:
**Unanticipated Difficult Airway in Obstetric Patients**

*Development of a New Algorithm for Formative Assessment in High-fidelity Simulation.*

Mrinalini Balki, Mary Ellen Cooke, Susan Dunington, Aliya Salman, Eric Goldszmidt.

*Anesthesiology* 2012; 117:883–97

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**Algorithm for unanticipated difficult airway in obstetric patients.**

- **BMV ± cricoid**: Not adequate
- **Adequate**
  - **2nd Alternative approach to intubation**
    - If failed
      - **BMV ± cricoid**: Not adequate
  - **CAN VENTILATE**
    - **LMA/alternative supraglottic device**: Not adequate
    - **CANNOT VENTILATE**
      - **MATERNAL EMERGENCY**
      - **FETAL EMERGENCY**
      - **ELECTIVE CS**
      - **Awake airway or Regional anesthesia Proceed with CS**
      - **Cricothyrotomy Proceed with CS**

**For MATERNAL EMERGENCY**:
- If mother not likely to be rapidly stabilized post delivery
- **Definitive airway (e.g., Fiberoptic through LMA, Transesophageal airway etc.)**

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1. **Cricoid pressure** should be released if thought to be impairing visualization of the larynx or impeding ventilation by bag and mask (BMV) or with LMA.
2. All cases, including semi-urgent, must be classified as ‘urgent’ or ‘elective’ type cases for the purposes of subsequent management decisions.
3. Canadian Airway Focus Group (1998) recommends only 2 attempts at intubation in the pregnant patient (vs. 3-4 attempts in other recommended algorithms). However, if the airway has not been traumatized, good oxygenation is being well maintained and there is a high likelihood of success at a 3rd attempt, then a 3rd attempt may be reasonable. It should be noted any successive attempts should be done after optimizing head position and that different techniques/equipment (e.g., intubating LMA, glidescope, fiberoptic intubation etc.) are tried for each of the successive attempts.
4. **If initial BMV is inadequate but ventilation by LMA (ideally or proseal or alternative supraglottic device is inadequate**, might consider proceeding with CS directly if absolute emergency or only make 2nd or 3rd attempt at intubation if mother is at higher risk for aspiration and/or slow difficult CS is anticipated.
5. In the event of a *fetal emergency only* and a situation in which mother can be ventilated, there are two options: one may proceed with unprotected airway for sake of fetus or if mother is at higher risk than usual for aspiration, desaturation or subsequent failure to ventilate or loss of airway (e.g., recent large meal, morbidly obese, airway significantly traumatized in failed intubation attempts etc), one may choose to awaken the mother and proceed to regional anesthesia or awake airway. This latter course of action may clearly put the fetus at great risk but follows the principle of 'Mother comes first'.
6. **Anesthesia management details** should be at the discretion of the anesthesiologist, bearing in mind their own practice and preference and any patient or obstetric issues unique to each case: a) additional doses of succinylcholine or return to spontaneous ventilation, b) choice of maintenance anesthetic agents, and c) elective change to LMA or other supraglottic devices even if BMV remains easy and effective.
7. In the **three cannot ventilate situations**, maternal and fetal emergencies should proceed to CS immediately after tracheal intubation. Arguably in **elective CS**, the fetus will be stressed by now and hence CS should also be seriously considered at this point.

BP = blood pressure; BMV = bag and mask ventilation; CS = caesarean section; ETCO₂ = end-tidal carbon dioxide; HR = heart rate; LMA = laryngeal mask airway; SpO₂ = oxygen saturation.