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Obstetric airway management

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Abstract

Obstetric airway management continues to provide a challenge to anaesthetists. The incidence of difficult and failed intubations has either remained static, or improved slightly, in specific settings in recent years. Established dogma is being challenged and practice continues to evolve and adapt to new evidence. Rapid sequence induction, while still the standard of care for airway management in obstetrics, is no longer considered to be essential in all cases. Supraglottic airway devices are being used in subcategories of patients as a first-line airway device, and are increasingly being accepted as a rescue device. In addition, novel devices, such as the video laryngoscope, are becoming increasingly commonplace in obstetric theatres. This review will briefly outline the problems with obstetric airway management, and then focus on a few of the areas where controversy still exists.

Keywords: obstetric, airway, management

What is the problem with obstetric airways?

Pregnancy brings a unique set of challenges to the obstetric anaesthetist. Many of these are brought about by anatomical and physiological changes which occur in the parturient. Body mass index (BMI) increases, the breasts enlarge, the diaphragm is elevated by the growing foetus and the airway may become oedematous.[1] Several studies have identified airway changes during pregnancy and labour, with significant changes to both airway anatomy and Mallampati scores occurring in a matter of hours.[2,3] In addition to this, pregnant women undergo physiological changes, such as increased oxygen consumption, decreased functional residual capacity and a reduced time to desaturation following apnoea. The end result is a potentially more difficult airway with reduced time to achieve adequate ventilation in a situation in which maternal and foetal oxygenation is required.

How are we doing?

The incidence of a difficult or failed intubation is probably in the range of 1:250-300,[1,4] although it is noted that there are better numbers in units in which a large number of general anaesthetics are performed.[1] The incidence may be as low as 1:750 in the South African context,[5] while the incidence of difficult and failed intubations is similar to that in the general surgical population in other areas.[6] There were no failed or oesophageal intubations, and only 23 difficult intubations, in a UK study that covered 3 430 intubations in an obstetric population, all of which were rapid sequence inductions. The authors attributed their success to a high rate of general anaesthesia (30% of emergency, and 8% of elective, Caesarean sections), readily available senior cover and specialised anaesthetic operating department assistants. A unit-based estimation approach was used in a national UK study published in 2012, in which the incidence of failed intubation was reported to be 1 in 225. [7] The improvement seen in the mortality rates secondary to failed intubations is likely to be multifactorial. Earlier use of rescue supraglottic airway devices,[1] better training and preparation, earlier identification of the difficult airway, and potentially increased regional anaesthesia in preference to general anaesthesia, are means of avoiding the predicted difficult airway.

The legacy of Mendelson

In 1946, Mendelson published an article entitled: *The aspiration of stomach contents into the lungs during obstetric anesthesia*.[8] He reviewed 44 016 cases undergoing general anaesthesia for Caesarean section and receiving nitrous oxide and ether by face mask. There were 66 cases of aspiration (0.15%) and two mortalities. Both of the mortalities occurred secondary to solid food aspiration. Mendelson correctly identified delayed gastric emptying in the labouring patient, coupled with the loss of airway reflexes during general anaesthesia, as contributory factors to the cases of aspiration. The large number of deaths reported secondary to aspiration pneumonitis in subsequent years helped to establish rapid sequence induction and endotracheal intubation as cornerstones of obstetric airway management.[9]

Heightened awareness of the risk of aspiration, largely as a result of Mendelson's landmark study, has driven clinical practice in obstetric anaesthesia. Change has been slow to occur, at least in part owing to an understandable wish by anaesthetists to adopt a conservative approach to implementing new practices which do not provide definitive airway protection.[9] Despite this, clinicians need to be cognisant of emerging evidence that may allow for exceptions in certain clinical scenarios. While pregnant women

in labour should still be considered to have an increased risk of pulmonary aspiration due to delayed gastric emptying during labour,[9] it does not appear that non-labouring pregnant women are at increased risk, regardless of BMI.[10,11] The risk of aspiration is difficult to quantify. One Australian study estimated an incidence of 1:1 004,[4] and another retrospective review did not find a single case in 215 000 patients.[12] If it is true that the aspiration risk of the non-labouring pregnant woman is equivalent to that found in the general surgical population, then one should consider whether rapid sequence induction and intubation are necessary in all patients.

Do all obstetric patients require rapid sequence induction for general anaesthesia?

It is a long-established anaesthetic tenet that "all pregnant women having Caesarean delivery under general anaesthesia must be intubated using rapid sequence induction".[9] Surveys carried out in 2008 and 2009 in the UK confirmed that 98% of anaesthetists still follow these recommendations.[4,13] Evidence supporting the use of rapid sequence induction to reduce aspiration risk in all categories of patient undergoing general anaesthesia[14] was not found in a review of 50 years' worth of medical literature (1966-2006). While the non-labouring parturient may have decreased lower oesophageal sphincter tone, this may be of questionable importance, given the normal gastric emptying that occurs in these patients.[15] Thus, concerns around the integrity of the lower oesophageal sphincter are probably less relevant in the non-labouring fasted patient. It has also been pointed out that cricoid pressure in itself may make mask ventilation, laryngoscopy and rescue strategies in failed intubation which makes it more difficult.[16,17] Thus, rapid sequence induction, as a general strategy for airway management in the patient at risk of aspiration, has received a considerable amount of attention in recent years. Concerns around cricoid pressure are part of this debate, but are beyond the scope of this article. Rapid sequence induction remains the standard of care for the obstetric patient who is at risk of aspiration. The appreciation that not all obstetric patients are at risk of aspiration is an important development in recent years, and thus, true rapid sequence induction is not required in all patients. There is also increasing support for "gentle mask ventilation" during rapid sequence induction,[18] which has particular relevance to obstetrics, given the reduced time to desaturation following apnoea.

Do all obstetric airways require an endotracheal intubation?

The laryngeal mask airway (LMA) is often used as a first-line rescue device for failed tracheal intubation in obstetric airways. The use of the LMA as a first-line airway management device followed,[19] and recent studies have continued to examine whether or not the LMA can be used during Caesarean section under general anaesthesia as an alternative to tracheal intubation. Halaseh et al described the use of the LMA Proseal® in 3 000 parturients undergoing Caesarean section under general anaesthesia.[20] Patients were not obese (BMI < 30 kg/m^2) and did not have risk factors for regurgitation or a difficult airway. The authors used a technique which involved muscle paralysis with rocuronium (0.9 mg/kg) and the use of a Macintosh laryngoscope and Magill forceps to facilitate placement of the LMA Proseal®. The haemodynamic impact of the technique employed was not quantified, which was highlighted in subsequent correspondence.[21] They reported a 99.7% first insertion rate, and one case of regurgitation into the upper airway, but without clinical sequelae. None of the patients required "rescue" intubation.

Yao et al studied the use of the LMA Supreme® in providing ventilation and oxygenation in patients undergoing elective or semi-elective Caesarean delivery under general anaesthesia.[22] Patients were excluded if they had a BMI greater than 35 kg/m^2. They enrolled 700 American Society Anesthesiology grade I or II parturients who had fasted for a minimum of four hours. All of the patients received sodium citrate and ranitidine. Evidence of aspiration was not observed and all of them were successfully managed with the LMA Supreme®. Hypoxia, laryngospasm or bronchospasm did not occur in any of the patients. First-time successful insertion occurred in 98% of subjects, with an average insertion time of 19.5 seconds. The gastric tube was placed successfully on the first attempt in 99.3% of cases. It should be noted that the use of the LMA Supreme® is standard practice in the institution in which the study was carried out, and the anaesthetists were experienced in its use. They also paralysed all patients with rocuronium (0.5 mg/kg). In an accompanying editorial, it was suggested that while the use of the LMA Supreme® may be "considered for use in slim, fasted patients with no gastroesophageal reflux scheduled for an elective Caesarean delivery, tracheal intubation should remain the standard for airway management in obstetric patients".[23]

It has been noted that caution needs to be applied to the findings of these trials, as the study population is not necessarily representative of the populations found in most obstetric units.[9,21] It would seem prudent to adopt a cautious approach in generalising these findings to every fasted patient having an elective Caesarean section. In an excellent editorial, Paech commented that an argument could be made for a clinical equipoise between conventional rapid sequence induction techniques and the LMA technique for airway management during general anaesthesia for Caesarean delivery, especially in the fasted, healthy, non-obese patient.[9] However, he asked for a conservative approach to be adopted until the evidence base is stronger. Perhaps the strongest message conveyed by these studies is that there is a place for supraglottic airway devices in obstetric general anaesthesia, and potentially, earlier use of these devices should be allowed in rescue situations.

Should video laryngoscopy be standard equipment in obstetric theatres?

Despite the known difficulties with obstetric airway management, the use of newer airway management devices has been slow to permeate into routine care. The role of video laryngoscopy in obstetrics is still being clarified, but early data from the general population appears to be favourable. Video laryngoscopy is performed better in the setting of the predicted difficult airway and in rescue situations.[24-26] Specific to the obstetric setting,

Aziz et al observed 180 intubations over a three-year period.[27] One hundred and fifty-seven of the 163 intubations with direct laryngoscopy were successful on the first attempt, with one failed intubation. Eighteen of the 18 were successful with the video laryngoscope, and the failed intubation from the direct laryngoscopy group was rescued with a video laryngoscope. In addition, there were predictors of a difficult airway in 16 of the 18 in the video laryngoscope group, suggesting that this was a higher-risk group for failed intubation. The authors concluded that video laryngoscopy may be a useful adjunct to obstetric airway management. By the end of the study, a dedicated video laryngoscope was stationed in the labour ward operating theatre.

Given the known difficulties with obstetric airways and the evidence base suggesting success with video laryngoscopy, perhaps these devices should be stationed permanently in obstetric theatres. Aside from being an invaluable teaching aid, they are relatively simple to use and would be placed in a known high-risk area.

Conclusion

Despite improvements in the incidence of difficult and failed intubations, obstetric airway management continues to challenge clinicians. A reduction in the number of general anaesthetics being performed means that increased attention needs to be paid to skill retention in this area. Rapid sequence induction with endotracheal intubation remains the standard of care, while gentle mask ventilation during rapid sequence induction should also be considered, and even encouraged, in some instances. While available data suggest that a subcategory of patient may have a supraglottic airway device placed as a first-line airway, it would be wise to practise a conservative approach to the universal adoption of this strategy. However, earlier intervention with a supraglottic device should be encouraged. The use of video laryngoscopy in obstetric theatres must be explored and consideration given to it being placed permanently in high-volume theatres.

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