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EDITORIAL

Rapid-sequence induction of anesthesia in obstetric women: how safe is it?

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A cautionary tale…

> A 35-year-old woman, 154 cm, 86 kg, with placenta previa and preeclampsia, had massive bleeding after consuming a lunch. She was immediately transferred to the operating room, where an anesthesiologist was called in. She was morbidly obese, having large breasts and a low-pitched voice (indicative of laryngeal edema), and the view of the oropharynx was obscured (Mallampati score 4). Awake tracheal intubation was attempted, but the patient refused to open her mouth. General anesthesia was induced as a rapid sequence, and tracheal intubation was attempted, but failed twice. A senior anesthesiologist was called in and accomplished intubation. Cesarean section was started. Soon after this, it was found that the tube was wrongly inserted into the esophagus. The tube was taken out and mask ventilation was attempted, but this was difficult. Arterial hemoglobin oxygen saturation rapidly decreased to 70 % with cardiac arrhythmia. Nevertheless, the baby was successfully taken out and the mother started to breathe. As the operation would continue, the laryngeal mask airway was inserted. The mother vomited and aspirated.

This is a fiction, but we all might have heard about a real story like this. And, what was wrong with this case? Why cannot we clearly answer what should have been done to this case?

In this issue of the Journal, Tao et al. [1] report a retrospective analysis of pregnant women who underwent general anesthesia during 2001–2006 in a teaching hospital, to obtain the incidence of 'difficult airway,' which was defined as follows: necessity of three or more attempts at direct laryngoscopy, the use of any maneuvers or techniques outside the rapid sequence induction routine (including mask ventilation resulting from oxygen desaturation from unsuccessful intubation attempts), the use of additional airway equipment, or inability to intubate the trachea. The incidence was 0.56 % (12 of 2,158 patients). They state that tracheal intubation was possible in more than 99.9 % of pregnant patients, and the incidence of difficult airway in pregnant patients is no higher than the incidence in nonpregnant patients. They attempted to seek factors contributing to the difficult airway, and have found that the lack of experience of anesthesia providers increased the incidence, whereas emergency cesarean section did not add another level of difficulty over planned cesarean section [1].

So, can we conclude that tracheal intubation in pregnant women is as easy as in nonpregnant patients? The reported incidence in the general population of difficult tracheal intubation is about 1 %, and that for difficult facemask ventilation is as much as 5 % [2–4]. Therefore, it seems reasonable to conclude that the incidence in pregnant patients may be similar to, or not much higher than, the incidence in the general population.

Can we then state that the pregnant patients are not at increased risk of serious airway complications during anesthesia? To answer this question, we need to know the risk in the general population. Until recently, the incidence, consequences, and causes of the problems had not been that

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clear, as there have been only reports of analysis of litigation, retrospective series, or prospective studies of a limited area [5]. Recently, the 4th National Audit Project (NAP4) of the Royal College of Anaesthetists and the Difficult Airway Society examined prospectively the occurrence of serious airway complications (resulting in death, brain damage, surgical airway, or unexpected ICU admission) during anesthesia, at all the National Health Service (NHS) hospitals in the UK [6]. This report represents the most definitive source of information on serious airway complications in the UK and provides the most useful data to the world.

In a 1-year audit, there were 133 cases of serious airway complication, an estimated incidence of 1 per 5,000–22,000 patients who underwent general anesthesia. Of these, 16 died [6]. The most common factor associated with serious airway complications related to difficulty with tracheal intubation, whereas pulmonary aspiration was the most common cause. A poor standard of care was a major contributing factor [6].

In the report of Tao et al. [1], none of the 12 patients with 'difficult airways' had serious airway complications. Can we consider that pregnant patients are not at increased risk of serious airway complications during anesthesia? The answer is no. The reason for this answer is that the number of cases studied was too small to draw reasonable conclusions about the incidence and causative factors of serious complications in pregnant women. Another reason is that even if the incidence of difficult tracheal intubation were similar between pregnant and nonpregnant patients, the severity of complications would be much greater in pregnant patients, if tracheal intubation is found to be difficult.

When the patient is at a low risk of pulmonary aspiration, failed tracheal intubation is not life threatening, insofar as facemask ventilation is possible. In contrast, if tracheal intubation has failed in patients who need emergency cesarean section, life-threatening complications are more likely to occur. Pregnant patients have reduced oxygen store, and thus they are more likely to be hypoxic after failed intubation. They also tend to have laryngeal edema, and thus repeated attempts at tracheal intubation are more likely to cause airway obstruction and hypoxia. If tracheal intubation has been difficult, anesthesia providers may not have the courage to take the tube out even when esophageal intubation is suspected; this may be particularly true when cesarean section is truly emergent, and the obstetricians have started the operation. Therefore, in such a very limited time during rapid-sequence induction of anesthesia, we need to choose appropriate methods and then carry these out rapidly and safely, to prevent these major complications.

Of the 12 patients with 'difficult airways' reported by Tao et al. [1], tracheal intubation was possible using a laryngoscope in 6 patients, but repeated attempts (4–6 attempts) at laryngoscopy were required in some patients. In the remaining 6 patients, the intubating laryngeal mask airway was inserted; in 4 of these patients, the trachea was intubated through the laryngeal mask, and in the other 2 patients, a clear airway was maintained using the laryngeal mask airway under cricoid pressure. One patient had pulmonary aspiration. Those 12 patients may be judged to have been treated rapidly and safely, but they were nevertheless at higher risk of pulmonary aspiration and airway obstruction. One major concern is that the trachea was not intubated in 2 patients, and they were at risk of death from pulmonary aspiration [6, 7]. Although cricoid pressure was applied in these cases, the efficacy of the pressure may decrease over time.

When the patient is at risk of pulmonary aspiration, and difficult tracheal intubation is predicted, general anesthesia should be avoided, or at least deferred, until the airway has been secured. In reality, however, when cesarean section is truly emergent, there may be no time to give spinal anesthesia, and thus either awake intubation or tracheal intubation after rapid-sequence induction of anesthesia should be selected [4]. In the report of Tao et al. [1], tracheal intubation was always attempted after rapid-sequence induction of anesthesia, even when difficult tracheal intubation was predicted. We need to establish clear-cut criteria as to when awake intubation should be selected in patients undergoing emergency cesarean section.

It has repeatedly been pointed out that education in airway skills does not occupy a central place in anesthesia training and that the training system for the management of the difficult airway is less than ideal worldwide [8]. Tao et al. have stated that tracheal intubation was difficult in some patients because inexperienced anesthesia providers failed to wait sufficient time for suxamethonium to take effect, or did not place the head and neck in the optimal position. The current trend of decreasing numbers of rapid-sequence induction of anesthesia for emergency cesarean section has made it imperative that training for appropriate airway management (including cognitive, psychomotor, and behavioral areas) should become more organized.

It has long been considered that tracheal intubation is more difficult in obstetric patients than in their nonobstetric counterparts. It is not exaggerating to say that appropriate airway management during anesthesia has been developed mainly in the field of obstetric anesthesia: recognition of the risk of pulmonary aspiration (in the 1930s) [9], national surveys of serious airway complications during anesthesia (e.g., Confidential Enquiries into Maternal Death in the United Kingdom) [10], establishment of an optimal method of laryngoscopy (by Cormack and Lehane [11]), and the first algorithm for difficult airway management [12]. In the 1990s, the importance of airway management was

recognized in nonobstetric patients as well, and several major efforts have been made: major guidelines about difficult airway management have been formulated, new reliable airway devices developed, and oximetry and capnography have become widely available. Because of these efforts, the incidence of serious airway complications has decreased, and airway management in obstetric patients can now be regarded as a safe procedure. Nevertheless, in a limited number of patients, tracheal intubation is unexpectedly difficult and we face a difficult situation of acting very quickly to secure a clear airway without causing complications. Therefore, we need to make further efforts to elucidate contributing factors to difficult airways, improve our technique and devices, and establish an education and training system to attain complication-free airway management in obstetric anesthesia.

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