Use of a ProSeal™ laryngeal mask airway for airway maintenance during emergency Caesarean section after failed tracheal intubation

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We report the use of the ProSeal™ laryngeal mask airway to establish and maintain the airway during emergency Caesarean section when tracheal intubation had failed with conventional laryngoscopy and mask ventilation was difficult. The ProSeal™ laryngeal mask allowed controlled ventilation without gas leak and facilitated drainage of the stomach.

Keywords: complications, difficult intubation; complications, failed intubation; equipment, airway, laryngeal mask

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The ProSeal™ laryngeal mask airway (PLMA) (Intavent Ortho®x, Maidenhead, UK) is a new supraglottic device introduced in the UK in 2001. It is designed to facilitate controlled ventilation and enable separation of the respiratory and gastrointestinal tracts. Its use after failed tracheal intubation in obstetric anaesthesia has been suggested, but not reported.

Case report

A 41-yr-old primigravid parturient, at 41-weeks gestation presented in the operating theatre for emergency lower segment Caesarean section. A severe fetal bradycardia had developed during the early phase of the first stage of labour. An effective lumbar epidural had been placed 30 min earlier and a syntocinon infusion commenced.

Her medical history was unremarkable as was the course of her pregnancy. She had undergone anaesthesia 18 months previously for a simple gynaecological procedure without complication. She had eaten a light meal 6 h earlier and a small amount of chocolate 4 h earlier. She denied symptoms of gastro-oesophageal reflux.

She was 1.83 m tall and weighed 92 kg. Examination of the upper airway revealed a Mallampati score of 2, an interincisor gap greater than 3 cm and a thyromental distance greater than three finger-breadths. She was able to protrude the lower incisors anterior to the upper incisors and had normal flexion and extension of the neck.

Such was the urgency of the delivery that regional analgesia was not considered appropriate and preparations were made for immediate induction of general anaesthesia. The procedure was explained to the patient, including the risk of awareness. She received ranitidine 150 mg orally before induction of general anaesthesia.

After pre-oxygenation, the patient was anaesthetized with a rapid sequence induction, using thiopental 450 mg and succinylcholine 100 mg. A grade 3 view of the larynx with evidence of a degree of airway swelling was obtained using a Macintosh laryngoscope with size 3 blade. Readjustment of the head position and changing to a longer blade did not improve the view. Two attempts at intubation using a gum elastic bougie failed because the bougie could not be passed into the trachea.

Senior assistance was called for. The oxygen saturation decreased to 55%. Manual ventilation using a reservoir bag attached to a circle breathing system and facemask required two people and was difficult. With oxygen 100%, continuous positive airways pressure and maintenance of cricoid pressure, the oxygen saturation steadily recovered to 92%.

The oxygen saturation started to reduce again just as senior anaesthetic help arrived. Cricoid pressure was released to enable a size 4 PLMA to be inserted. Using manual ventilation with oxygen 100% through the PLMA the patient’s oxygen saturation increased to 98%.

The patient was now regaining consciousness but remained partially paralysed. She was reassured and midazolam 4 mg was administered intravenously.
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A healthy male infant was delivered. The mother remained haemodynamically stable throughout the procedure, with oxygen saturations greater than 97%.

At the end of the procedure neostigmine 2.5 mg and glycopyrrolate 0.5 mg were administered. Spontaneous ventilation was re-established, the patient was turned to a left lateral position and when she was fully awake the PLMA was removed. There was no evidence of aspiration at any stage of the procedure. Examination of the bowl of the PLMA showed it to be clean. After the operation the patient made an unremarkable recovery.

A full explanation of the events was given to the patient and her partner. This included information regarding her difficult airway to relay to anaesthetists in the future. The patient had no recollection of events after pre-oxygenation.

Discussion

This is the first reported use of the PLMA either during Caesarean section or after failure to intubate the trachea during rapid sequence induction.

There are some issues of management of this patient that some readers may consider sub-optimal. Omission of antacid pre-medication was an error. The decision, made by a senior consultant, to give a second dose of succinylcholine and make a further attempt at tracheal intubation is clearly controversial and is not routinely recommended. However, these issues are not the focus of this case report and are therefore not discussed further.

When intubation failure occurs during rapid sequence induction with succinylcholine, oxygenation and ventilation are the immediate priorities. Recent work indicates that even when a dose of succinylcholine of 1 mg kg\(^{-1}\) is administered, where ventilation is difficult, awareness and haemoglobin desaturation are likely before return of spontaneous ventilation.\(^5\) In a recent survey of obstetric anaesthetists in the UK, 85% of respondents used more than 1.0 mg kg\(^{-1}\) of succinylcholine during rapid sequence induction for obstetric anaesthesia.\(^6\)

The laryngeal mask airway is included in the algorithms for unexpected failed intubation published and promoted by the airway societies of the US\(^7\) and Canada\(^8\) and in the guidelines being developed by the Difficult Airway Society in the UK (J. Henderson, Difficult Airway Society Meeting, London, 2002). In a recent UK survey of planned management of failed intubation after rapid sequence induction, if attempted intubation with a gum elastic bougie and McCoy blade failed, more than 50% of trainees and consultants would then use a classic laryngeal mask airway (cLMA). The combitube and other supraglottic airways were used by less than 2% of anaesthetists.\(^9\) In the survey of obstetric anaesthetists 93% would use a cLMA in the circumstances of an obstetric failed intubation with difficulty in facemask ventilation.

In a recent paper on the management of failed obstetric intubations, ventilation was difficult in seven (30%) and impossible in two (9%). Fifteen (65%) of 23 failed intubations were Cormack and Lehane grade 3 at laryngoscopy. Of the five patients who were not woken a cLMA was used in three successfully but without success in one.\(^10\) The cLMA may provide a clear airway in these difficult circumstances but the median airway seal pressure is only 20 cm H\(_2\)O and rarely ever above 30 cm H\(_2\)O.\(^11\) Thus, ineffective ventilation and gastric inflation may occur. The cLMA does not reliably protect against aspiration of regurgitated stomach contents.\(^12\)

There are several reasons why the PLMA may offer advantages over the other supraglottic airways and in particular the cLMA. The airway seal is at least 50% higher than that with the cLMA.\(^11\) The integral drain tube allows passage of an orogastric tube on the first attempt in more than 90% of patients\(^11\) and perhaps 100% when the PLMA is correctly placed.\(^13\) The design of the PLMA makes gastric inflation unlikely and the available evidence suggests it offers some protection over aspiration if regurgitation does occur.\(^14\)-\(^16\) Finally the large bowl of the PLMA and the absence of aperture bars means that the view of the glottis through the PLMA is comparable with that with the cLMA\(^12\) and may allow tracheal access if intubation is required.\(^17\)

There are also reasons why some may consider the PLMA to be a suboptimal device in this circumstance. The PLMA takes slightly longer to insert than the cLMA,\(^12\) first time success rates are lower than for the cLMA\(^12\) and there may be a lack of familiarity with the device. However, the time difference is a matter of seconds, the overall success rate is very nearly as high as the cLMA and the learning curve is unknown. The insertion technique when using the introducer is identical to that for an intubating laryngeal mask.

fetal heart was assessed with a Sonicaid device and was found to be bradycardic. The obstetrician was asked if there was time to wake the patient and administer regional anaesthesia: their opinion was that this would further endanger the fetus. The decision was made to continue with general anaesthesia for the operation.

With the PLMA in situ, propofol 150 mg and succinylcholine 100 mg were given. Cricoïd pressure was applied, the PLMA removed and tracheal intubation was attempted, this time by the consultant anaesthetist. Using a McCoy blade a difficult grade 3 view (very posterior epiglottis) of the larynx was obtained and attempts at intubation were unsuccessful because it was not possible to pass a gum elastic bougie into the trachea. The PLMA was re-inserted and the patient’s lungs were manually ventilated successfully with isoflurane 1.5% in oxygen. Cricoïd pressure was released. It was decided to continue the surgery using the PLMA. Atracurium 50 mg was given and controlled ventilation instituted using a Drager Narkomed 4 ventilator. Tidal volume was set at 800 ml, ventilatory frequency at 10 with an inspiratory:expiratory ratio of 1:2. Airway pressures were in the range of 26–35 cm H\(_2\)O with no evidence of leak of gas. A gastric tube was passed easily on the first attempt into the stomach but nothing was aspirated.

When intubation failure occurs during rapid sequence induction.

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airway (ILMA) and without the introducer is as for the cLMA. Prior experience with the cLMA and ILMA might modify or eliminate a learning curve. Finally, one might argue that if the PLMA is considered a better device than the cLMA in such circumstances, it is beholden on the practising anaesthetist to ensure familiarity with its use.

After considering the available evidence we have had a PLMA on our difficult airway trolley in the obstetric suite for the last year. We do not advise those inexperienced in its use to attempt insertion in the circumstances of failed intubation and it is not currently part of our failed obstetric intubation protocol. On this occasion the senior anaesthetist called to assist was experienced in the use of the PLMA and considered it a superior device to the cLMA.

That the PLMA offers increased safety over the cLMA in the circumstances of a failed intubation with a potentially full stomach is unproven and probably unprovable. However, the best evidence available indicates that, in experienced hands, the PLMA is likely to be the better choice.

References
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