Case report

Laryngeal nerve monitoring during thyroid surgery in pregnancy

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Abstract A 32-week parturient required partial thyroidectomy for suspicious carcinoma. The surgeon requested laryngeal nerve monitoring to decrease the chances of laryngeal nerve injury during surgery. After rapid-sequence induction of general anesthesia and intubation, a size 3 laryngeal mask airway was inserted posterior to the endotracheal tube and the cuff inflated with 15 mL of air. A fiberoptic bronchoscope inserted through the laryngeal mask airway provided an unhindered view of vocal cords for laryngeal nerve identification and testing during surgery. This combined technique also offered the advantages of a secured airway, as well as positive pressure ventilation in the parturient during thyroid surgery. © 2005 Elsevier Inc. All rights reserved.

1. Introduction

Thyroidectomy is usually performed during the second trimester for malignant lesions and cytological findings suspicious for papillary cancer\cite{1}. Thyroidectomy may also be necessary in pregnant women who cannot tolerate thionamides for treatment of hyperthyroidism due to allergies or agranulocytosis. Trauma to the laryngeal nerves continues to be the most devastating complication of thyroid surgery\cite{2}. Laryngeal nerve monitoring is being used with increasing frequency to decrease the incidence of laryngeal nerve injury during thyroid surgery\cite{3-8}. We report the successful use of a laryngeal mask airway (LMA) through which a fiberoptic bronchoscope (FOB) was inserted to view the larynx in the intubated parturient undergoing partial thyroidectomy. This method allowed continuous visualization of the vocal cords throughout surgery while providing a safe and secure airway in a parturient.

2. Case report

A 33-year-old parturient (162 cm, 78 kg) at 32 weeks’ gestation presented for a partial thyroidectomy for a left-sided mass that was suspicious for papillary carcinoma on fine-needle aspiration. She was otherwise healthy and had no significant past medical history. Her airway was classified as Mallampati I. The thyroid mass was discovered at a routine prenatal visit at 19 weeks. Her neck had never been irradiated in the past, but she had a positive family
history of papillary thyroid carcinoma. Therefore, she was advised to undergo partial thyroidectomy during pregnancy, and if needed, follow-up thyroidectomy/radiation therapy after the conclusion of pregnancy. The surgeon requested monitoring of the recurrent laryngeal nerves, if feasible, without jeopardizing the safety of the mother or the baby. (This surgeon prefers laryngeal nerve monitoring in all patients undergoing thyroid surgery).

Metoclopramide 10 mg IV and sodium citrate 30 mL PO were administered before surgery. Left uterine displacement was ensured before induction of anesthesia. After preoxygenation, anesthesia was induced with 5 mg/kg of thiopental sodium and 1.5 mg/kg of succinylcholine, with the application of cricoid pressure. After spraying the vocal cords with 2 mL of 4% lidocaine, the trachea was intubated using a 6.5 cuffed endotracheal tube (ETT). Lidocaine was used with the intention of allowing the patient to tolerate the ETT, especially because no other muscle relaxants were to be used during the case. The ETT was positioned at the right side of the oropharynx and secured. Anesthesia was maintained with nitrous oxide (50%) in oxygen, desflurane (6%), and fentanyl (150 μg). End-tidal CO₂ was maintained between 32 and 34 mm Hg with positive pressure ventilation. No further muscle relaxants were used after intubation. Fetal heart rate (FHR) monitoring, which was initiated preoperatively, was continued until the parturient made complete recovery from general anesthesia. Fetal heart rate monitoring was used to allow us to monitor fetal well-being and take appropriate interventions to correct any undesirable FHR changes. The obstetrician was present in the operating room to perform urgent cesarean delivery, if needed.

Once the patient was positioned on the table with a shoulder support and head ring, an LMA size 3 was positioned posterior to the ETT and inflated partially with 15 mL of air (Fig. 1). An FOB was then inserted via the LMA and its view adjusted until the vocal cords were clearly in view (Fig. 2). The FOB was then attached to a television monitor. At various intervals and before neck closure, the integrity of the recurrent laryngeal nerves was monitored using a nerve stimulator while any movement of

3. Discussion

The risk of failed intubation in parturients who undergo Cesarean section has been reported to be as great as 1 in 300 [9], which is 8 times the rate of the general surgical population. Furthermore, death due to anesthesia is the sixth leading cause of pregnancy-related mortality in the United States [10]. A review of these deaths from 1979 to 1990 showed that the majority were due to failed intubation and/or pulmonary aspiration during general anesthesia for Cesarean section [11]. Although most of the complications occurred during general anesthesia for emergency Cesarean sections, some also occurred during elective Cesarean section [11-14]. The factors that conspire to yield a higher incidence of failed airway management in pregnancy include weight gain, increased intragastric pressure, oropharyngeal edema, enlarged breasts, and decreased functional residual capacity, among others [15]. These factors, which are of concern during anesthesia for Cesarean section, also play a dominant role in the planning and execution of anesthesia for nonobstetric surgery during pregnancy. Our case report is one such example, in which we illustrate the feasibility of vocal cord monitoring during thyroidectomy in a parturient while adhering to the safety precautions needed during Cesarean delivery.

The rate of recurrent laryngeal nerve palsy varies from 2% to 4% after thyroid surgery [16]. Laryngeal nerve monitoring during thyroidectomy could potentially decrease injury to these nerves by facilitating their identification. Real-time monitoring of the laryngeal nerves may also be advantageous if the surgery becomes complicated by
anatomical variation, invasive or extensive tumor, previous radiation to the neck, or revision surgery. Laryngeal nerve injury can result in postoperative stridor and difficulty in breathing, both of which are undesirable events in the pregnant patient.

The use of FOB and LMA (without endotracheal intubation) to visualize the vocal cords and monitor the laryngeal nerves during thyroid surgery has been described by numerous authors [3-7]. However, in one series, an anesthesiologist was required to intervene and intubate in 10% of cases where the LMA technique was used, because of inadequate ventilation or hypoxia [4]. An unsecured airway may lead to aspiration and/or loss of the airway intraoperatively with disastrous consequences, particularly in pregnancy. To circumvent these difficulties, Hillermann et al [8] described the use of the combined technique of LMA and ETT for facilitating laryngeal nerve monitoring during thyroid surgery in nonpregnant subjects. The use of this technique, as described in our case report, assures that the airway is secured from the onset of anesthesia until the parturient is awake, while providing an unhindered and uninterrupted view of vocal cords during the entire procedure. Hillermann et al [8] used a 5.0-mm microlaryngeal tube. However, we used a larger 6.5-mm ETT in this parturient, as we felt that a smaller ETT would not provide an adequate seal around the tracheal cuff, hence, predisposing the patient to aspiration in spite of the high cuff inflating volume. Furthermore, ETT suctioning is easily facilitated with larger rather than smaller ETTs. In addition, a relatively larger ETT can avoid the use of higher peak inspiratory pressures that may be required to provide adequate tidal ventilation in the presence a gravid uterus.

One could have used FOB to monitor vocal cords without the use of an LMA. However, capillary engorgement and airway edema associated with pregnancy would render the mucosa susceptible to bleeding during manipulation of the FOB. In addition, FOB manipulation can stimulate mucosal secretion that could hamper the endoscopic view. Repeated periodic suctioning to alleviate this situation can also cause airway trauma, as well as additional mucosal stimulation. An LMA, on the other hand, provides a conduit for inserting FOB and facilitates an uninterrupted view without mucosal airway contact.

In conclusion, the LMA, in addition to conventional ETT, can be used to facilitate monitoring of laryngeal nerves during thyroid surgery while providing a secure airway in a parturient.

References