Title: Monitoring ProSeal™ Laryngeal Mask Airway Intracuff Pressures using a Simple Aneroid Gauge

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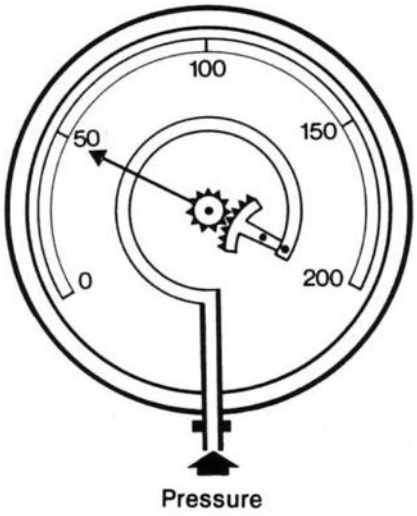
Introduction: Raised intracuff pressures in Laryngeal Mask Airways™ (LMA) are associated with increased incidence of pharyngolaryngeal morbidity such as sore throat.[1,2] Dysphonia, Dysphagia, and nerve injury have also been reported in association with LMA use, possibly from raised intracuff pressures.[3] Excessive cuff volumes and pressures have also been found to produce a suboptimal seal and potential LMA malfunction.[4,5] Additionally, LMA™ cuff inflation with the recommended maximum volumes may result in excessively high cuff pressures.[1,6,7] Cuff underinflation, on the other hand, can produce an inadequate seal making positive pressure ventilation and airway protection from above the cuff ineffective. Although cuff pressure monitoring is recommended by the manufacturers, little evidence exists for this in clinical practice. A recent study showed that most pediatric anesthesiologists do not routinely monitor LMA cuff pressures.[7] We describe the use of a simple, calibrated aneroid manometer to monitor intracuff pressures during ProSeal™ laryngeal mask (PLMA) anesthesia in a child.

Case Report: A 2½ year old, 15kg, male child presented for umbilical hernia repair. Following premedication with oral midazolam and acetaminophen, anesthesia was induced with an O_2/N_2O/sevoflurane mixture and an intravenous catheter placed. Rocuronium 6mg and fentanyl 75 mcg were given and a size 2 PLMA was inserted using the finger insertion technique. A pre-calibrated, aneroid gauge (Marshall Town®, 91901, USA), used as an airway pressure gauge on many commonly used anesthesia machines, was then connected to the pilot balloon valve using a three-way tap and a short low-compliance tubing (Figure 1). The gauge was calibrated against the electronic pressure monitor of the Ohmeda 7900 SmartVent ventilator module on the anesthesia machine. The cuff was then inflated to a pressure of 60 cmH_2O as recommended by the manufacturer.[8] The depth of insertion was appropriate with 75% of the bite block deep to the incisors. The suprasternal notch test was positive, indicating correct placement of the PLMA in the hypopharynx, behind the cricoid cartilage. The airway leak pressure was 22cm H_2O and there was no evidence of glottic or supraglottic obstruction. With the intracuff pressure stable at 60 cmH_2O, N_2O (66%) was reintroduced into the anesthetic gas mixture and the intracuff pressure was recorded every 10 minutes. The intracuff pressure after 10 minutes had risen to 72 cmH_2O and 0.5ml of air was evacuated to return the intracuff pressure to 60 cmH_2O. Similar cuff pressures and deflation volumes were observed for the next two 10-minute epochs. The PLMA was removed in the recovery room with no blood staining observed.

Figure 1

Discussion: Methods for intracuff pressure monitoring include digital palpation of the pilot balloon, use of mercury manometers, brand name aneroid manometers, pressure transducers, and other electronic methods.[1,6,9,10,] Cuff pressure control devices have also been described.[11,12] The digital palpation method requires a brief period of training to produce consistently accurate estimates of intracuff pressures.[9] Brand name aneroid gauges and electronic methods are expensive and not readily available. Common causes of excessive intracuff pressures are inadvertent or deliberate overinflation, nitrous oxide diffusion into the cuff and to a lesser extent, warming of anesthetic gases. The manufacturers recommend cuff inflation to a maximum of 60 cmH_2O and cuff pressure monitoring to prevent pharyngolaryngeal morbidity.[8] Use of the PLMA requires perfect positioning and optimal cuff inflation to ensure proper function and avoid potentially dangerous complications. Overinflation of the PLMA may result in glottic or supraglottic obstruction, displacement of the mask from the hypopharynx, malposition, and eventual malfunction. Monitoring intracuff pressures with intermittent cuff deflation is the easiest and most logical method of controlling cuff pressures especially during nitrous oxide anesthesia.[10,13] Figure 2 is a schematic of the principle of a simple aneroid gauge. Increasing pressure uncoils the metal tube and moves the pointer. The modified aneroid gauge described is easy to assemble, easy to use, readily available, portable, and can record pressures of -20 to 100 cmH_2O which covers the clinically useful range for both supraglottic devices and endotracheal tubes. The ability to record negative pressure could aid proper LMA cuff deflation prior to insertion. MRI compatibility is another added advantage. We have used this gauge to monitor and control cuff pressures in over 200 cases utilizing the PLMA in children at our institution.

Figure 2



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