The LMA ProSeal

The LMA-ProSeal®. Although the original LMA and the LMA-flexible have been used successfully for positive-pressure ventilation, they are not ideally suited to this task for two reasons: first, if poorly seated in the hypopharynx, gastric inflation may occur; second, the seal pressure is limited to approximately 20 cm H₂O. In 1994 an LMA prototype that included a gastric drain was described. The LMA-Proseal® was introduced to clinical practice in 2001. It was believed that such a design would reduce both the risk of gastric inflation (by providing a low-resistance pathway for pressure transmitted to the esophagus) and the risk of aspiration of refluxed gastric contents. Subsequently, it was found that the design, which also incorporates a second, posterior cuff, could reliably allow positive-pressure ventilation with 40 cm H₂O pressure. It is inserted in an identical manner as describe previously for the LMA-classic. A metallic insertion device is available from the manufacturer. Table 23-8 lists the unique features of the LMA-Proseal and the resultant clinical advantage.

The LMA-Proseal has been shown to achieve a higher effective seal than the LMA-classic (40-45 cm H₂O), and allow easier and quicker gastric tube placement. A wide variety of surgical cases have been performed with the LMA-Proseal. Many of these have previously been considered contraindicated for supraglottic airway use. Maltby et al. have pioneered the use of the LMA-Proseal laparoscopic cholecystectomy in obese patients. This surgical procedure has long been considered the prototypical case for contraindicated LMA use due to high intraperitoneal pressures, as well as intraoperative stomach manipulation. Laparoscopic cholecystectomy was performed in 46 patients, 12 of which had a body mass index of greater than 30 kg –m⁻². The median airway pressure at which a gas leak occurred was 34cm H₂O (range 18-45). Four obese patients crossed over to a control, tracheal tube group. Stomach size (e.g. distension) was equal between groups.

Apart from being successfully used as a positive pressure as well as spontaneous ventilation airway, the LMA-Proseal has a distinct advantage overall currently available supraglottic airways. The presence of the gastric drain allows position diagnosis. This facility, originally intended by Dr. Archie Brain, has been extensively researched by Drs. M. Stix and C. O’Connor. These authors have developed a protocol for judging LMA-Proseal position, a task typically difficult for the less experienced LMA user. The protocol of Stix and O’Connor follows a simple logic based on the observations of Dr. Archie Brain and their own observations.

Bite block depth: Based on the successful use of the LMA-Proseal in 147 woman and 127 men, a first approximation of insertion adequacy can be made from observation of the integral bite block. The midway point of the bite block was found to be proximal to the incisors (e.g. within the oral cavity) in 78% of women and 92% of men. Though mid (or greater) bite block advancement into the esophagus indicated good placement, a normal distribution of depths indicate that the bite block test affords a “first approximation” of LMA-Proseal position adequacy.
**Suprasternal notch test (SSN):** When correctly positioned, the proximal orifice of the gastric drain tube should be within the boundaries of the upper esophagus, making it contiguous with the esophageal lumen. Gentle percussion over the suprasternal notch results in a brief pressure increase in the lumen of the gastric drain. This can be demonstrated with the placement of a seal of surgical jelly, or preferably, nontoxic soap (e.g. children’s bubble making soap) over the distal end of gastric drain. Inadequate insertion depth and glottic or folded positions will result in a negative SSN test.

**Airway seal test:** Once the insertion depth and esophageal position of the proximal gastric drain orifice is assured, positive pressure breaths are given. If an adequate separation of the alimentary and airway tracks have been achieved, no insufflated gas should emerge from the distal gastric drain. The surgical jelly-soap or bubble seal of the distal gastric drain will aid in detection of escaping gas.

**Gastric drain patency:** Posterior folding of the distal aspect of the LMA-Proseal mask has been described. Folding of the mask in the hypopharynx may not be detected during routine ventilation. Dr. Brimacombe et al. have stated that one or more of the above mentioned tests may give a false-positive results. These authors suggest supplementing the LMA-Proseal position testing with the insertion of a gastric tube, thereby assuring gastric drain patency.

The importance of position testing was highlighted in a report of pulmonary aspiration of gastric contents during a cholecystectomy with an LMA-Proseal. No position testing had been performed, and though adequate ventilation was achieved and with airway pressures of 27cm H2O, the LMA-Proseal had been unknowingly placed in a folded position. This case illustrates the importance of the LMA-Proseal in modern clinical practice: as of this writing more than 10 supraglottic airways are in use in clinical practice. Because many are recent arrivals to the clinical arena, there is little or no information available regarding gastric insufflation with positive pressure ventilation and protection from gastric content aspiration. The LMA-Proseal remains the only device where these questions have been repeatedly investigated, and position testing is a possibility.

Similarly, little is known of the resuscitation utility of new SGAs. The LMA-Proseal would be expected to function similarly to the LMA-Classic in a can not intubate, can not ventilate situation, and adds gastric emptying as a resuscitative maneuver.

Esophageal and gastric insufflation have been noted with some proseal LMA placements. The incidence and clinical signature of this air trapping is unknown.