



## Use of I-Gel in Anesthesia for Laparoscopic Cholecystectomy

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### Abstract

#### Introduction:

Supra-glottic airway devices (SADs) have been claimed to be as effective and safe as endotracheal intubation or even better. The SADs have been used as effective measures in difficult airway management as well as in rescue ventilation for life-saving situations. The i-gel LMA is one of the second-generation SADs. It is constructed of a thermoplastic elastomer which provides an airtight seal around patient's peri-laryngeal anatomy without the inflatable cuff mechanism found in other LMAs. Use of i-Gel LMA has been suggested as a safe alternative to endotracheal intubation during general anaesthesia for laparoscopic cholecystectomy. This study was conducted to evaluate if routine use i-Gel LMA was a possibility in laparoscopic cholecystectomy. **Method:** A prospective study was made over a period of one year (Jan 2021 to Jan 2022) among the 150 patients who underwent laparoscopic cholecystectomy under general anaesthesia. Airway was managed with I-gel insertion. A back-up provision to convert to endotracheal intubation was kept ready, in case positive pressure ventilation was considered inadequate with respect to maintaining oxygenation and end-tidal carbon dioxide pressure was within normal limit. A gastric drainage tube of 10F was attempted to be passed via the LMA drainage channel before and after lubrication with lignocaine jelly and its ease of insertion recorded. Aspiration of the tube was done and its success / failure recorded. The open end of the tube was kept fixed below the operating table level to help spontaneous drainage of gastric secretions. Airway pressure, end-tidal CO<sub>2</sub> ( EtCO<sub>2</sub> ) and oxygen saturation (SpO<sub>2</sub> ) were monitored. Inhaled and exhaled tidal volume were recorded. Leak volume percentage was calculated from these values. The mean blood pressure (MAP) was recorded at start, at 5 minute intervals and just prior to removal of the device. Frequency of coughing and visible blood on removal of the device were recorded. The postoperative oropharyngeal discomfort (POPD) during 1 hour of stay of the patients in the recovery room was also recorded. **Results:** Placement of i-Gel LMA was successful on first attempt in all patients. Ventilation was possible in all patients before initiation of surgery. However, two patients (1.33%) had leak volumes more than 50 % of tidal volume, requiring conversion to endotracheal intubation. All other patients (148) were adequately ventilated prior and after initiation of pneumoperitoneum. **Conclusion:** Our study found that ventilation by i-Gel provides a steady and safe level of end tidal carbon dioxide level during anaesthesia in patients undergoing laparoscopic cholecystectomy. The same has been reported previously. Extension of use of SAD to laparoscopic surgeries has been reviewed (Y1) and found a non-existent risk of aspiration with the use of LMA with drain channels. The review suggests that to find a twofold increase in aspiration risk needs

**KEY WORDS:** I-Gel, laparoscopic cholecystectomy, drainage, ventilation

DOI Number: 10.48047/NQ.2022.20.20.NQ109187

NeuroQuantology2022;20(20): 1792-1795



## Introduction

Supra-glottic airway devices (SADs) have been claimed to be as effective and safe as endotracheal intubation or even better. The SADs have been used as effective measure in difficult airway management as well as in rescue ventilation for life-saving situations. Over time the second-generation SADs have been used increasingly in laparoscopic surgical procedures as they protect against pulmonary aspiration due to incorporated gastric channels.<sup>[1],[2]</sup> Preference of these devices over endotracheal intubation has evolved due to multiple advantages which include ease of placement, lesser requirement of neuromuscular blockade, more hemodynamic stability, less restricted mucociliary clearance, and lower incidence of postoperative airway morbidity.<sup>[1],[2],[3],[4]</sup>

The i-gel LMA is one of the second-generation SADs. It is constructed of a thermoplastic elastomer which provides an airtight seal around patient's peri-laryngeal anatomy without the inflatable cuff mechanism found in other LMAs. Use of i-Gel LMA has been suggested as a safe alternative to endotracheal intubation during general anaesthesia for laparoscopic cholecystectomy.<sup>[1]</sup> However, not many anaesthesiologists are still very comfortable with its routine use. This study was conducted to evaluate the if routine use i-Gel LMA was a possibility in laparoscopic cholecystectomy.

## Method

A prospective study was made over a period of one year (Jan 2021 to Jan 2022) among the 150 patients who underwent laparoscopic cholecystectomy under general anaesthesia. Airway was managed with I-gel insertion. A back-up provision to convert to endotracheal intubation was kept ready, in case positive pressure ventilation was considered inadequate with respect to maintaining oxygenation and end-tidal carbon dioxide pressure was within normal limit.

A gastric drainage tube of 10F was attempted to be passed via the LMA drainage channel before and after lubrication with lignocaine jelly and its ease of insertion recorded. Aspiration of the tube was done and its success / failure recorded. The open end of the tube was kept fixed below the operating table level to help spontaneous drainage of gastric secretions.

Airway pressure, end-tidal CO<sub>2</sub> ( EtCO<sub>2</sub> ) and oxygen saturation (SpO<sub>2</sub> ) were monitored. Inhaled and exhaled tidal volume were recorded. Leak volume percentage was calculated from these values.

The mean blood pressure (MAP) was recorded at start, at 5 minute intervals and just prior to removal of the device.

Frequency of coughing and visible blood on removal of the device were recorded. The postoperative oropharyngeal discomfort (POPD) during 1 hour of stay of the patients in the recovery room was also recorded.

## Results

Placement of i-Gel LMA was successful on first attempt in all patients. Ventilation was possible in all patients before initiation of surgery. However, two patients (1.33%) had leak volumes more than 50 % of tidal volume, requiring conversion to endotracheal intubation. All other patients (148) were adequately ventilated prior and after initiation of pneumoperitoneum.

Passing the drainage tube via the LMA was difficult without lubrication but use of lubricating jelly made passing the gastric drainage tube very easily in all patients. Aspiration of gastric secretions was successful in all these patients. It also facilitated spontaneous drainage of gastric secretions during the surgery in all of these patients.

Mean airway pressure before pneumoperitoneum was 18.5 cm H<sub>2</sub>O (±4.2;



cm; range 12–25 cm H<sub>2</sub>O) and 23.7 cm H<sub>2</sub>O ( $\pm 3.6$  cm; range 18–33 cm H<sub>2</sub>O) after pneumoperitoneum. The mean EtCO<sub>2</sub> value was 38.8 mm Hg ( $\pm 3.1$  mm Hg; range 37–42 mm Hg). The mean SpO<sub>2</sub> level was 98 % ( $\pm 1$  %; range 98–99 %). The mean leak volume percentage was 6.5% ( $\pm 1$  %; range 3–8%).

The mean of the MAP during the surgery was 86 mmHg ( $\pm 5$  mm Hg; range 67–92 mm Hg) and at removal of device was 91 mmHg ( $\pm 5$  mm Hg; range 67–92 mm Hg). None of the patients suffered from any coughing on removal of LMA and no visible blood was found on LMA in any patient. None of the patients complained of any POPD in the recovery room.

## Discussion

General anaesthesia traditionally is linked to endotracheal intubation for safe airway maintenance of patients. The main concern of safety has been the risk of aspiration of stomach contents into the lungs. The endotracheal tube having an inflatable tracheal cuff practically eliminated this risk and as such is considered the gold standard for securing patient's airway. This advantage is however associated with disadvantages like immediate systemic response of increase in blood pressure and tachycardia, post operative throat discomfort and occasional pharyngeal or dental trauma.

As a result this is being increasingly challenged by the idea of use of supra-glottic airway devices (SAD) like various laryngeal mask airways (LMA) for a select group of patients undergoing surgery under general anaesthesia.

This study was an effort to determine whether instead of a select group of patients we could use i-Gel LMA as a safe airway device for anaesthesia in Laparoscopic cholecystectomy in all routine patients.

Our study indicate that i-Gel is easy to insert and the percentage of patients having ventilation inadequacy due to high leak volumes requiring conversion to ETT is low (1.33%). Use of LMA -ProSeal (PLMA) (1) and LMA-supreme(SLMA) (2) for positive pressure ventilation during laparoscopic cholecystectomy was found to be adequate. The respiratory mechanics parameters using the two devices have been found to be comparable apart from the dynamic compliance, which was significantly higher with i-Gel (3).

We found that the passage of drainage was much easier with the use of a lubricating jelly as compared to without it. Previous literature does not report any studies mentioning the use of a lubricating jelly. However studies have indicated that drainage tube insertion was easier in PLMA as compared to i-Gel (5). We recommend that a lubricating jelly be used while passing a drainage tube via the suction channel of any LMA. The drainage tubes have been connected to continuous suction in past (1). However our study suggests that initial suction followed by fixing the open end of the tube below the patient level leads to spontaneous continuous drainage obviating the use of a continuous suction pressure. This however needs to be further evaluated given the small cohort of our study.

In our study the mean airway pressure before pneumoperitoneum was 18.5 cm H<sub>2</sub>O ( $\pm 4.2$ ; cm; range 12–25 cm H<sub>2</sub>O) and 23.7 cm H<sub>2</sub>O ( $\pm 3.6$  cm; range 18–33 cm H<sub>2</sub>O) after pneumoperitoneum which is in concordance with an earlier study (2) in which mean airway pressure before pneumoperitoneum was 17.5 cm H<sub>2</sub>O ( $\pm 3.3$ ; cm; range 11–26 cm H<sub>2</sub>O) and 22.9 cm H<sub>2</sub>O ( $\pm 4$  cm; range 16–32 cm H<sub>2</sub>O) after pneumoperitoneum. Our study found that ventilation by i-Gel provides a steady and safe level of end tidal carbon dioxide level during anaesthesia in patients undergoing



laparoscopic cholecystectomy. The same has been reported previously by (6).

Literature shows that they evoke minimal systemic response, cause very little post operative throat discomfort or trauma. Comparative studies of endotracheal tube(ETT) with SAD of various types like Classical laryngeal mask airway (CLMA), LMA supreme (SLAM) and Proseal LMA (PLMA) exist (1,2,3,4,5). These do not demonstrate any significant increase in risk of use of SAD over ETT.

Extension of use of SAD to laparoscopic surgeries has been reviewed (Y1) and found a non-existent risk of aspiration with the use of LMA with drain channels. The review suggests that to find a twofold increase in aspiration risk needs

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