International Journal of Research in Medical Sciences
Quraishi AN et al. Int J Res Med Sci. 2023 Jun;11(6):2140-2144
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20231632

Original Research Article

A comparative study to assess I-gel as an alternative to endotracheal tube in laparoscopic surgeries

Athar Un Nisa Quraishi[1]*, Akshi Goel[2], Kamran Ahmad Quraishi[3], Touseef Ul Ayoub[4]

[1]Department of Anaesthesiology, GS Medical College Hapur, Ghaziabad, Uttar Pradesh, India
[2]Department of Anaesthesiology, Sir Gangaram Hospital, Delhi, India
[3]Department of Medicine, Government Medical College, Srinagar, Jammu and Kashmir, India
[4]Department of Pediatric, Cardiology Fortis Escort Heart Institute, Okhla, Delhi, India

Received: 07 April 2023
Revised: 09 May 2023
Accepted: 16 May 2023

***Correspondence:**
Dr. Athar Un Nisa Quraishi,
E-mail: atharqureshi603@gmail.com

ABSTRACT

Background: This study was conducted to compare and evaluate the effectiveness of I-gel over endotracheal tube with regards to respiratory and hemodynamic parameters in laproscopic surgeries.
Methods: In this study 60 adult patients of either sex, of ASA status I or II, aged 16 to 60 years, undergoing laparoscopic surgeries under general anesthesia were randomly studied. In Group-A (I-gel) appropriate sized I-gel was inserted, and in Group-B (ETT) patient's airway was secured with laryngoscopy-guided endotracheal intubation. Monitoring of PR, MBP, SpO_2 and $EtCO_2$ was done throughout the peri-operative period. Haemodynamic and ventilatory parameters were recorded before induction (baseline), just after intubation, then at 1, 3 and 5 min after I-gel insertion/intubation, after pneumoperitoneum, after change of position, before and 5 min after release of pneumoperitoneum and after I-gel removal/extubation.
Results: Following the insertion of airway device there was significant rise in PR (3 min after intubation [P = 0.011, df-58, CI-95%]) and MBP (3 min after intubation [P = 0.02, df-58, CI-95%], 5 min after intubation [P = 0.04, df-58, CI-95%]) in Group-B patients when compared to Group-A patients. Following insertion of airway device there was no significant difference in $EtCO_2$ (3 min after intubation [P = 0.778, df-58, CI-95%]), 5 min after intubation [P = 0.75, df-58, CI-95%]) in Group-B patients when compared to Group-A patients.
Conclusions: I-gel requires less time for insertion with minimal haemodynamic changes when compared to ETT. I-gel can be a safe and suitable alternative to ETT for laparoscopic surgery.

Keywords: Endotracheal tube, Intubation, I-gel, Laparoscopic surgery, Pneumoperitoneum

INTRODUCTION

Maintenance of airway is an integral part of general anesthesia. The major responsibility of an anesthesiologist is to provide adequate ventilation to the patient. There are wide variety of supraglottic airway devices available which are used for surgeries requiring general anesthesia, so as to avoid the hemodynamic response associated with endotracheal intubation.[1] The tracheal tube is always considered to be the gold standard for laparoscopic surgeries. Recently, trends in airway management have progressed from using an endotracheal tube (ETT) to a supraglottic airway device (SAD) because of the advantages that such devices confer.[2-4] However, the use of SADs in surgeries requiring LPT positioning remains controversial because of the increased risk of insufficient ventilation and pulmonary aspiration.[5-7] As conventional laryngoscopy guided endotracheal intubation evokes significant hypertension and tachycardia, we have used I-gel, second generation

supraglottic airway device, in attempt to overcome these drawbacks. The second-generation SADs with gastric channel provide higher sealing pressures and more complete airway protection than the laryngeal mask airway classic.[8] The i-gel (intersurgical, Wokingham, UK) is a new second-generation SAD. It is a truly anatomical device that includes the non-inflatable cuff, and a buccal stabilizer to prevent malposition.[9] It provides lower respiratory complications and is capable of sealing higher oropharyngeal leak pressures than earlier SADs.[10] The device is fabricated from styrene ethylene butadiene styrene (SEBS), and provides improved sealing pressure when warming up to body temperature.[11,12]

Aim was to compare haemodynamic changes during insertion and efficacy of ventilation with the use of I-gel over endotracheal tube (ETT) in laproscopic surgeries.

METHODS

A prospective, comparative, randomised study was conducted in department of anaesthesiology GS Medical College from January 2021 to June 2022. Total 60 adult patients of either sex, of ASA status I or II, aged 16 to 60 years, undergoing laparoscopic surgeries under general anesthesia were studied. The anticipated duration of surgery was up to two hours. Exclusion Criteria were the patients having chronic lung disease, pathology of the neck, difficult intubation/mouth opening, those undergoing emergency surgeries, patients with body mass index (BMI) >35 kg/m^2, pregnant women, increased risk of aspiration (hiatus hernia, gastro-oesophageal reflux disease, full stomach) and the patients not willing to participate.

Methodology

After obtained written informed consent of patients and relatives,and approval from ethical committee 60 adult patients of American Society of Anaesthesiologists physical status I or II undergoing elective laparoscopic surgeries were randomly allocated to one of the two groups of 30 patients each. Randomisation was done using closed envelop technique. In Group-A (I-gel) appropriate sized I-gel was inserted, and in Group-B (ETT) patient's airway was secured with laryngoscopy - guided endotracheal intubation. After securing intravenous (IV) line, all standard monitors like electrocardiogram (ECG), non-invasive blood pressure and pulse oximeter were applied, and patient's baseline parameters like pulse rate (PR), mean blood pressure (MBP) and peripheral oxygen saturation (SpO_2) were recorded. Patients were premedicated with injection glycopyrrolate 4 µg/kg, ondansetron 50 µg/kg, ranitidine 1 mg/kg and fentanyl 1 µg/kg IV. After 15 min of premedication Group-A patients were induced with propofol 2-2.5 mg/kg IV without muscle relaxant. Group-B patients were induced with injection vecuronium bromide 0.08-0.1 mg/kg IV to facilitate the endotracheal intubation. Airway devices (ETT and I-gel) of appropriate size were inserted by the experienced anaesthesiologists. Position of the airway devices and efficacy of positive-pressure ventilation were assessed by observing adequate chest rise on manual ventilation, bilateral equal air entry on auscultation, normal rectangular shape capnograph tracing, absence of leak and normal SpO_2 (>95%). After fixing the airway device, appropriate sized gastric tube was inserted. Ease of insertion of I-gel/ETT was assessed as Easy: No resistance to insertion in the pharynx in a single manoeuvre; Difficult: Resistance to insertion or more than one manoeuvre was required for the correct placement of the device and impossible: Unable to insert the I-gel/ETT. We also recorded the number of attempts and time required for insertion of airway device. The time for insertion was recorded as time from insertion of the airway device to the first capnograph trace. The ease of placement (easy: inserted in 1st attempt, difficult: requires >1 attempt), number of attempts required and failure of gastric tube placement was also noted.

Anaesthesia was maintained with O_2, N_2 O, sevoflurane 1-2% and intermittent doses of injection vecuronium bromide 0.01mg/Kg. Controlled ventilation was provided with tidal volume of 8-10 ml/kg and respiratory rate set to obtain an end tidal carbon dioxide ($EtCO_2$) between 35 and 45 mmHg. At the end of surgery, neuromuscular blockade was reversed with glycopyrrolate 8 µg/kg and neostigmine 0.05 mg/kg. Removal of I-gel/extubation of ETT was done after recovery of adequate spontaneous respiration and muscle tone. Monitoring of PR, MBP, SpO_2 and $EtCO_2$ was done throughout the perioperative period. Haemodynamic and ventilatory parameters were recorded before induction (baseline), just after intubation, then at 1, 3 and 5 min after I-gel insertion/intubation, after pneumoperitoneum, after change of position, before and 5 min after release of pneumoperitoneum and after I-gel removal/extubation.

RESULTS

Participants of this study were recruited from routine laparoscopic list there were no dropouts. Demographic profiles as shown in Table 1 were comparable in both groups. No significant difference in terms of age, weight, height, BMI and duration of surgery were noted.

Above table shows that mean age was 31±11.92 yrs in Group A and 32.9±9.97 yrs in Group B. Mean weight was 51.7±9.65 and 54.5±7.67 Kgs respectively for Group A and Group B. Duration of surgery was 1.25 hrs for Group A and 1.46 hrs for group B. Male:Female ratio was 1.5:1 for group A and 0.76:1 for group B.

Above Table 1 shows that among 30, 28 patients had easy insertion of I Gel, 02 had difficult in Group A and 30 patients had easy insertion of I Gel, 00 had difficult in Group B.

Table 1: Demographic profile of patients.

Group	Age (in years) Mean±SD	Weight (in kg) Mean±SD	Height (in cm) Mean±SD	BMI (in kg/m^2) Mean±SD	Duration of surgery (in hrs)	Gender (male/female)
A (I-gel)	31±11.92	51.7±9.65	158.65±5.41	21.12±2.78	1.25	18/12
B (ETT)	32.9±9.97	54.5±7.67	157.23±6.19	21.23±3.23	1.46	13/17

Table 2: Comparison of parameters between two groups.

Parameters	Group –A(I-gel)	Group-B(ETT)
Airway device number (size)	15 (3), 15 (4)	11 (7.5), 10 (8.0), 9 (8.5)
Ease of insertion		
Easy	28	30
Difficult	02	00
Failed	00	00
Number of attempts		
1	24	30
2	06	00
3	00	00
Attempts for gastric tube insertion		
1	27	28
2	03	02
3	00	00

The mean times from insertion of the airway device to the first capnograph trace was significantly less in I-gel insertion (11.01±1.98 seconds) when compared with ETT (13.12±2.97 seconds) (Table 3).

Table 3: Mean time of insertion.

Group	Time of insertion (seconds), Mean±SD
A(I-gel)	11.01±1.98
B(ETT)	13.12±2.97

Table 4: Mean pulse rate and mean blood pressure changes.

Parameter	Pre op	Before induction	3 min after intubation	5 min after intubation	After pneumoperitoneum	After release of pneumo	After extubation
Mean pulse rate (Group A)	77.2	79.47	84.1	82.4	84.3	77.2	85.3
Mean pulse rate (Group B)	77.8	78.4	86.2	82.6	85.2	77.7	86.4
Mean BP (Group A)	90.37	91.98	93.78	92.81	93.44	89.99	95.56
Mean BP (Group B)	91.23	92.36	97.87	95.91	92.56	90.09	95.47

Following insertion of airway device there was significant rise in PR (3 min after intubation [P = 0.011, df-58, CI-95%]) and MBP (3 min after intubation [P = 0.02, df-58, CI-95%], 5 min after intubation [P = 0.04, df-58, CI-95%]) in Group-B patients when compared to Group-A patients. However after 5 min of intubation till the removal of airway device the changes in PR and MBP were comparable in both groups (Table 4).

Following insertion of airway device there was no significant difference in $EtCO_2$ (3 min after intubation [P = 0.778, df-58, CI-95%]), 5 min after intubation [P = 0.75, df-58, CI-95%]) in Group-B patients when compared to Group-A patients (Table 5).

Table 5: $EtCO_2$ changes.

Parameter	Just after intubation	3 min after intubation	5 min after intubation	After pneumoperitoneum	After release of pneumo	After extubation
$EtCO_2$ (Group A)	36.57	37.86	37.75	39.33	38.25	36.23
$EtCO_2$ (Group B)	36.37	37.56	37.23	39.73	38.45	37.76

DISCUSSION

In present study we found significant changes in HR and MAP immediately after insertion, persisted till 3 minutes after intubation and during extubation in ET tube. Increase in the HR and MAP in ET group and I-gel group were only after insertion of device. It is attributed to sympathetic stimulation during laryngoscopy and the passage of the ET through the vocal cords.[13]

In present study the mean times from insertion of the airway device to the first capnograph trace was significantly less in I-gel insertion (11.01±1.98seconds) when compared with ETT (13.12±2.97seconds).

Similar observation was reported by Sharma et al and Uppal et al who found, mean time for I-gel insertion 13.67 and 12.2 s, respectively.[14,15] The results were comparable to Helmy et al study, where 80 patients were studied, they underwent different surgical procedures under general anesthesia.[16] The success rate for insertion of gastric tube through the I-gel was 95% compared to overall success rate of 90% in the current study.

In present study, following insertion of airway device there was significant rise in PR (3 min after intubation [P = 0.011, df-58, CI-95%]) and MBP (3 min after intubation [P = 0.02, df-58, CI-95%], 5 min after intubation [P = 0.04, df-58, CI-95%]) in Group-B patients when compared to Group-A patients. However after 5 min of intubation till the removal of airway device the changes in PR and MBP were comparable in both groups. Similar results were seen study done by Jindal P et al on hemodynamic responses after insertion of I-gel. They found that there was significant difference in MAP after insertion.[17] The results of this study approved with Uppal et al who studied 25 patients comparing I-gel and ETT using pressure-controlled ventilation, they found several well-established advantages of using I-gel compared with a tracheal tube. The major ones include less hemodynamic upset during induction and maintenance of anesthesia and lower incidence of sore throat.[18]

CONCLUSION

We have concluded that I-gel requires less time for insertion with minimal hemodynamic changes when compared to ETT. I gel provides adequate positive-pressure ventilation, comparable with ETT. Hence, I-gel can be a safe and suitable alternative to ETT for laparoscopic surgeries.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Richez B, Saltel L, Banchereau F, Torrielli R, Cros AM. A new single use supraglottic airway device with a noninflatable cuff and an esophageal vent: An observational study of the i-gel. Anesth Analg. 2008;106:1137-9.
2. Castle N, Owen R, Hann M, Naidoo R, Reeves D. Assessment of the speed and ease of insertion of three supraglottic airway devices by paramedics: a manikin study. Emerg Med J. 2010;27(11):860-3.
3. Cork RC, Depa RM, Standen JR. Prospective comparison of use of the laryngeal mask and endotracheal tube for ambulatory surgery. Anes Analg. 1994;79(4):719-27.
4. Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. Br J Anaesth. 2002;88(4):582-4.
5. Maltby JR, Beriault MT, Watson NC, Liepert DJ, Fick GH. LMA-Classic and LMA-ProSeal are effective alternatives to endotracheal intubation for gynecologic laparoscopy. Can J Anaesth. 2003;50:71-7.
6. Abdi W, Amathieu R, Adhoum A, Poncelet C, Slavov V, Kamoun W, et al. Sparing the larynx during gynecological laparoscopy: a randomized trial comparing the LMA Supreme and the ETT. Acta Anaesthesiol Scand. 2010;54(2):141-6.
7. Teoh WH, Lee KM, Suhitharan T, Yahaya Z, Teo MM, Sia AT. Comparison of the LMA Supreme vs the i-gel in paralysed patients undergoing gynaecological laparoscopic surgery with controlled ventilation. Anaesthesia. 2010;65(12):1173–9.
8. Ali A, Canturk S, Turkmen A, Turgut N, Altan A. Comparison of the laryngeal mask airway Supreme and laryngeal mask airway Classic in adults. Eur J Anaesthesiol. 2009;26(12):1010-4.
9. Wharton NM, Gibbison B, Gabbott DA, Haslam GM, Muchatuta N, Cook TM. I-gel insertion by

novices in manikins and patients. Anaesthesia. 2008;63(9):991–5.
10. Theiler LG, Kleine-Brueggeney M, Luepold B, Stucki F, Seiler S, Urwyler N, Greif R. Performance of the pediatric-sized i-gel compared with the Ambu AuraOnce laryngeal mask in anesthetized and ventilated children. Anesthes. 2011;115(1):102–10.
11. Levitan RM, Kinkle WC. Initial anatomic investigations of the I-gel airway: a novel supraglottic airway without inflatable cuff. Anaesthesia. 2005;60(10):1022-6.
12. Komasawa N, Nishihara I, Tatsumi S, Minami T. Prewarming of the i-gel facilitates successful insertion and ventilation efficacy with muscle relaxation: a randomized study. J Clin Anesth.2014;26(8):663-7.
13. Misra MN, Ramamurthy B. The Pro-Seal LMAtm and the tracheal tube: A comparison of events at insertion of the airway device. Internet J Anesthesiol. 2008;16(2).
14. Sharma B, Sehgal R, Sahai C, Sood J. PLMA vs. I-gel: A comparative evaluation of respiratory mechanics in laparoscopic cholecystectomy. J Anaesthesiol Clin Pharmacol. 2010;26(4):451-7.
15. Uppal V, Gangaiah S, Fletcher G, Kinsella J. Randomized crossover comparison between the i-gel and the LMA-Unique in anaesthetized, paralysed adults. Br J Anaesth. 2009;103(6):882-5.
16. Helmy AM, Atef HM, El-Taher EM, Henidak AM. Comparative study between I-gel, a new supraglottic airway device, and classical laryngeal mask airway in anesthetized spontaneously ventilated patients. Saudi J Anaes. 2010;4(3):131.
17. Jindal P, Rizvi A, Sharma JP. Is i-gel a new revolution among supraglottic airway devices. Department of Anesthesiology American University of Beirut Medical Center PO Box 11-0236. Beirut 1107-2020, Lebanon. 2009;20(1):53.
18. Uppal V, Fletcher G, Kinsella J. Comparison of the i-gel with the cuffed tracheal tube during pressure-controlled ventilation. British J Anaes. 2009;102(2):264-8.

Cite this article as: Quraishi AN, Goel A, Quraishi KA, Ayoub TU. A comparative study to assess I-gel as an alternative to endotracheal tube in laparoscopic surgeries. Int J Res Med Sci 2023;11:2140-4.