International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

Randomised Comparative Study of Efficacy of Proseal Laryngeal Mask Airway, Laryngeal Tube and Endotracheal Tube in Mechanically Ventilated Gynaecological Laproscopic Surgeries

Dr. Apoorva Mittal, Dr. Sushil Kumar Bhati

Abstract: ***In spite of tremendous advances in contemporary anaesthetic practice, airway management continues to be of paramount importance to anaesthesiologists. Till date, the cuffed tracheal tube was considered as the gold standard for providing a safe glottic seal. To overcome the disadvantages of tracheal intubation, supraglottic airway devices were introduced. This study was therefore undertaken to compare PLMA and laryngeal tube with standard tracheal tube for the number of attempts and time taken for insertion, haemodynamic changes, oxygenation, ventilation and intraoperative and postoperative laryngopharyngeal morbidity (LPM) occurring during general anaesthesia in young healthy adult patients undergoing laparoscopic surgeries.***

Keywords: laproscopic Surgery, Larynggeal suction tube, endotracheal tube, Proseal Laryngeal mask airway

1. Introduction

In spite of tremendous advances in contemporary anaesthetic practice, advances, airway management continues to be of paramount importance to anaesthesiologists. Till date, the cuffed tracheal tube was considered as the gold standard for providing a safe glottic seal, especially for laparoscopic procedures under general anaesthesia.[1] The disadvantages of tracheal intubation, which involves rigid laryngoscopy, are in terms of concomitant haemodynamic responses and damage to the oropharyngeal structures at insertion. Postoperative sore throat is also a serious concern. This precludes the global utility of the tracheal tube and requires a better alternative.[2] over a period of time, new airway devices have been added to the anesthesiologist's armamentarium.

Since its introduction in 1983, the Laryngeal Mask Airway (LMA) has established an important role in airway management. Originally, it was designed as an alternative to facemask ventilation and tracheal intubation. Over the years, it has become a rescue device in cannot- intubate- cannot-ventilate situations. Even though the LMA has been a major advance in airway management, there is an ongoing search for improvement.

One main goal in this search is to increase the laryngeal seal, permitting safe use of positive pressure ventilation without leakage into the mouth or stomach. A second goal is to protect against regurgitation and gastric insufflation by separating the respiratory from the gastro-intestinal tracts by a drainage tube.

Recently, two newly developed devices providing these improvements were introduced into clinical practice. One device is the Laryngeal Tube Suction.

It is a double lumen tube wherein the larger lumen is used for ventilation and the other lumen can be used for drainage of gastric fluid and for gastric tube placement. The LTS has an oropharyngeal and an oesophageal low-pressure cuff, with two main ventilation apertures placed between them, which are positioned at the level of the vocal cords

The other device is the Proseal Laryngeal Mask Airway (LMA-Proseal) . It has a modified cuff at the dorsal side, improving the seal around the glottis by the cuff itself and by changing the shape of the device once in situ. It has a drain tube added to provide a bypass channel for regurgitated fluid. This channel also facilitates passage of a gastric tube. Both latex-free instruments are inserted without direct visualization of the glottis in anaesthetized patients.

This study was undertaken to compare the ease of insertion, hemodynamic changes, oxygenation and incidences of intraoperative and postoperative laryngopharyngeal morbidity in patients undergoing elective gynecological laproscopic surgeries.

2. Material and Methods

This prospective, comparative, randomized study was conducted after being reviewed and approved by institutional ethics committee. After obtaining written informed consent of patients, 90 adult patients of American Society of Anaesthesiologists physical status I or II undergoing elective gynecological laproscopic surgeries were randomly allocated to one of the three groups of 30 patients each. Randomization was done using closed enveloped technique. In group A (PLMA) appropriate size proseal laryngeal mask airway was inserted. In group B (Laryngeal tube suction),patients airway was secured with laryngeal tube and in group C (ETT) patients airway was secured with laryngoscopy guided endotracheal intubation.

The patients having presence of any significant acute or chronic lung disease, pathology of neck or upper respiratory tract, potential difficult intubations, mouth opening <2.5 cm, cervical spine disease, increased risk of aspiration (hiatus hernia, garstro-esophageal reflux disease, full stomach), pregnant women, patients with body mass index(BMI) >35 kg/m² and all emergency surgeries were excluded from the study.

After securing intravenous line (IV) line, all standard monitors like electrocardiogram (ECG), non –invasive blood pressure and pulse oximetry were applied, and patient's baseline parameters like pulse rate (PR), mean blood pressure (MBP) and peripheral oxygen saturation (SPO2) were recorded. Patients were premedicated with injection ranitidine 50 mg, metoclopromide 10mg, midazolam 1mg, glycopyrrolate 0.2 mg and fentanyl 2 µg/kg. After 15 minute of premedication, patient were induced with propofol 2mg/kg intravenously and were preoxygenated with oxygen for 3 minute. To facilitate device insertion succinylcholine 1.5 mg/kg was given intravenously. Airway devices (PLMA, LTS and ETT) of appropriate size were inserted by 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 capnography tracing, absence of leak and normal SPO2 (>95%), after fixing the airway device , appropriate sized gastric tube was inserted. Ease of insertion of PLMA, LTS or ETT was assessed as easy: no resistances to insertion in the pharynx in a single maneuver; difficult: resistance to insertion or more than one maneuver was required for correct placement of the device and impossible: unable to insert the device. We also recorded the number of attempts and time required for insertion of airway device to the first capnography trace. The ease of placement (easy: inserted in first attempt, difficult: requires > 1 attempt), number of attempts required and failure of gastric tube placement was also noted.

Anaesthesia was maintained with oxygen, nitrous oxide, sevoflurane (0.2-1 %) and intermittent dose of injection atracurium. Controlled ventilation was provided with tidal volume 8ml/kg and respiratory rate set to obtain an end tidal carbon dioxide between 35 and 45 mmhg. At the end of surgery, neuromuscular blockade was reversed with glycopyrrolate 8µg/kg and neostigmine 0.05 mg/kg. Removal of PLMA, LTS and ETT was done after recovery of spontaneous respiration and muscle tone.

Monitoring of PR, MBP, SPO2, End tidal carbon dioxide and ECG was done throughout the perioperative period. Hemodynamic and ventilatory parameters were recorded before induction (baseline), just after intubation, then at 1, 3 and 5 minutes after PLMA, LTS or intubation, after pneumoperitoneum, before and 5 min after release of pneumoperitoneum and after device removal or extubation.

Common complications such as coughing, laryngospasm, regurgitation, aspiration, blood on device, injuries (to lip, teeth and gums), sore throat, dysphagia and dysphonia during perioperative period were recorded.

Statistical analysis was performed with the SPSS, version 21 for Windows statistical software package (SPSS inc., Chicago, IL, USA). The Categorical data was presented as numbers (percent) and were compared among groups using Chi square test. The quantitative data was presented as mean and standard deviation and were compared by students t-test. Probability was considered to be significant if less than 0.05.

For significance cut off values are as follows →

- $p > 0.05$ = not significant
- $p < 0.05$ = significant
- $p = 0.05$ = just significant
- $p < 0.01$= highly significant

3. Observation and Results

Participants of this study were recruited from routine laproscopic list there were no dropouts. Demographic profiles as shown in table 1 were comparable among the three groups. No significant difference in terms of age, weight duration of surgery was noted.

Table 1: Demographic profile

	Group C(ETT)		Group (A) Proseal		Group(B) LT		P value
	Mean	SD	Mean	SD	Mean	SD	
Age	28.36	3.38	28.7	4.05	28.43	3.081	0.927
Weight	42.33	4.65	40	4.59	40.4	4.68	0.120
Duration	27.96	3.71	27.96	3.71	27.96	3.71	-

Table 2: Details of Airway management

	Group C(ETT)	Group A(Proseal)	Group B (LT)	P value
Time taken of insertion of device (mean±SD)	27.73±2.47	18.43±2.89	26.26±2.93	0.000
Attempt (1/2/3/failed)	30/0/0/0	30/0/0/0	30/0/0/0	
Time taken of ryles tube (mean±SD)	26.16±3.09	27.73±2.47	27.76±4.55	0.133
Attempt (1/2/3/failed)	27/3/0/0	29/1/0/0	30/0/00	

The time taken for insertion of PLMA less as compared to time taken for insertion of laryngeal tube and endotracheal tube. In all the patients' airway was secured in 1st attempt itself. Insertion time of ryles tube was almost same, but in 3 cases ryles tube was inserted in 2nd attempt in group C and in 1 case it was inserted in 2nd attempt in group A.

Table 3: Hemodynamic parameters

Table 3.1: Trend of PR

	Group C (ETT)		Group A (Proseal)		Group B (LT)		P value
	Mean	SD	Mean	SD	Mean	SD	
Preinduction	91.33	8.12	92.8	10.50	90.63	13.81	0.741
Intubation	99.43	10.23	90.23	14.72	92.46	13.30	0.018
1 Min	89.33	7.33	94.83	9.63	92.36	13.64	0.134
3 Min	91.33	8.12	93.1	10.52	92.86	13.93	0.800
5 Min	91.03	8.28	93.2	10.86	91.8	14.48	0.761
10 Min	90.5	12.95	90.83	8.94	91.1	11.18	0.978
Pneumoperitoneum	90.1	8.41	90.5	8.21	90.7	12.51	0.971

The increase in pulse rate was found to be statistically significant just after intubation in group C (p=0.018)

Table 3.2: Trend of MAP

	Group C (ETT)		Group A (Proseal)		Group B (LT)		P value
	Mean	SD	Mean	SD	Mean	SD	
Preinduction	90.6	8.73	92.57	8.12	90.1	21.94	0.782
Intubation	97.2	12.36	85.83	11.85	96.26	7.58	0.0001
1 Min	102.6	13.32	91.93	9.74	99.3	6.52	0.0004
3 Min	94.23	14.01	90.53	10.99	103.0	19.56	0.006
5 Min	99.16	14.41	93.63	8.68	100.76	8.17	0.031

10 Min	89.9	21.82	99.83	12.13	101.03	8.15	0.009
Pneumoperitoneum	102.36	13.14	102.30	15.39	104.76	10.32	0.709

The rise in Mean arterial pressure was found to be statistically significant at time of intubation, 1 min, 3 min, 5 min, 10 min after intubation.

Table 4: Laryngeal Morbidity

	Group E (No.)	Group Proseal (No.)	Group LT (No.)	P value
Gastric Insufflation	-	-	-	-
Regurgitation	1	3	4	0.391
Cough	1	-	1	0.608
Blood Stain	5	3	6	0.562
Trauma	5	-	2	0.052
Sore Throat	1	3	4	0.391
Vomiting	4	3	6	0.541

There were no significant differences in complications associated with use of either airway devices.

4. Discussion

Laproscopic surgery has been shown to adversely affect intraoperative pulmonary mechanics, thus providing the most severe test of the efficacy of airway device. Tracheal intubation is considered ideal for airway management in laproscopic surgeries, as it provides adequate ventilation and protects against pulmonary aspiration even in presence of raised airway pressure due to pneumoperitoneum.

However, the device is not foolproof against aspiration. Endotracheal intubation is also not uncommon during laproscopic procedures, and in difficult airway situations this may fail. PLMA and LTS may overcome some of these problems, even in those who require high airway pressure for adequate ventilation.

This study was designed to compare the insertion qualities, hemodynamic changes and complications of PLMA, Laryngeal tube suction and endotracheal tube in laproscopic surgeries.

In our study we found that time taken for insertion of PLMA (18.43±2.89) was less than time taken for insertion of LTS (26.26±2.93) which was less than time taken for insertion of endotracheal tube (27.73±2.47). This was in accordance to study conducted by Masoum khoshfetrat et al who compared Laryngeal tube suction and Endotracheal tube and Saini S et al who compared PLMA with Endotracheal tube in patients undergoing elective lower segment cesarean section.

The rise in Mean arterial pressure was found to be statistically significant in our study just after intubation in group C which remained elevated till 10 minutes as compared to group A and group B. This was similar to study conducted by Halash et al who reported that none of their patients had fluctuations of blood pressure in in excess of 25% on insertion of PLMA. In this study, hemodynamic changes remained insignificant with PLMA insertion or removal. However statistically significant changes were observed in ETT group.

Risk of aspiration still remains a concern in patients undergoing laproscopic procedures. No statistically significant incidence of aspiration was found in patients in whom airway was secured with supraglottic airway device as compared to ETT in our study. This was similar to study conducted by Saraswat N et al.

5. Conclusion

We concluded that supraglottic airway device require less time for insertion with minimal hemodynamic changes when compared to ETT. I addition, gastric channel in second generation supraglottic airway device provides protection against aspiration. Hence, second generation supraglottic airway device can be a safe and suitable alternative to ETT for laproscopic surgeries.

References

[1] Saraswat N etal The comparison of Proseal Laryngeal mask airway and endotracheal tube in patients undergoing laproscopic surgeries under general anaesthesia. Indian J Anaesth 2011; 55:129-34
[2] Roth H etal The proseal LMA and the laryngeal tube suction for ventilation in gynaecological patients undergoing laproscopic surgery. European J anaesthesiology 2005; 22:117-122