Prospective, Randomized Comparison of Proseal Laryngeal Mask Airway and Endotracheal Tube in Adults Selected for Elective Laparoscopic Abdominal Surgery

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Author’s contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

ABSTRACT

Both PLMA and SLIPA were easy to insert (100% success) and ventilate with maximum sealing pressure of 30cm H2O (P = 0.4) with no muscle relaxant. No significant difference (P = 0.265) in intubation time between PLMA and ETT were observed in the study. A significant SpO2 change (P = 0.804, 0.561, 0.657, 0.248, 0.561) measured Pre op, Pre intubation, lmt, 3 mt and 5mts after intubation and there were no significant EtCO2 changes (P =0.861, 0.251, 0.44) measured after intubation was observed. Blood staining in 1/25 cases with PLMA and 2/25 cases with ETT with a P value of 0.561 was seen.

Keywords: PLMA; SLIPA; Blood staining.

1. INTRODUCTION

Laryngeal mask airway (LMA) is a recommended and a better alternate to face mask. But from the day since it was development the LMA has challenged the assumption that tracheal intubation is the only approved method to maintain a clear
airway and provide positive pressure ventilation [1,2]. To meet the complications of this Proseal laryngeal mask airway (PLMA) in 2000, with some alterations were designed to enable partition of gastro intestinal and respiratory tract, improve airway seal, enable positive pressure ventilation and diagnose mask displacement. A Drain tube (DT) is the other mask which help in diagnosis of mask displacement, decreases risk of gastric insufflation, regurgitation, and aspiration of gastric contents. With this background this study was conceptualized to compare Endotracheal tube and Proseal LMA for elective laparoscopic abdominal surgery.

2. METHODOLOGY

2.1 Study Design

Prospective, Randomized, Comparative single blinded case control study. The study was carried out in Sree Balaji medical college, Chennai from November 2010 to May 2011. The study was conducted in 50 patients in the age group of 18 years and above belonging to ASA I and II. Posted for elective laparoscopic abdominal surgery.

The patients who had come for laparoscopic surgery were screened for comorbid illness and difficult airway. Age, Height and Weight were assessed. The patients were randomized in to 2 groups using closed envelope technique as proseal LMA group and endotracheal tube group. Patient was premedicated with Inj. Glycopyrrolate 0.2 µg/kg body weight and Inj. Fentanyl 2 µg/Kg. Pre oxygenated with 100% oxygen at a flow rate of 8L/m.t. by using tight fitting facemask for 5 mts. Patient was induced with Inj. Propofol 2 mg/Kg & paralysed with Inj.suxamethonium 2mg/kg. In the Proseal Laryngeal mask airway group, device was inserted and cuff was inflated with 20ml room air. With the PLMA, we filled the proximal 3 cm of the drain tube with the water soluble lubricant jelly. After completion of surgery and adequate neuromuscular recovery patient was reversed with Inj. Neostigmine 50 µg/kg and Inj. Glycopyrrolate 0.4 mg. All data were collected, tabulated and expressed as Mean +/- standard deviation. Appropriate statistical analysis was conducted. All quantitative data were compared using unpaired student's test. All qualitative data were compared using Chi square test. P values were calculated for all tests. A P values 0 to 0.01 was considered as 1% significant, 0.011 to 0.05 was considered as 5% significant, and >0.05 was considered as not significant.

3. RESULTS

PLMA insertion was successfully in 21/25 cases in first attempt while 4 patients 4/25 required second attempt. With ETT all 25 patients were intubated in first attempt. The time taken for PLMA/ETT from introduction into oral cavity to the final confirmation of its proper positioning. Time taken for intubation with PLMA is 37.36 and with ETT is 32.4 (Fig. 1). Gastric distension was assessed by surgeon who was operating. It was assessed just after peritoneal deflation. Student's 't' test revealed P value of 0.161 which is not significant. This indicates that PLMA provides good airway seal and adequate pulmonary ventilation (Fig. 2).

SPO2 was measured pre-operatively, just before intubation, lmt, 3mt and 5mt after intubation. The actual values are documented in the tabular column (Table 1). There was no significant oxygenation difference between two techniques.

Blood staining m the airway noted after extubation which indicates airway trauma Heart rate, systolic blood pressure Diastolic blood pressure and mean arterial pressure were measured pre-operatively, pre intubation, lmt, 3mt and 5mts after intubation. The actual values are documented in the tabular column. No significant difference in heart rate between two techniques and Laryngospasm did not occur in both the groups were observed. Hence there was a significant haemodynamic response with ETT when compared to PLMA.

4. DISCUSSION

Miller DM, camporota et al in 2006 compared PLMA and SLIPA with ETT in 150 patients. Both PLMA and SLIPA (supra laryngeal airways) were easy to insert (100% success) and ventilate with maximum sealing pressure of 30cm H2O (P = 0.4) with no muscle relaxant. The findings of our study are in concurrence with the above data. Both ETT and PLMA were intubated with ease with P value of 0.312. N.R. Evans, S.V. Gardner et al in 2002 assessed insertion characteristics of
PLMA, airway seal pressure, ease of gastric tube placement in 300 anaesthetised patients. Insertion was successful in 94% of patients and graded as easy in 91% of patients. Gastric tube placement was successful in 98.6% of patients. In our study, 96% of patients (24/25) were graded as PLMA with ease. In our study, we compared PLMA and ETT in only 50 anaesthetised patients. Sample size is small. Possible reasons for disparity in numbers of attempts for successful placement of masks and small sample size due to lack of experience.

I. Roger Maltby, Neil C, Watson et al. [3-10] in 2002, compared PLMA with ETT in 109 patients undergoing laparoscopic cholecystectomy.

**Table 1. SPO2 Changes**

| Groups          | No | Mean | Standard Deviation |
|-----------------|----|------|--------------------|
| Pre op          | PLMA | 25   | 99.8 | 0.50 | t = 2.25 P = 0.804 |
|                 | ETT  | 25   | 99.8 | 0.62 | Not significant |
| Pre intubation  | PLMA | 25   | 99.92 | 0.28 | t = 0.59 P = 0.561 |
|                 | ETT  | 25   | 99.96 | 0.20 | Not significant |
| Post intubation1 min | PLMA | 25   | 99.96 | 0.20 | t = 0.45 P = 0.657 |
|                 | ETT  | 25   | 99.92 | 0.40 | Not significant |
| Post intubation3 min | PLMA | 25   | 99.96 | 0.20 | t = 1.17 P = 0.248 |
|                 | ETT  | 25   | 99.84 | 0.47 | Not significant |
| Post intubation5 min | PLMA | 25   | 99.92 | 0.28 | t = 0.59 P = 0.561 |
|                 | ETT  | 25   | 99.96 | 0.20 | Not significant |

**Table 2. Systolic blood pressure**

| Groups          | No | Mean | Standard Deviation |
|-----------------|----|------|--------------------|
| Pre op          | PLMA | 25   | 127.08 | 12.36 | t = 0.30 P = 0.766 |
|                 | ETT  | 25   | 126.08 | 11.2 | Not Significant |
| Pre Intubation  | PLMA | 25   | 121.04 | 12.63 | t = 0.85 P = 0.401 |
|                 | ETT  | 25   | 124.20 | 13.72 | Not Significant |
| Post Intubation1 min | PLMA | 25   | 114.28 | 18.23 | t = 2.30 P = 0.026 |
|                 | ETT  | 25   | 127.60 | 22.50 | Significant 5% |
| Post Intubation3 min | PLMA | 25   | 111.06 | 18.20 | t = 3.20 P = 0.002 |
|                 | ETT  | 25   | 130.52 | 24.28 | Significant 1% |
| Post Intubation5 min | PLMA | 25   | 103.20 | 14.73 | t = 2.93 P = 0.005 |
|                 | ETT  | 25   | 117.68 | 19.83 | Significant 5% |
Table 3. Diastolic blood pressure

|                      | Group   | No | Mean | Standard Deviation | t   | P      |
|----------------------|---------|----|------|--------------------|-----|--------|
| Pre op               | PLMA    | 25 | 80.04| 8.53               | t = 1.16 | 0.250  |
|                      | ETT     | 25 | 77.04| 9.64               |     |        |
| Pre Intubation       | PLMA    | 25 | 77.6 | 9.88               | t = 1.20 | 0.236  |
|                      | ETT     | 25 | 74.08| 10.84              |     |        |
| Post Intubation 1mt  | PLMA    | 25 | 71.8 | 15.97              | t = 2.14 | 0.037  |
|                      | ETT     | 25 | 81.32| 15.44              |     |        |
| Post Intubation 3mt  | PLMA    | 25 | 72.16| 16.53              | t = 2.44 | 0.019  |
|                      | ETT     | 25 | 83.60| 19.68              |     |        |
| Post Intubation 5mt  | PLMA    | 25 | 64.64| 15.11              | t = 2.24 | 0.030  |
|                      | ETT     | 25 | 75.36| 18.61              |     |        |

Table 4. Mean arterial pressure

|                      | Group   | No | Mean | Standard Deviation | t   | P      |
|----------------------|---------|----|------|--------------------|-----|--------|
| Pre op               | PLMA    | 25 | 95.7 | 8.53               | t = 0.94 | 0.352  |
|                      | ETT     | 25 | 93.36| 9.11               |     |        |
| Pre Intubation       | PLMA    | 25 | 92.04| 9.94               | t = 0.43 | 0.668  |
|                      | ETT     | 25 | 90.75| 11.26              |     |        |
| Post Intubation 1mt  | PLMA    | 25 | 85.94| 15.38              | t = 2.33 | 0.024  |
|                      | ETT     | 25 | 95.62| 22.24              |     |        |
| Post Intubation 3mt  | PLMA    | 25 | 96.72| 17.22              |     |        |
|                      | ETT     | 25 | 85.14| 16.45              |     |        |
| Post Intubation 5mt  | PLMA    | 25 | 77   | 14.23              | t = 2.56 | 0.014  |
|                      | ETT     | 25 | 89.42| 18.54              |     |        |

Table 5. Blood staining in airway

| Group | YES | NO | MEAN | Standard deviation | t   | P      |
|-------|-----|----|------|--------------------|-----|--------|
| PLMA  | 1   | 24 | 1.96 | 0.2                | 0.59 | 0.561  |
| ETT   | 2   | 23 | 1.92 | 0.28               |     |        |

5. CONCLUSION

They concluded that no significant gastric distension in both the groups. This study result is comparable with our study result which shows no significant SpO2 change and hemodynamics aswell.

of 0.161. The study done by J. Roger Maltby, Michael T. Beriault on SpO2 changes and their results are in comparable with our study result which shows no significant SpO2 change and hemodynamics aswell.
CONSENT AND ETHICAL APPROVAL
The study was carried out after obtaining Institutional Ethical committee clearance and patient's written informed consent.

COMPETING INTERESTS
Author has declared that no competing interests exist.

REFERENCES
1. Sharma B, Sahai C, Bhattacharya A, Kumar VP, Sood J. ProSeal laryngeal mask airway: A study of 100 consecutive cases of laparoscopic surgery. Indian J Anaesth. 2003;47:467-72.
2. Shroff P, Surekha K. Randomized comparative study between the proseal laryngeal mask airway and the endotracheal tube for laparoscopic surgery. Internet J Anesthesiol 2006;11. [Last accessed on 2010 Jul 9].
3. Haley A, Kais H, Efrati Y et al: Continuous esophageal pH monitoring during laparoscopic cholecystectomy. Surg Endosc. 1994;8:1294.
4. Lind JF, Warrian, WG, Wankling WJ. Responses of the gastroesophageal junctional zone to increases in abdominal pressure. Can J Surg. 1966;9:32-39
5. Iizuka T, Kinoshita K, Fukui H. Pulmonary compliance of the Laryngeal mask airway during laparoscopic cholecystectomy (abstract). Anesth Analg. 2000;90:S210.
6. Lu PP, Brimacombe J, Yang C, and Shyr M. ProSeal laryngeal mask airway for positive pressure ventilation during laparoscopic Cholecystectomy. Br J Anaesth. 2002;88(6):824-827.
7. Maltby JR, Beriault MT, Watson NC, Liepert DJ, Fick GH. LMAClassic TM and LMA- ProSealTM are effective alternative to endotracheal intubation for gynecologic laparoscopy. Can J Anaesth. 2003;50(1):71-77.
8. Brock-Utne JG, Rubin J, Downing JW, Dimopoulos GE, Moshal MG, and Naicker M. The administration of metoclopramide with atropine. Anaesthesia. 1976;31:1186.
9. Stix Michael S, Borromeo Carl J, O'Connor Cornelius J Jr. Esophageal Insufflation with Normal Fibreoptic Positioning of the ProSealTM Laryngeal Mask Airway. Anesth Analg. 2002;94:1036-1039.
10. Brimacombe J, Judd D Vasoba, ortely K, Barron E, Branagan H. Gastric Tube-Guided Reinsertion of the Proseal Laryngeal Mask Airway (letter). Anesth Analg. 2002;94:1670.