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# Comparison Between LMA Proseal and Blockbuster LMA in Patients Undergoing Gynaecological Laparoscopic Surgery with Controlled Ventilation

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**Abstract**

**Objective;** In laparoscopic gynaecological surgeries, endotracheal tubes have been used traditionally, however use of ProSeal LMA has been reported as a useful alternative. In this study a newer type of second generation LMA- Blockbuster LMA, was compared with proven LMA like ProSeal LMA for its effectiveness in controlled ventilation and ease of use. The primary measure of our study was oropharyngeal leak pressure. Time taken, successful first pass attempt at LMA insertion, ease of insertion and complications of use were the secondary outcome measures.

**Methodology;** This randomized prospective study was carried out at a tertiary care hospital for a period of six (06) months from December 2021 to May 2022 and included patients undergoing elective laparoscopic gynaecological surgeries.50 patients were allocated into two groups, Group P (n=25) and Group B (n=25).

**Results and Conclusion;** Patient characteristics including age, weight, ASA status and Mallampati Classification (MPS) are comparable in both the groups. Time taken proseal LMA placement was significantly lesser that that taken for Blockbuster LMA placement. Oropharyngeal leak pressures (OLP) are high in both the groups and are comparable with no statically significant difference.

From our study it can be concluded that both ProSeal and Blockbuster LMA with high success rate of insertion and high OLP can be safely used during laparoscopic surgeries under general anesthesia with positive pressure ventilation. Blockbuster LMA has added advantage that it is an intubating LMA.

**Keywords**: LMA, Supraglottic Airway Device, Controlled Ventilation, LMA Proseal, Blockbuster LMA

## Introduction

Supraglottic airway devices (SADs) are gaining popularity for airway management. They provide adequate ventilation, oxygenation, and delivery of anaesthetic agents; besides they have lower risk of respiratory adverse events, thus replacing the need for conventional tracheal intubation. To overcome the risk of regurgitation and aspiration of gastric contents with the first-generation SADs, several second generation SADs with a gastric drain tube have been introduced[1]. Second generation LMAs include devices with a gastric port, a bite block and seal pressure of more than 30 $cmH_2O$.

LMA® ProSeal™ (pLMA) is the oldest second-generation supraglottic airway device with a gastric tube channel. pLMA is made of silicone and is reusable. It has a soft reinforced flexible airway tube and has a gastric tube that runs alongside the airway tube, it curves at the cuff and end is placed at the tip of LMA. pLMA has a dorsal cuff that provides for higher seal pressures.

BlockBuster® LMA was invented in 2012 (Tuoren Medical Instrument co, Ltd, Changyuan city, China) and is a newer second generation LMA and has gained increased popularity. It has advantage of providing a channel for intubation[2]. Intubating LMAs have also been recommended by recent 'All India Difficult Airway Association' guidelines 2016[3].

In laparoscopic gynaecological surgeries, endotracheal tubes have been used traditionally, however use of pLMA has been reported as a useful alternative[4,5].

During laparoscopic gynaecological surgeries patient is often placed in trendlenburg position, which along with pneumoperitoneum results in decreased lung compliance and increased peak airway pressure. During positive pressure ventilation in such patients using LMA, there is increased chances of airway leak, which could further lead to hypoxia, gastric insufflation, or theatre pollution[6].

Aim of this study is to compare efficacy of providing adequate seal and ease of insertion of pLMA and Blockbuster LMA for gynaecological laparoscopic surgery in paralysed patients for controlled ventilation.

The primary measure of our study was oropharyngeal leak pressure. Time taken, successful first pass attempt at LMA insertion, ease of insertion and complications of use were the secondary outcome measures.

**Methods**

This randomized prospective study was carried out at a tertiary care hospital, Lalla Ded Hospital, Government Medical College Srinagar for a period of six (06) months from December 2021 to May 2022.

Following approval of local ethics committee and obtaining written informed consent from patients, 50 patients belonging to American Society of Anesthesiologists (ASA) physical status I -II, aged between 25 to 60 years scheduled for elective gynaecological laparoscopic surgery under General Anaesthesia and controlled ventilation were enrolled for the study.

Exclusion criteria included patient refusal, mouth opening less than 2 cm, morbid obesity, oropharyngeal pathology, non-fasting status, risk of regurgitation and pregnancy.

Patients were randomly allocated into two groups, *Group P* and *Group B*, with 25 patients in each group. Randomisation was done using computer generated random numbers.

Operating room monitoring included electrocardiogram, non-invasive blood pressure measurement, pulse oximetry and end tidal capnometry.

Premedication included intravenous administration of glycopyrrolate 0.2 mg, ondansetron 4mg, midazolam 0.02 mg/kg and fentanyl 2 µg/kg. After preoxygenating with 100% oxygen for 3 minutes patients were induced with intravenous propofol 2mg/kg in incremental doses. After checking for adequacy of mask ventilation, loading dose of muscle relaxant atracurium 0.5mg/kg was given intravenously. LMA was placed once patient was properly relaxed with midline insertion technique and neck in neutral position in both the groups. Size of LMA was selected according to weight and inflated with air; volume determined by size of LMA and manufacturer recommendation. LMA was connected to breathing circuit, adequate ventilation was confirmed by chest movements and end-tidal carbon dioxide ($EtCO_2$ ) waveforms. Besides LMA insertion in both the groups was assessed by performing a bubble test, inserting a gastric tube and by measuring oropharyngeal leak pressure (OLP).

Balanced gas mixture of Oxygen 50% and volatile anaesthetic Isoflurane was used to achieve minimum alveolar concentration of 1. Tidal volume was set at 8 ml/kg of ideal body weight, and a positive end-expiratory pressure of 5 $cmH_2O$ was used in all patients. Inspiratory–expiratory time ratio was set at 1:2, and respiratory rate was adjusted to 12–16 per minute to maintain $EtCO_2$ at 35–40 mmHg. Fractional inspired oxygen ($FiO_2$) was set at 0.3–0.45 with 3 l/min of fresh gas flow to maintain $SpO_2 \geq 94\%$. General anesthesia was maintained in all patients with isoflurane and atracurium.

Time required for insertion of LMA was calculated from removal of facemask and establishment of proper ventilation as confirmed by square wave capnography. Number of attempts taken for LMA placement was noted. Ease of insertion was determined by subjective scale of 1-4 (1-no resistance, 2-mild resistance, 3-moderate resistance, and 4-inability to place the device)[7]. The



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oropharyngeal leak pressure was measured with expiratory valve closed at 40cm $H_2O$ and fresh gas flow of 3L/m until equilibrium was seen on the pressure gauge.

Complications such as coughing, bronchospasm, laryngospasm, blood on the device after removal, injury to lips, teeth or tongue, and sore throat were noted.

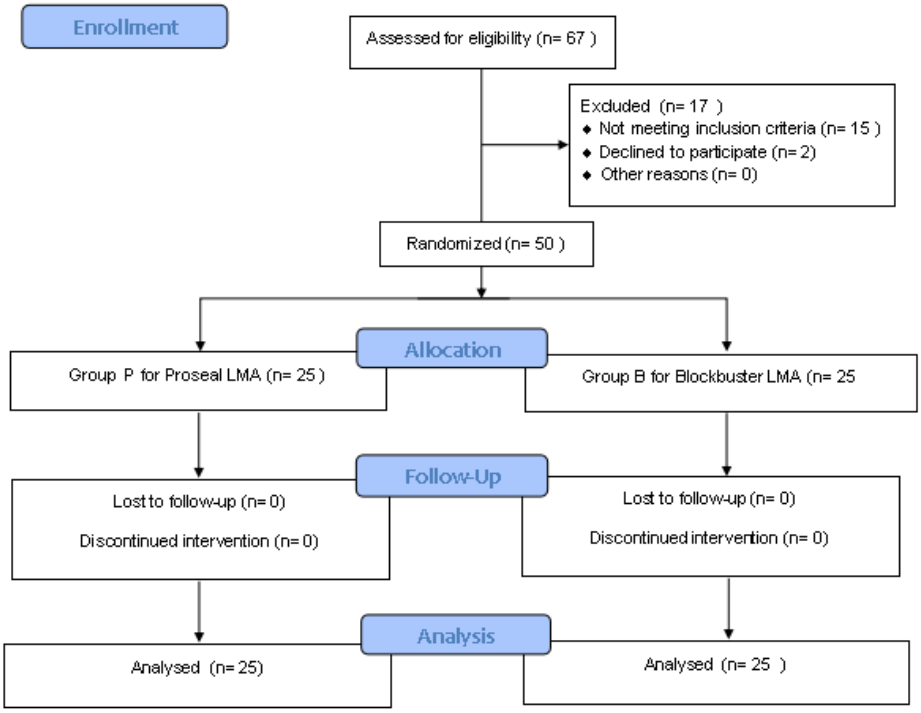
**Statistical Analysis.**

SPSS v.15 (SPSS Inc., Chicago, Illinois, USA) was used to analyse the data. Descriptive and inferential statistics were used to analyse the data. Continuous data were presented as mean ± SD and assessed using Student's t-test. Categorical data were presented in frequency (%) and assessed using Chi-Square and Fisher Exact tests. P values of $< 0.05$ were considered statistically significant.

**Results**

67 patients were enrolled in the study during the period of six months and were assessed for eligibility. Among these patients 15 did not meet the inclusion criteria and two patients declined to participate. Remaining 50 patients were randomised into two groups and analysed. CONSORT flow diagram is presented in **Figure 1**.

**Figure 1. CONSORT flow diagram**




Patient characteristics including age, weight, ASA status and Mallampati Classification (MPS) are compared (Table 1).

**Table 1. Patient characteristics**

| ***Demographic Data*** ***Mean ± SD*** | ***Group P*** ***(n=25)*** | ***Group B*** ***(n=25)*** | ***P Value*** |
|---|---|---|---|
| Age, years | 34 ±12 | 36 ±10 | P >0.05 Not Significant (N.S) |
| Weight, Kg | 58 ±8 | 60 ±6 | |
| ASA status (I:II) | 18:7 | 20:5 | |



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| | | | |
|---|---|---|---|
| MPC (I:II) | 14:11 | 17:8 | |

Both the groups present with similar demographic characteristics with no statically significant difference, so the two groups are comparable.

Number of attempts, time taken for proper LMA placement is compared between the two groups (**Table 2**).

**Table 2. Comparison of success and ease of LMA insertion.**

| ***Variable*** | ***Group P*** | ***Group B*** | ***P value*** |
|---|---|---|---|
| Number of attempts for LMA placement | | | |
| *1st* | 21 | 20 | N.S |
| *2nd or more* | 4 | 5 | N.S |
| Time for LMA insertion, seconds Mean ±SD | 18 ±1.5 | 20 ±1.5 | < 0.0001 Significant |
| Ease of insertion (I/II/III/IV) | I/II 17/8 | I/II 16/9 | N.S |

Time taken proseal LMA placement was significantly lesser that that taken for Blockbuster LMA placement.

Leak pressure was measured according to set protocol and data has been presented in **Table 3**. Oropharyngeal leak pressures are high in both the groups and are comparable with no statically significant difference.

**Table 3. Oropharyngeal leak pressures.**

| ***Group P*** | ***Group B*** | ***P value*** |
|---|---|---|
| 35 ± 8.5 | 32 ± 8 | 0.204 (N.S) |

Both the groups had similar profile of postoperative complications. Complications were noted and are documented in Table 4. Sore throat was the most common complication in both the groups.

**Table 4. Complications noted postoperatively.**

| **Complications** | **No. of Patients %** | | **P value** |
|---|---|---|---|
| | *Group P* | *Group B* | |
| Sore throat | 14 | 16 | N.S |
| Blood staining | 4 | 6 | |
| Nausea and vomiting | 0 | 0 | |
| Laryngospasm | 0 | 0 | |

**Discussion**

Many studies have been done comparing LMA ProSeal with other LMAs like i-gel, Fastrach, LMA Supreme among others. However not many studies have compared LMA ProSeal with Blockbuster LMA. Blockbuster LMA is a relatively newer airway device, with features like a four-way connector for easy fixation of LMA, dorsal cuff for better seal



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pressure, also the curvature of shaft with the short airway tube provides easy insertion and helps in keeping the LMA in a stable position.

The ProSeal was chosen as the comparator for our study as it is well known and clinically proven superior airway device with a high airway seal pressure compared with other commonly available supraglottic airway devices[8].

Overall success rate for insertion of LMA is 100% for both the devices, which was like previously conducted studies[9]. In our study we found out that both LMA ProSeal and Blockbuster LMA are quick and have similar ease of insertion. The first pass attempt of LMA ProSeal was more than Blockbuster LMA though it was not clinically significant. However time taken for LMA ProSeal placement was significantly less than that of Blockbuster LMA placement.

It is known that higher Peak airway pressure (PAWP) than oropharyngeal leak pressure (OLP) can cause airway leak during positive pressure ventilation with supraglottic airway devices; therefore, it is recommended to maintain OLP at ≥ 25 cmH2O or > 8 cmH2O above PAWP during laparoscopic surgery with supraglottic airway devices[10]. Oropharyngeal leak pressures for the LMA ProSeal were similar to previous studies[11,12]. In our study both the devices have higher oropharyngeal leak pressures (>25cmH2O) and hence are effective airway devices in gynaecological laparoscopic procedure. Although clinically insignificant, OLP was slightly higher in LMA ProSeal group than Blockbuster LMA.

Incidence of complications are low, with sore throat being the most common post-operative complication in both the groups.

Although traditionally laparoscopic surgeries are conducted under general anaesthesia with endotracheal intubation, we believe that our study will promote use of pLMA and Blockbuster LMA in laparoscopic gynaecological surgeries of limited duration.

Blockbuster LMA as seen in our study is equally effective airway device as LMA ProSeal with added features of it being an intubating LMA. So, it could be used in case of difficult airway or in case of prolonged surgery.

Present study has few limitations which need to be mentioned. The data was collected by unblinded observers, which could introduce a bias. Also, the study did not include patients with difficult airway hence the data cannot be inferred on this group of patients. The devices were placed by single experienced operator and data cannot be applied to less experienced users. Number of patients included in the study are smaller and it is a single centre study, a larger multicentre study is required to confirm these findings.

## Conclusion

From our study it can be concluded that both ProSeal and Blockbuster LMA have a high success rate of first pass placement and can be placed quickly and provide high oropharyngeal leak pressure for effective ventilation and hence can be safely used during laparoscopic gynaecological surgeries under general anesthesia with positive pressure ventilation. The Blockbuster LMA has added advantage that it is an intubating LMA.

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