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Proseal LMA vs. Endotracheal Intubation in General Anaesthesia for Abdominal Surgeries

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Abstract

Varients of supraglottic airway devices are generally used in difficult airways or in day-care surgeries to bypass the consequences of endotracheal intubation or to replace tracheal intubation. In this study, the aim was to evaluate the advantages of proseal LMA over endotracheal tubes in the prospects of ease of insertion and efficacy for positive pressure ventilation without the risk of regurgitation and aspiration and without any detrimental variations in hemodynamics. A randomized clinical study was carried out on 80 patients of either sex belonging to ASA Grade I and II, proposed for abdominal surgeries under general anaesthesia and were randomly allocated in two groups (Group I- Proseal LMA and Group II- Endotracheal intubation). Parameters observed were ease of insertion (number of attempts), insertion or intubation time of device and nasogastric tube and effects on hemodynamics. 40 patients were included in each group. Success rate for insertion of device in first attempt was 93% in group I and 99% in group II. Mean insertion time in group I was 15.57 seconds and 22.24 seconds in group II, which was statistically insignificant ($p<0.1$). Mean nasogastric tube (Ryle's tube) insertion time in group I was 9.96 seconds in compare to group II, where the mean time was 12.55 seconds, which was statistically significant. The conditions for proper and adequate ventilation to maintain 100% oxygen saturation in both groups were satisfactory without any air leak. According to this study, it can be concluded that Proseal LMA is a safer and effective alternative for endotracheal tubes in general anaesthesia.

Keywords: Proseal LMA; Endotracheal Tubes; General Anaesthesia; Aspiration Pneumonitis; Positive Pressure Ventilation.

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Introduction

Laryngeal mask airway was invented by British anaesthesiologist Archibald Brain in 1983 as an alternative to tracheal intubation in patients when conventional endotracheal intubation is either difficult or impossible. They can be used instead of face mask or endotracheal tube during sponataneous or controlled ventilation. Many modifications in LMA's were carried out according to the ease and requirement. Proseal LMA is the modified and most complex version of the specialized laryngeal mask devices. It was designed by Archie Brain in 1990s and released in 2000 [1]. The aim was to construct a laryngeal mask with improved adequate ventilation characteristics by sealing glottic opening with no leak and protection against regurgitation. The new

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features incorporated in this device are a modified cuff and a drain tube. The proseal LMA has a larger ventral cuff, attached to a second cuff placed on the dorsal surface of bowl. Mask design is also unique. The bowl is deeper and has no apertures and the inflatable portion extends around the back. When the cuff is inflated, the mask is pushed anteriorly and the glottis becomes enveloped in the bowl which provides better leakproof seal around the glottic aperture [1]. It has an integrated gastric/venting port and a tube which traverses through the mask. When this airway is placed properly, the distal orifice of the drain tube lies in the upper eosophagus [1]. It is a safer and effective device to use as an alternative to face mask in spontaneously breathing patients [2]. In comparison to endotracheal intubation, proseal LMA produces less or no incidence of sore throat, hoarseness, minimum pressor response and better tolerance in spontaneously breathing patients. It can be inserted easily without direct laryngoscopy and without the use of muscle relaxants.

Aims of Study

The aim of this study was to compare proseal LMA and endotracheal intubation by assessing the ease of insertion, insertion time and its effects on hemodynamics.

Material and Method

A randomized, prospective study was done on 80 patients of 18-60 yrs of age, either gender of ASA Grade I and II admitted for planned abdominal surgery under general anaesthesia and randomly allocated in two groups.

Group I- Proseal LMA

Group II- Endotracheal tube

Written and informed consent was obtained after explaining the study protocol. Proper pre-anaesthetic check-up was done including airway assessment and all routine investigations were checked. Patients with body mass index >25 kg/M^2, age below 18 yrs, mouth opening <2cm (Mallampati Grade III and IV), patients with history of gastro-eosophageal reflux disease, pregnant females and anticipated difficult airway due to any physiological or musculo-skeletal abnormalities were excluded from this study [3]. All patients were advised nil orally for 6-8 hrs and tablet alprazolam 0.5mg was given night before surgery. In operation theatre, monitor was attached to record basal heart rate, blood pressure, oxygen saturation, $EtCO_2$ and ECG. Patent intravenous line was secured and drip of crystalloid fluid was started. Patients were premedicated with Inj glycopyrrolate 0.2mg, ranitidine 50 mg, metoclopromide 10mg, ondensetron 4mg, pentazocine 30mg and midazolam 2mg intravenously 5mins before induction of anaesthesia. Pre-oxygenation was done with 100% oxygen for 3 mins. Induction was done with inj propofol (2-2.5mg/kg), intubated with inj succinylcoline (1-1.5mg/kg). Bag-mask ventilation was continued till the disappearance of fasciculations. Patients head was placed and stabilized in intubating position. Appropriate size selection of proseal LMA and endotrachial tube was done on the basis of weight as recommended by the manufacturer's guidelines [4]. Proseal LMA or endotracheal tube was inserted according to the respective group. Proseal LMA was inserted by digital method [1]. Cuff was inflated with the recommended volume of air [4]. Correct placement of Proseal LMA was confirmed by uniform chest expension, capnograph and by gel displacement test [1]. Insertion time of device and nasogastric tube, attempts of insertion and associated hemodynamic changes were recorded. Once the patient was properly intubated, auscultated for adequate ventilation, they were maintained on N_2O+O_2, Vecuronium 0.8mg/kg and Isoflurane (1-1.5%). Heart rate, blood pressure and oxygen saturation were monitored at frequent interval throughout the intra-operative period and immediately after extubation. $EtCO_2$ was maintained below 36 mmHg. At the end of surgery, patients were reversed with inj 2.5mg neostigmine and 0.4mg glycopyrroate. Patients were observed for any airway trauma, sore throat or hoarseness of voice.

Observations

This table 1 shows that mean age in group I was 42.2±11.32 yr and 40.8±12.01 yr in group II. There were 28 males and 12 females in group I and 25 males and 15 females in group II. The difference in mean age, sex distribution and mean body mass index were statistically insignificant (p>0.05).

Ease of insertion of the device, according to attempts classified into easy, moderate, difficult and impossible. More than 3 attempts for insertion of PLMA was considered as impossible and it was substituted by endotracheal intubation. According to this table, 37 patients were intubated with PLMA in the first attempt and 3 patients in second attempt in group I, whereas only 1 patient was intubated in second attempt in group II (Table 2).

Mean insertion time in group I with PLMA was 15.57±3.18 seconds and 22.24±2.61 seconds in group II with ETT. The difference was statistically insignificant (p>0.05).

This Table 3 shows that insertion of nasogastric tube was moderately difficult in 2 patient in group I and in 5 patients in group II.

Table 4 shows it was easy to insert nasogastric tube in group I in comparison of group II. Findings were found statistically significant.

Table 5 shows statistically significant changes in heart rate and mean arterial pressure during laryngoscopy and intubation/extubation and perstisted after 3 min in group II, whereas statistically significant changes were observed during insertion of proseal LMA in group II which persisted for 15 seconds.

Table 1: Demographic data

Parameters	Group I	Group II	P value
Age in yrs (mean ±S.D.)	42.2±11.32	40.8±12.01	P=0.465
Sex, number			
Males	28	25	p>0.05
Females	12	15	p>0.05
BMI	22.7±2.05kg/m^2	23.1±1.81kg/m^2	p>0.05

Table 2: Device insertion characteristics

Ease of insertion	Group I	Group II	P value
Easy	37	39	p>0.05
Moderate	3	1	
Difficult	-	-	
Impossible	-	-	
Insertion time(in mins)	15.57±3.18 sec	22.24±2.61 sec	p>0.05

Table 3: Nasogastric tube insertion characteristics

Ease of insertion	Group I (PLMA)	Group II (ETT)
Easy	38	35
Moderate	2	5
Difficult	-	-
Impossible	-	-

Table 4: Insertion time

	Group I (PLMA)	Group II (ETT)	P value
Mean ± S.D.	9.96±1.29 sec	12.55±1.25 sec	P<0.05

Table 5: Insertion time

Parameters	Group I	Group II
Heart rate± S.D.		
Basal	81.3±3.14	80.91±3.88
During insertion	83.12±3.77	88.7±6.1
After 15 seconds	83.19±3.59	90.0±5.83
After 1 min	82.59±2.64	89.83±5.37
After 3 min	81.76±3.1	86.29±3.13
After 5 min	80.03±4.01	81.41±2.92
During extubation	80.59±2.96	87.27±4.49
After 1 min	80.97±3.02	86.81±3.69
After 3 min	78.49±3.69	82.5±2.19
Mean arterial pressure		
Basal	84.62±2.37	83.49±2.82
During insertion	86.48±3.34	94.53±4.41
After 15 seconds	87.17±3.67	97.38±4.85
After 1 min	85.34±2.99	94.13±3.71
After 3 min	85.09±2.17	89.1±3.19
After 5 min	83.21±3.28	86.52±2.94
During extubation	83.48±3.63	99.21±5.15
After 1 min	83.16±3.0	98.63±4.47
After 3 min	81.37±2.36	89.55±3.18

Discussion

Endotracheal intubation with endotracheal tubes in patients under general anaesthesia is the standardized technique to achieve secured airway for proper ventilation along with minimum risk of regurgitation and aspiration since long time [5]. Problems related to rigid laryngoscopy and intubation such as sympathetic stimulation, trauma to the airway, sore throat and postoperative hoarseness of voice, inability to intubate in difficult airway patients and inability in conducting day care surgeries without endotracheal intubation leads to invent a device which can fulfill the advantages of endotracheal tubes without intubation [6,7]. A new era of anaesthesia has started since the invention and modification in classic LMA [8]. Before the invention of proseal LMA, classic LMA was used in place of endotracheal tubes to bypass its related consequences.

This study was conducted to compare the efficacy of proceal LMA over endotracheal tubes to overcome the associated problems of endotracheal intubation.

Insertion of device was found easy in 93% of patients in group I and 99% in group II. These findings correlated with the findings of Evans et al[7]. Mean insertion time for successful and secured placement of PLMA in group I was 15.57±3.18 seconds and 22.24±2.61 seconds in group II with ETT which was insignificant. These findings corresponds with earlier studies [9,10,11,12,13,14].

Hemodynamic response during insertion and extubation in both groups corresponds with the findings with other studies [8,9,13].

Mean insertion time for introducing nasogastric tube in group I was 9.96±1.29 seconds with PLMA and 12.55±1.25 seconds in group II with ETT. These values were found statistically significant ($p<0.01$). The difference in mean time was due to as it was inserted with ease in group I through drain tube in PLMA. Findings correlated with the findings of Saraswat et al. [9], where the mean insertion time was 9.77 seconds with PLMA and 11.5 seconds with ETT.

Conclusion

In this study, it was observed that proceal LMA is easy to insert without producing any trauma to oropharyngeal structures, provides adequate spontaneous and controlled ventilation [15].

Achieving adequate ventilation along with normocapnic state is the paramount goal of an anaesthesiologist, which was achieved by PLMA.

According to the findings of this study, it can be concluded that both PLMA and endotracheal tubes showed similar efficiency during intubation and maintenance of anaesthesia without any air leak and without any risk of regurgitation. Hence, it can be concluded that PLMA can replace and can be a better and effective alternative to endotracheal intubation as it also not produces any detrimental hemodynamic changes.

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