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Traumatology

USE OF BASKA® MASK IN MILITARY TRAUMA & DISASTERS : MILITARY MEDICINE ON THE MOVE

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ABSTRACT

Introduction: Airway management is an essential component in the first aid of medical emergencies in the combat medical care. Though Endotracheal tube (ETT) is considered ideal for airway management, supraglottic airway devices (SGA) are gaining popularity as an alternative. We studied the use of a novel SGA device (BASKA® mask) in hospital which can be extended to the combat situation.

Methods: In this randomised, clinical study, we compared two airway devices (ETT and Baska® Mask) for ventilation in patients (n=100) undergoing laparoscopic surgery. We evaluated the mean airway seal pressure, ease of insertion, time taken for insertion and the complication rates with the use of airway devices. The data were analyzed using appropriate statistical tests.

Results: We found that the mean airway seal pressures were comparable with the two devices. The first-time success rate for insertion was higher with the Baska® mask than with the ETT (94% vs 70%) respectively ($p < 0.001$). The overall device insertion success rates were comparable between the two devices (100% vs 96% respectively, $p = 0.5412$).

Conclusion: Baska® mask is comparable on various parameters to the ETT and is easier to insert due to its flexible head. This is relevant for airway management during combat medical support in field situations.

KEYWORDS :

INTRODUCTION:

Airway protection and provision of adequate ventilation is an essential component of the emergency medical care. Tracheal intubation using endotracheal tube (ETT) is considered ideal for airway management as it provides safe glottis seal, adequate ventilation and protects against pulmonary aspiration even in the presence of raised airway pressures. However, the ETT device is not easy to insert without adequate training and in a difficult airway scenario. Supraglottic airway (SGA) devices are becoming popular as rescue airway devices in patients with difficult intubation. They manage the airway without intubation and with reduced upper airway complications they are ideal for use in field conditions even by paramedics. Baska® mask is a new, easy and efficient device with a soft non-inflatable cuff, which fits snugly on to the peri laryngeal frame work and the seal created is sufficient for both spontaneously breathing patients and for intermittent positive pressure ventilation. It has a unique drain port which separates respiratory tract from the alimentary tract and allows placement of gastric tube for venting of gas or liquid thereby decompression of stomach.

The common laparoscopic surgeries in anaesthetic practice are cholecystectomy, appendicectomy, hernia repair, urologic and minor gynaecologic procedures. Laparoscopic surgery has been shown to adversely affect the intraoperative pulmonary mechanics, thereby providing the most severe test of the efficacy of an airway device. Pulmonary compliance is decreased and the resistance is increased leading to high airway pressures. The problems associated with maintenance of a patent airway and adequate ventilation are due to carbon dioxide insufflation in the body, raised intra-abdominal pressure and potential danger of regurgitation and pulmonary aspiration. This study was conducted to compare the use of Baska(®)mask and endotracheal tube (ETT) in patients undergoing laparoscopic procedures under general anaesthesia using controlled ventilation. We studied the use of a novel SGA device (Baska(®) mask) with the ETT in laparoscopic surgeries for various clinical and ventilation parameters.

MATERIALS AND METHODS:

Study Population: This randomized, comparative, clinical study was conducted at a tertiary care hospital of the Indian Armed Forces in the year 2017. The study protocol was approved by the institutional ethical committee and written informed consent was obtained from all the participants. The study population (100 adults of either sex) consists of patients in American Society of Anaesthesiologists physical status I or II, undergoing elective laparoscopic surgery. The patients having presence of any significant acute or chronic lung disease, pathology of the neck or upper respiratory tract, potential difficult intubations, mouth opening <2.5 cm, cervical spine disease, increased risk of aspiration (hiatus hernia, gastro-oesophageal reflux disease, full stomach), pregnant women, patients with body mass index (BMI) >35 kg/m2 and all emergency surgeries were excluded from the study. The patients were randomly allocated into two groups of 50 patients: Group-A (Baska® mask) appropriate sized Baska(®) mask was inserted, and in Group-B patients, airway was secured with laryngoscopy guided ETT insertion.

Study Procedures: 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 (SpO2) 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 propofol 2-2.5 mg/kg IV and succinylcholine 1.5-2 mg/kg IV to facilitate the endotracheal intubation. Airway devices (Baska(®) mask and ETT) 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 SpO2(>95%). After fixing the airway device, appropriate sized gastric tube was inserted. Anaesthesia was maintained with O2, N2 O, traces of inhalation agents and intermittent doses of injection vecuronium bromide. Controlled ventilation was provided with tidal volume of 8-10 ml/kg and respiratory rate set to obtain an end tidal carbon dioxide (EtCO2) 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 Baska(®)mask /extubation of ETT was done after recovery of adequate spontaneous respiration and muscle tone.

Study Measures: We 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. Airway seal pressures

haemodynamics (HR, SBP, DBP and MAP) as primary outcome measure. Monitoring of PR, MBP, SpO2, EtCO2, and ECG 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 Baska(®) mask insertion/intubation, after pneumoperitoneum, after change of position, before and 5 min after release of pneumoperitoneum and after Baska(®)mask removal/extubation. Common complications such as coughing, laryngospasm, gastric inflation, regurgitation, aspiration, blood on device, injuries (to lip, teeth, and gum), sore throat, dysphagia and dysphonia during perioperative period were recorded.

Statistical analysis: A total of 100 patients were enrolled (50 in each group) giving 85% power to our study at an error margin of 0.05. The patient data was analyzed using relevant tests like Chi square and Unpaired t test. The data was analyzed using SPSS (version 21.0; SPSS Inc, Chicago, IL) and a p value of less than 0.05 was considered significant for all the tests.

RESULTS:

The study participants were recruited from the routine laparoscopic list and there were no dropouts. The demographic details of the study participants is given in table 1. There was no significant difference between the groups in terms of age, weight, height, BMI and duration of surgery. The data regarding the size of Baska® mask and ETT, attempts and ease for insertion of airway device and attempts for insertion of gastric tube are shown in the table 2. The mean times from insertion of the airway device to the first capnograph trace was significantly less in Baska® mask insertion (10 ± 2 seconds) when compared with ETT (16 ± 2). Baska® mask was placed in 1st attempt in 45/50 (90%) cases and rest 5/50 (10%) cases required 2nd attempt. However, ETT was placed in 1st attempt in only 35/50 (70%) cases, 12/50 (24%) cases required 2nd attempt and rest 3/50 (6%) required additional manoeuvres. The median leak pressure was 30 cm of H2O, which is effective in preventing aspirations. Results for gastric tube insertion were comparable in both Baska® mask (1st attempt 92%, 2nd attempt 8%) and ETT (1st attempt 84%, 2nd attempt 18%).

There was no significant difference in the pulse rate (P = 0.18, df-58, CI-95%) and mean blood pressure (P = 0.292, df-58, CI-95%) before insertion of airway device between the two groups. Following insertion of airway device there was significant rise in PR (just after intubation [P = 0.0013, df-58, CI-95%], 3 min after intubation [P = 0.011, df-58, CI-95%]) and MBP (just after intubation [P = 0.0002, df-58, CI-95%], 3 min after intubation [P = 0.0001, df-58, CI-95%], 5 min after intubation [P = 0.014, df-58, CI-95%]) in Group-B(ETT) patients when compared to Group-A(BASKA) patients. However after 5 min of intubation till the removal of airway device the changes in PR and MBP were comparable in both groups. SpO2 and EtCO2 between the two groups were comparable at all times throughout the procedure. There were no significant differences in complications associated with the use of either airway devices. On removal, visible blood indicative of mucosal injury was noticed in 2/50 (4%) patients of Baska® mask group. Injury to lips/gums/teeth and post-operative mild sore throat was observed in 5/50 (10%) patients respectively in ETT group. No incidence of coughing, bronchospasm, laryngospasm, regurgitation, aspiration or gastric insufflation was noted in BASKA group however 3/50(6%)patients in ETT group had bronchospasm and 2/50(4%) patients had post operative vomiting.

DISCUSSION

Our study showed that the Baska® mask is beneficial over the use of traditional ETT insertion in patients undergoing laparoscopic surgery. The patients in group A had more ease of insertion, less complications and also early recovery in comparison to patients ventilated with the ETT. Supraglottic airway devices (SGAs) are gaining popularity as tools for airway management in anesthesia and also in certain situations outside the operating room. These devices offer several advantages over the tracheal tube (TT) with regard to ease of insertion, haemodynamic stability, favourable respiratory mechanics and decreased airway morbidity.4-8 Due to their positioning outside of the larynx they are less invasive as compared to endotracheal tubes.

The Baska® mask (PROACT Medical Systems, Frenchs Forest NSW, Australia), designed by Australian anesthetists Kanag and Meena Baska®, is a new CE approved and internationally patented supraglottic airway device, provided in single use and multi-use versions. It has a non-inflatable cuff which facilitates a better airway seal, integrated bite block and pharyngeal drainage system that reduces the risk of lung aspiration. Baska® mask has incorporated novel features of other in –vogue supraglottic devices into a single device and is now used in short surgical procedures under general anaesthesia thereby avoid complications associated with intubation. Furthermore, on comparison of haemodynamic response to insertion of Baska(®) Mask , I-gel and classic LMA with endotracheal intubation in one of the studies, it was found that Baska(®) Mask was superior to other two airways in maintaining stable haemodynamics and was not associated with increase in IOP under general anaesthesia.11

Baska(®) Mask formed an effective seal around the glottis allowing adequate oxygenation and controlled ventilation as good as ETT. Oxygenation and ventilation were optimal in all our patients throughout the surgery as well as in post-operative period. Our results agree with those of previous study done by Maltby et al1 and Lu et al12 who compared proseal LMA with ETT and CLMA respectively. The firmness of the tube section of Baska(®) Mask and its natural oropharyngeal structures allows the device to be easily and rapidly inserted by grasping the proximal part, which helps to glide the leading edge against the hard palate into pharynx. This structure of Baska(®) Mask increases the success rate with first attempt even with inexperienced anaesthesiologists. The success rate of inserting the Baska(®) Mask were observed by previous studies.5,13-14.

Endotracheal intubation requires laryngoscopy, which may also increase the average time for insertion and hence may cause increased sympatho-adrenal activity and rise in hemodynamic response.15We observed the significant rise in PR and MBP just after, 3 min and 5 min after endotracheal intubation when compared to BASKA . However, the hemodynamic parameters thereafter were comparable in both groups. Major sources of the stimuli responsible for the adrenergic response may be the supraglottic structures distorted by laryngoscopy.15-18 Hence it suggests that Baska(®) Mask offer greater hemodynamic stability to insertion, during maintenance and at extubation compared to ETT. The complication rate observed were similar to those observed by parker et al with the use of disposable LMAs11 and ETT. Patients undergoing laparoscopy might be considered to be at risk of developing the acid aspiration syndrome. However, the inbuilt design of the BASKA mask device allows the regurgitant material to collect in the sump cavity and drained out. In our study, we did not observe any incidence of regurgitation.

CONCLUSION: We conclude that Baska® mask requires less time for insertion with minimal hemodynamic changes when compared to ETT and also provide adequate positive-pressure ventilation, comparable with ETT. In addition, the gastric channel in Baska® mask provides protection against aspiration. Thus proving that, Baska® mask can be a safe and suitable alternative to ETT. We consider that Baska ® mask is an ideal rescue airway device in compbat medical support because of the ease of insertion, maintenance of better airway pressure and reduced risk of aspiration. Further research will establish the supremacy of the Baska® mask in combat medical care.

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Figures and Tables

Table 1

	BASKA® MASK	ETT
AGE (YEARS)	32(24-43)	34(22-45)
WEIGHT (KGS)	55(48-65)	52(49-62)
HEIGHT (CMS)	160(150-170)	162 (152-171)
BMI (Kg/m2)	22(19-25)	22.45(20-26)
SEX (M/F)	28-M/ 22-F	32M/18-F
SURGERY DURATION (Min)	46(25- 60)	48(22-58)

Demographic profile

Table 2

	BASKA® MASK	ETT
SIZE OF AIRWAY	33(3)/17(4)	24(7)/20(8)/ 6(8.5)

EASE OF INSERTION (EASY/DIFFICULT/FAILED)	45/5/0	35/15/0
NO OF ATTEMPTS FOR AIRWAY INSERTION (1/2/3)	45/5/0	35/12/3
NO OF ATTEMPTS FOR GASTRIC TUBE INSERTION (1/2/3)	46/4/0	42/9/0
TIME TAKEN FOR INSERTION	10(8-12)	16(14-18)

Comparison of parameters between two groups
Table 3

	MEAN PULSE RATE		MEAN BLOOD PRESSSURE (MAP)		EtCO2	
	BASKA	ETT	BASKA	ETT	BASKA	ETT
PRE OPERATIVE	76	74	86	85	-	-
AFTER AIRWAY INSERTION	80	90	88	94	34	36
3Min POST AIRWAY INSERTION	78	84	86	91	37	38
5Min POST AIRWAY INSERTION	70	78	80	88	38	39
AFTER PNEUMOPERITONEUM	78	85	84	92	40	42
AFTER RELEASE OF PNEUMOPERITONEUM	74	80	80	90	36	38
AFTER EXTUBATION/REMOVAL OF BASKA	80	84	86	87	33	36

Mean pulse rate and mean blood pressure changes
Table - 4

SURGERY	BASKA	ETT
LAP. CHOLECYSTECTOMY	25	24
GYNAECOLOGICAL	18	16
HERNIORRAPHY	06	07
UROLOGICAL PROCEDURES	01	03

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