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ORIGINAL ARTICLE

Compare the Mean Cuff Pressure in Endotracheal Tube Cuff Filled with Air versus Saline in patients undergoing Surgery under General Anesthesia

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ABSTRACT

Background*:* Securing and maintaining airway and ventilating the patients by placement of endotracheal1tube is common practice in the operation1theater for delivery of general anesthesia and in the critical care settings. The primary role of endotracheal tube (ETT) cuff's primary role is to seal the airway, preventing leaks and pharyngeal contents aspiration into the trachea1during ventilation.
Aim*:* To compare the mean cuff pressure in endotracheal1tube cuff filled with air vs saline in patients undergoing surgery under general anesthesia.
Study Design: Randomized control trail
Place and Duration of Study: Department of Anesthesia, National Hospital, Lahore from 1st July 2016 to 31st December 2016.
Methodology: One hundred patients undergoing surgery under general anesthesia were enrolled. They were divided into two groups and each group comprised equal number of patients. In group A, endotracheal tube was inserted with air filled cuff while in group B, endotracheal tube was inserted by using 0.9%saline solution. On follow-up outcome was noted.
Results*:* The average age of the air filled cuff was 38.24±12.22 years and in saline filled cuff group was 39.68±13.79 years. Insignificant (p=0.269) difference statistically was found between the groups with cuff pressure at baseline of the patients and insignificant difference was noted at baseline.
Conclusion*:* The mean cuff pressure in ETT was significantly less with saline than air filled cuff in patients undergoing surgery under general anesthesia.
Key words*:* General anesthesia, Endotracheal tube, Saline, Cuff pressure

INTRODUCTION

Securing maintaining airway ventilating the1patients by placement of1endotracheal tube is1common practice in the1operation theatre for delivery of general anesthesia and in the critical care settings. The use of a cuffed tube for safer anesthetic practice is recommended, as is monitoring the endotracheal tube cuff pressure using traditional methods such as palpating the pilot1balloon and hearing the absence of the audible air leak[1,2].

Maximum endotracheal cuff pressure of 20-30cm H_2O is recommended. Under inflation is associated with complications such as aspiration and over inflation is associated with tracheal wall damage. Endotracheal cuff pressure changes are common. The duration of previous intubation and the lack of anaesthesia are both linked to an increased risk of cuff under inflating[3]. In prolonged surgeries endotracheal tube cuff pressures >30cm H_2O cause problems ranging from sore1throat to rare1cases of trachea esophageal fistula[4,5].

The use of a1solution was successful in keeping the endotracheal cuff pressure in the 20 to 30cm H_2O range nearly double as often as the control condition (88.9% vs 48.3%). Cuff pressure variability was decreased as a result of the intervention[6].

A study conducted in Sao Paulo, Brazil on 30 patients, the cuff pressure was 32.5±1.2cm H_2O in air filled cuff (n=15) versus 18.2±1.2cm H^2O with solution filled cuff (n=15) after 30 minutes of endotracheal intubation. This difference was observed to be highly significant (p=0.000)[7]. One more study conducted in Bangalore, India on 60 patients, the cuff pressure was 62.60±12.33cm H_2O in air filled cuff (n=30) while 27.63±3.221cm H_2O with solution filled cuff (n=30) after 60 minutes of endotracheal tube intubation. This difference was also observed to be highly significant[8].

The purpose of this study is to compare whether saline is also effective in maintaining endotracheal seal pressure around 20-30cm H_2O to obtain local evidence, as previous studies mostly involves alkalinized lidocaine or N_2O_2.

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MATERIALS AND METHODS

This randomized controlled trial was conducted in Department of Anesthesia, National Hospital, Lahore from 1st July 2016 to 31st December 2016. A total of 100 patients were enrolled. Patients of age 20-60 years of with undergoing general anesthesia like hysterectomy, laparotomy, hernioplasty, chest surgery, orthopedic, urology, ENT, laparoscopic procedures of >60 minutes duration under general anesthesia with ASA I & II were included. Known or Systemic problems like uncontrolled hypertension (BP >140/90mmHg), poor controlled diabetes (BSR >186mg/dl), peripheral vascular disease, ischemic heart disease, cardiac arrhythmias or having cardiac pace makers, Patients with tracheotomy, laryngeal disease, laryngeal surgery, history of smoking patients were excluded.

After taking informed consent then patients were randomly divided in two groups. In group1A, endotracheal tube was inserted with air filled cuff while in group1B, endotracheal tube was inserted by using 0.9% saline solution. We used 7.0 mm tube in female patients and 7.5mm tube in male patients. After following all standard protocols of intubation, tracheal intubation was performed. Before intubation, no lubricant of any kind was applied on the tracheal tube, after orotracheal intubation, the endotracheal tube cuff was inflated with minimum volume of air or saline required to form a seal in the cuff and pressure was measured. After 60 minutes of surgery, the cuff pressure was noted again. All this information was noted. Data was analyzed into SPSS 21. Independent sample t-test was used to compare mean of cuff pressure in both groups. Data was stratified for age, gender and ASA class. Post-stratification, independent sample t-test was applied. P-value ≤0.05 considered significant.

RESULTS

The mean values of age of the air filled cuff patients was 38.24±12.22 years 39.68±13.79 years in saline filled cuff group patients was. There were 56 males in which 28 were from air filled cuff group and 28 were from saline filled cuff patients. Likewise, there were 44 females in which 22 were from air filled cuff group

and 22 were from saline filled cuff patients. Anesthesia type ASA I was given in 57 patients in which 33 were from group I and 24 were from group II. Similarly, the anesthesia type ASA II was done in 43 cases in which 17 were from group I and 26 were from group II (Table 1).

The mean value of cuff pressure at baseline in group I was 24.60±2.58 cm H_2O whereas group II was 25.26±3.31 cm H_2O. Statistically difference was insignificant (p=0.25) between the groups. The mean value of cuff pressure at 60 minutes in group I was 42.20±9.05 cm H_2O whereas its group II was 21.34±4.49cm H_2O. Significant (p=0.001) difference was found between the groups (Table 2).

Table 1: Demographic information of the patients in both groups (n=100)

Variable	Air filled cuff Group	Saline filled cuff Group
Age (years)	38.24±12.22	39.68±13.79
Gender		
Male	28 (28%)	28 (28%)
Female	22 (22%)	22 (22%)
ASA		
I	33 (33%)	24 (24%)
II	17 (17%)	26 (26%)

Table 2: Comparison of ASA cuff pressure at baseline and 60 minutes in both groups

ASA Cuff Pressure	Air filled cuff group	Saline filled cuff group	P value
At baseline	24.6±2.57	25.25+3.32	0.25
At 60 minutes	42.21±9.05	21.34+4.49	0.001

DISCUSSION

Airway control is required for general anaesthesia, and tracheal intubation is frequently the most efficient method. Cuffs, which are more commonly used in adults may or not be present in the tracheal tubes.[9] The purpose of the cuff is to seal the trachea, allowing for positive pressure breathing and preventing aspiration of stomach contents. It is suggested that Cuff pressure should be maintained between 25 and 34 cm H_2O. Gastric content aspiration is securely prevented at pressures above 25 cm H_2O, whereas broncho-aspiration is possible at pressures below 20 cm H_2O[10].

In this study insignificant difference was found between the groups with cuff pressure at baseline of the patients (p =0.25) and mean value of cuff pressure at 60 minutes in air filled cuff group patients was 42.20±9.05 cm H_2O and in saline filled cuff group was 21.34±4.49 cm H_2O (p=0.001). A study conducted in Sao Paulo, Brazil, the cuff pressure was 32.5±1.2 cm H_2O in air filled cuff (n=15) versus 18.2±1.2 cm H_2O with solution filled cuff (n=15) after 30 minutes of endotracheal intubation. This difference was observed to be highly significant (p=0.000)[5].

One study recognized that there was a broad range in cuff pressure (2-119 mmHg), with the greatest mean pressure (35.2 mmHg) in the air group and the lowest in the saline group (22.4mmHg). With nitrous oxide anesthesia, saline produces stable cuff pressures, although it is more difficult to utilize than air since cuff volume modification is frequently necessary[11].

The saline solution can reduce mixed gas diffusion, lowering the risk of this problem[12]. Lidocaine as a cuff-filling solution, but at the other hand, has been linked to a decreased frequency of angina[13]. Another study conducted in 50 patients, the cuff pressure was 36.00 [30-51.25] cm H_2O in air filled cuff (n=25) while 21.00 [16.83-27.60] cm H_2O with solution filled cuff (n=25) after 60 minutes of endotracheal intubation. This difference was also observed to be highly significant (p=0.000).[14]

One more study conducted in Bangalore, India on 60 patients, the cuff pressure was 62.60±12.33 cm H_2O in air filled cuff (n=30) while 27.63±3.221 cm H_2O with solution filled cuff (n=30) after 60 minutes of endotracheal tube intubation. This difference was also observed to be highly significant (p=0.000)[15].

The solution use was a successful in keeping the endotracheal cuff pressure in the 20-30 cm H_2O range almost double as often as the control treatment (88.9% vs 48.3 %. Cuff pressure variability was also decreased as a result of the intervention[16].

Although the clinical significance of saline is uncertain, it appears that it might be a good feeling agent for regular usage. Nitrous oxide is known to diffuse into air filled laryngeal mask airway cuff and to produce a increase in pressure during nitrous oxide anesthesia that plateaus at11-2 hours[17].

CONCLUSION

According to this study, saline considerably decreased the mean cuff pressure in endotracheal tubes compared to a cuff filled with air in patients undergoing surgery under general anaesthesia.

Conflict of interest: Nil

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