MEASUREMENT OF ENDOTRACHEAL TUBE CUFF PRESSURE USING A CONVENTIONAL METHOD IN ELECTIVE SURGERIES

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ABSTRACT

BACKGROUND
Endotracheal intubation is the key to airway management in general anaesthesia. It is essential to maintain an optimum endotracheal tube cuff pressure in order to achieve optimum seal, thereby preventing the damage to the tracheal mucosa. This study was done to determine the prevalence of endotracheal tube cuff pressure and the risk factors of overinflation.

MATERIALS AND METHODS
This cross-sectional study was done among 100 participants who underwent elective surgery under general anaesthesia. The participants were selected by convenient sampling. Trachea was intubated with high volume low pressure cuff. Then, cuff pressure was measured using standard cuff pressure manometer and VBM cuff pressure gauge sensitive for low pressure cuffs. The pressure was measured in centimetres of H₂O. Intracuff pressure of 20 - 30 cms of H₂O was set as standard and pressures outside this were adjusted to 30 cms of H₂O (22 mmHg).

RESULTS
Majority (46%) of the participants belonged to 40 - 59 years of age. Majority of the participants (52%) were males. It was observed that only in 10% of the participants a normal inflation was achieved. Overinflation occurred in 90% of the participants.

CONCLUSION
It is essential to strive to achieve an optimal cuff pressure in order to prevent complications to the tracheal mucosa.

KEYWORDS
Endotracheal Intubation, High Pressure, Mucosal Damage, Sore Throat, Trachea.


BACKGROUND
Endotracheal tube (ETT) intubation has been the mainstay in general anaesthesia during elective surgeries. It is the optimised technique of airway management and provides as a medium for safe delivery of anaesthetic gases and airway protection during the surgery.[1] There are several techniques of achieving ET intubation, some of them being used of direct Macintosh laryngoscope, video laryngoscope or laryngeal mask airway intubation.[2] Whichever may be the technique, it is important to maintain an optimum pressure in the ETT cuff.

The role of an ETT cuff is to seal the airway in order to prevent leaks and aspiration of pharyngeal contents into trachea during ventilation. An optimum ETT cuff pressure ensures delivery of the mechanical ventilation tidal volume and simultaneously reducing the risk of aspiration without compromising the tracheal perforation.[3] Achieving ideal endotracheal tube cuff pressure is vital in patients undergoing surgeries under general anaesthesia. Overinflation decreases tracheal perfusion pressure and may cause post intubation sore throat. Under inflation increases the risk of aspiration of oropharyngeal contents, ventilator failure.[4] Therefore, a minimum pressure of 20 cm of H₂O is recommended.

Various devices have been used to measure the ETT cuff pressure in the last few years. The recommendations of the optimum cuff pressure were made by French Society of Critical Care Medicine using a portable manometer.[5] There are several critical acclaim to the manual measurement of the cuff pressure. Conventionally, the clinical method of digital palpation of pilot balloon to achieve ideal pressure has been in vogue. Despite the fact that its efficiency is intensely debated in recent times, the prevailing paucity of studies on this subject on Indian population is worth noting.[3]

Objective
1. To estimate the mean ETT cuff pressures among the study participants.
2. To evaluate the risk factors for over/ underinflation among the study participants.

MATERIALS AND METHODS

Study Setting
This cross-sectional study was done in the Department of Anaesthesia of our medical college hospital among patients posted for elective surgeries.

Study Population
Based on the available literature, it was observed that in 31% of the cases, a normal ETT cuff pressure was achieved.[3] At 95% level of significance and 10% absolute precision, the sample size was calculated as 82.13. Accounting 10% for non-
The prevalence of ETT cuff inflation is given in Table 2. It was observed that only in 10% (4.1 to 15.9) of the participants a normal inflation was achieved. Overinflation occurred in 90% of the participants.

The association between the inflation and risk factors are given in Table 3. Overinflation was present in all participants who were < 20 years and > 60 years. However, the observed difference was statistically not significant. Similarly, males were found to be at increased risk of overinflation (92.3%) compared to females (87.5%). However, the observed difference was not significant statistically.

The proportion of range of pressures achieved is depicted in Figure 1. It is observed that in 25% of the participants the pressure ranged between 51 and 60 cm of H2O, while in 23% of the participants the pressure ranged between 61 and 70 cm of H2O.

The morbidity associated by an overinflated cuff has been regularly highlighted in literature like, mucosal ulceration, sore throat and hoarseness, tracheal necrosis, rupture and stenosis are all potential risks when intra-cuff pressure is excessively high.

Current clinical methods of endotracheal cuff pressure monitoring are not reliable.[6] Many authors recommended...
routine instrumental monitoring.[3,5,7] In our study also the proportion of subjects achieving normal pressure with clinical method is very low, as in 9 out of 10 persons the cuff pressure was higher than recommended value.

Almost 90% of the study population- The cuff pressure achieved was higher than recommended. This phenomenon was observed across the age groups, gender and in different BMI categories. It has been established that large volume, low pressure ETT cuffs have less deleterious effect on the tracheal mucosa compared to low volume high pressure ETT cuffs. Animal studies have proven to have lower depths of erosion; however, the area of erosion was larger with low pressure cuffs.

CONCLUSION
Monitoring cuff pressure by instrumental method can be more effective in achieving ideal cuff pressure and minimising the complications. It is essential to strive to achieve an optimal cuff pressure in order to prevent complications to the tracheal mucosa, which in turn improves the patient’s recovery and minimises the hospital stay.

Limitations
This study did not prospectively assess the impact of overinflation among the study participants due to certain logistic constraints. A larger sample of data could have proven statistical significance of association between overinflation and the risk factors.