

## A NOVEL METHOD OF EXTUBATION WITH A PARTIALLY DEFLATED CUFF VERSUS TRADITIONAL WAY - A COMPARATIVE STUDY

G Chaitanyakumar<sup>1</sup>, Prithivraj<sup>2</sup>, P Lavanya<sup>3</sup>, K Krishna Chaithanya<sup>4</sup>, K Lakshmi Sireesha<sup>5</sup>, K Brinda<sup>6</sup>

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### Corresponding Author:

Dr. K Lakshmi Sireesha

Email: drklsireesha@gmail.com

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<sup>1</sup>Assistant Professor, Department of Anaesthesiology, Narayana Medical College Hospital, Nellore, India.

<sup>2</sup>Assistant Professor, Department of Anaesthesiology, Narayana Medical College Hospital, Nellore, India.

<sup>3</sup>Senior Resident, Department of Anaesthesiology, Narayana Medical College Hospital, Nellore, India.

<sup>4</sup>Professor, Department of Anaesthesiology, Narayana Medical College Hospital, Nellore, India.

<sup>5</sup>Postgraduate, Department of Anaesthesiology, Narayana Medical College Hospital, Nellore, India.

<sup>6</sup>Assistant Professor, Department of Anaesthesiology, Narayana Medical College Hospital, Nellore, India.

### Abstract

**Background:** The extubation procedure is one of the risk factors for aspiration, which can lead to increased mortality. The removal of the ET tube is generally by cuff deflation, although microscopic aspiration is still reported. This study is aimed to compare the effects of extubation with a partially deflated versus completely deflated endotracheal tube. **Materials and Methods:** The comparative study was conducted among 60 patients undergoing general anaesthesia for elective surgeries with informed and written consent from the patient and ethical committee approval. Patients were further divided into Group P (partial deflation) and Group D (full deflation), with 30 patients in each group. Parameters such as incidence of hoarseness, heart rate, and systolic and diastolic blood pressure were measured. The unpaired student T-test was used to examine the significant difference. **Result:** A higher prevalence of hoarseness was reported in group D (30%), followed by group P (16.66%) and no laryngospasms were observed. Both groups' systolic and diastolic pressure were slightly elevated in the initial 0 to 3 minutes' duration, subsiding later to normal levels. However, the study reports no significant difference between both groups concerning heart rate and blood pressure. **Conclusion:** A partly-deflated cuff can reduce difficulties following extubation like hoarseness, microaspiration and minimal trauma to the vocal cords.

## INTRODUCTION

Extubation risks problems such as intra-tracheal suction, accumulating secretion above the endotracheal tube cuff, and eventual atelectasis due to a decrease in lung volumes brought on by the absence of physiological positive end-expiratory pressure.<sup>[1]</sup> The primary method for effectively delivering mechanical ventilation to patients in critical care is endotracheal intubation. According to studies, individuals who experience an unanticipated extubation failure have a greater death incidence (28–51%) than those who successfully endure the procedure (0–12%).<sup>[2]</sup> The endotracheal tube is traditionally removed when the cuff has completely deflated, although this practice can result in microscopic aspiration of secretions. According to conventional wisdom, the vocal cords suffer harm when we extubate with an inflated ETT cuff. On the

other hand, it is observed that the inflated cuff scrapes secretions from the glottis and upper trachea.<sup>[3]</sup>

The "cuff-leak" test, which entails showing a leak around a tracheal tube with the cuff deflated, has been recommended for patients with upper airway blockage.<sup>[4]</sup> Compared to the traditional method of awake extubation, extubation right before the reversal of neuromuscular blockade resulted in a lower incidence of bucking and coughing during extubation with less postoperative bleeding without increased risks of regurgitation, aspiration or delayed recovery.<sup>[5]</sup>

This study is aimed to compare the effects of extubation with a partially deflated versus completely deflated endotracheal tube. The comparison is done in terms of the following: prevalence of hoarseness, the prevalence of laryngospasm, Hemodynamic variables.

## MATERIALS AND METHODS

A comparative study was done with the Institutional Ethics Committee's permission. The subjects in this study were aged between 18-50 years. Sixty patients who satisfied the inclusion and exclusion criteria were enrolled in the research. Before conducting the ENT surgery under general anaesthesia, all participants gave their written consent.

Inclusion criteria: General anaesthesia was administered to all patients for elective surgeries. Informed and written consent from the patient. Age between 18-50 years.

Exclusion criteria: Patients belonging to ASA grade 3 and grade 4 were not included in the study. Patients who refuse to consent to the study. Patients with active upper respiratory tract infection, sore throat, CAD, CKD, COPD, and a history of laryngeal/tracheal surgery were excluded from the study. Patients who had already undergone intubation for more than one attempt.

In this study, the patients were allocated into two groups of 60 participants. Each group had 30 participants. The two groups were Group P (partial deflation) and Group D (complete deflation), respectively. The mean and standard deviation of continuous variables and the quantity and percentage of categorical variables are reported. In addition, the incidence of hoarseness, heart rate, SBP, and DBP were recorded. All data were input into MS Excel for statistical analysis, and SPSS 25 version software was used to determine statistical significance. The

data were shown as mean and standard deviation. Use of the Chi-square test was used to compare proportions. In addition, the unpaired student t-test was used to examine the statistical difference between the two research groups.

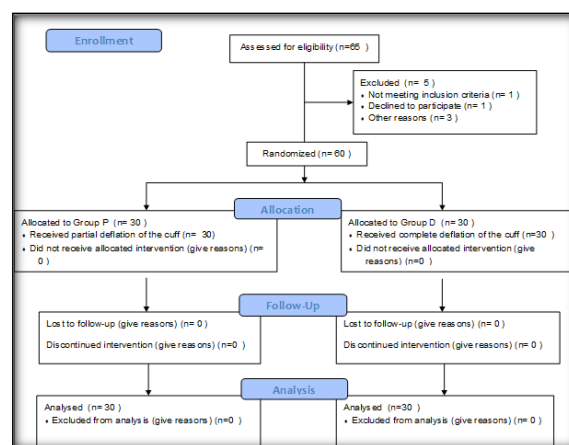


Figure 1: CONSORT Diagram

## RESULTS

A total of 60 patients were included in the current study, further divided into groups of 30 patients, each in Group P (partial deflation) and Group D (full deflation). Group P showed a lower incidence of hoarseness 5 (16.66%), whereas 9 (30%) was seen in Group D (P-value 0.22) [Table 2]. Laryngospasm did not occur in any of the groups.

Table 2: Incidence of hoarseness in both groups

Incidence of hoarseness	Group P	Group D	P-value
Present	5 (16.66%)	9 (30%)	0.22 (NS)
Absent	25 (83.33)	21 (70%)	

Table 3: Comparison of heart rates in both groups

Group	Basal hr	0 min	3 min	5 min	10 min	15 min	30 min
P	108 ± 14.1	117 ± 11.8	114 ± 11.4	103 ± 9.26	95.3 ± 7.92	89.5 ± 6.69	85.1 ± 5.99
D	107 ± 14.4	117 ± 11.3	110 ± 11.2	100 ± 10.6	96.7 ± 10.0	90.1 ± 8.15	83.9 ± 6.36
P-value	0.78	1.0	0.17	0.24	0.55	0.75	0.45

[Figure 2] reports the overall increase in heart rate between Group P and Group D.

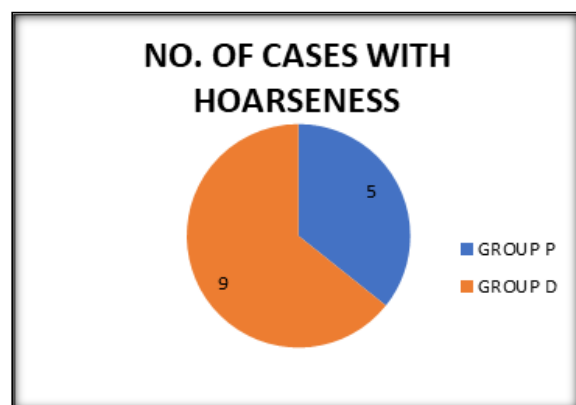
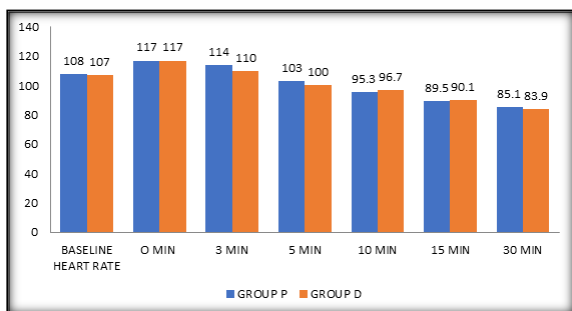


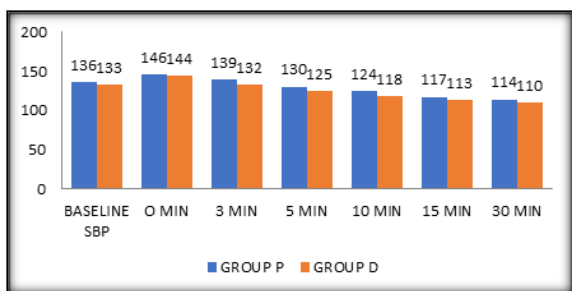
Figure 1: Prevalence of hoarseness in patients

The basal HR values were noted as Group P (108 ± 14.1) and Group D (107 ± 14.4) (P-value 0.78). The HR value for both the groups after 5 minutes of incubation was recorded as Group P (103 ± 9.26) and Group D (100 ± 10.6) (P-value 0.24). After 30 minutes of intubation, the heart rate in Group P and Group D was recorded as (85.1 ± 5.99) and (83.9 ± 6.36) respectively (P-value 0.45). Heart rates were constantly monitored from basal to 30-minute duration in intervals of 0 min, 3 min, 5 min, 10 min, 15 min, and 30 min, respectively. However, the comparison of HR between both groups did not reveal a significant difference, as demonstrated in Table 2. In addition, HR in both groups was mildly elevated between 0 and 5 minutes, which later reduced to normal levels



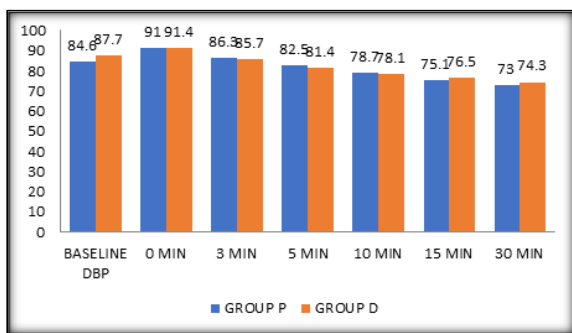
**Figure 2: Heart rate of patients**

The comparison of systolic blood pressure (SBP) in both groups reports no significant difference; however, both groups reported a slight elevation in SBP between the 0 to 3-minute duration [Figure 3].



**Figure 3: Comparison of SBP in both groups**

In addition, the diastolic blood pressure (DBP) was slightly raised in the initial 0 to 3-minute duration, returning to normal levels. However, the comparison of Group P and Group B did not reveal a significant DBP difference, as seen in [Figure 4].



**Figure 4: Comparison of DBP in both groups**

## DISCUSSION

In the present study, we found that the partially deflated cuff was responsible for most of the secretions. Therefore, we researched to evaluate the benefits and drawbacks of both cuff deflation techniques.

A similar study showed a new method considered safe and effective compared to the traditional method.<sup>[1]</sup> Another study also reported that the Standard procedure called for deflating the cuff before removing the endotracheal tube (ETT). The normal extubation side effect, such as cyanosis,

coughing, breath holding, laryngospasm, and bronchospasm, were experienced while using this approach. On the other hand, if the cuff is inflated, no common problems associated with extubation, such as injury to the vocal cords or glottis, were seen.<sup>[3]</sup> When the cuff is deflated, the edges will be uneven, but when it is only slightly deflated, the edges are smooth and round, which has the benefit of causing the least amount of damage to the mucosal surfaces. A similar finding was seen in our study, where there was no incidence of laryngospasm in either group.

In our study, the heart rate was recorded to be normal according to the partial deflation method. A study showed 70% of patients experienced increases in heart rate and systolic blood pressure of 20% or more who underwent extubation when they could breathe on their own and open their eyes on demand.<sup>[6]</sup> Research showed that following extubation, there are substantial increases in heart rate, mean arterial pressure, cardiac index, and systemic vascular resistance index that start at 1 minute and last for 10 minutes. The mean pulmonary artery pressure, pulmonary artery occlusion pressure, and pulmonary vascular resistance index all showed comparable substantial increases in these patients.<sup>[7]</sup> Compared with the above studies, our study doesn't show any significant difference in the hemodynamic parameters such as heart rate, SBP, and DBP, which makes partial deflation safer to use than the traditional method of extubation.

## CONCLUSION

Extubation using a partly deflated cuff is a unique technique that minimises damage to the vocal cords while preventing microaspiration. In our opinion, a partial cuff extubation technique might reduce difficulties following extubation, taking into account all of the study's findings. Furthermore, according to our study, the partially deflated cuff method can be safer than the traditional method as it doesn't disturb the different hemodynamic parameters.

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