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COMPARISON OF POSTURE AND COMFORT OF ANESTHESIOLOGISTS DURING TRACHEAL INTUBATION AND LARYNGOSCOPY IN SUPINE POSITION WITH 25 DEGREES BACKUP

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ABSTRACT

Background: HELP (head-elevated laryngoscopy position) with the 25 degrees back up has been advocated for better visualization of the glottis, however, it is still concerning for ergonomic discomfort which hinders its global adoption.

Aim: The present study was aimed at comparing the posture and comfort of anesthesiologists during tracheal intubation and laryngoscopy in a supine position with 25 25-degree backup

Methods: The study assessed 96 subjects with normal airways aged 18-60. The included subjects were randomly divided into two groups. Anesthesiologists performed intubation and laryngoscopy in a supine HELP position and a 25-degree backup HELP position. The anesthesiologists' posture was assessed by measuring the angles of their knee, back, elbow, wrist, and neck. A Likert scale was used to assess subjective comfort.

Results: The study showed that both the positions depicted comparable comfort and posture of anesthesiologist with p=0.642 and 0.917 respectively. Also, significant improvement was seen as 25 degrees backup HELP position improved Cormack–Lehane grades with grade 1 in 68% and 31% in the supine HELP group with p=0.01. Tracheal intubation time and hemodynamic stability depicted no significant difference in the two groups with p=0.115 and 0.473 respectively. No complication was seen in either group.

Conclusion: The present study concludes that the comfort and posture of anesthesiologists during tracheal intubation and laryngoscopy are similar in 25-degree backup and supine positions in subjects that have easy airways.

Keywords: 25° Backup, ergonomics, intratracheal laryngoscopy, head-elevated laryngoscopy position, patient positioning, posture, tracheal intubation

INTRODUCTION

Proper positioning of the subjects is vital to allow optimal visualization of the glottis and improved success associated with tracheal intubation. Existing literature data suggest that HELP (head elevated laryngoscopy position) exceeds the sniffing position in the facilitation of tracheal intubation and laryngoscopy. It has also been reported that 25 degrees backup along with HELP has proved to allow better glottic visualization by anesthesiologists.[1,2]

Despite these proven efficacious results, these positions are not used commonly for intubation or laryngoscopy. When assessed informally, anesthesiologists reported that they were not comfortable and were scared of abnormal posture during intubation in the backup position. Existing literature data reported objective assessment of the posture of anesthesiologists by assessing various angles in the leg, arm, back, and neck joints while performing intubation in the sniffing position. However, existing literature data is scarce on tracheal intubation and laryngoscopy done with HELP in 25 degrees and HELP position.[3,4]

It has been considered that implementation of 25 25-degree backup with HELP can improve the posture of anesthesiologists and ergonomics of the procedure for tracheal intubation and laryngoscopy. The study was primarily aimed to assess and compare the posture used by anesthesiologists by assessing the angles of lower back flexion, arm angle exertion, wrist angle deviation, and neck flexion during tracheal intubation with subjects in 25° backup HELP or supine position.[5,6] The study also aimed to compare the posture and comfort of anesthesiologists on CL (Cormack–Lehane) grade which is a 4-point Likert scale, complications, hemodynamics, and time to tracheal intubation in both positions during tracheal intubation and laryngoscopy.

MATERIALS AND METHODS

The present randomized crossover clinical study was aimed to compare the posture and comfort of anesthesiologists during tracheal intubation and laryngoscopy in a supine position with 25 25-degree backup. Verbal and written informed consent were taken from all the subjects before study participation.

The study assessed 96 subjects from both genders aged 18-60 years and in ASA (American Society of Anesthesiologists) I and II physical status, undergoing elective surgeries under general anesthesia and needed endotracheal intubation. Also, subjects with good mouth opening of >3mm in Mallampati grades I and II, having complete neck movement range, and positive upper lip bite tests were included. Exclusion criteria for the study were subjects with BMI (body mass index)>35kg/m2, aspiration risk, hemodynamic instability, undergoing emergency surgeries, and anticipated difficult airway as challenges in intubation or mask ventilation. The study also included anesthesiologists with a minimum of 5 years experience in at least 5 tracheal intubations and laryngoscopies in 25° backup HELP positions for intubation and laryngoscopy. During laryngoscopy and intubation, their angles of back flexion, knees, arms, and neck were assessed.

Subjects were divided into two groups and all underwent laryngoscopy in both positions followed by intubation in any one position. Subjects were preoxygenated using 100% oxygen and received IV (intravenous) 1-2mg midazolam and 2 μg/kg fentanyl as premedication followed by general anesthesia induction using 2 mg/kg IV propofol and 0.1 mg/kg vecuronium for neuromuscular blockade facilitation.

Depending on group allocation, subjects were placed in a 25° backup position with HELP or a supine position with HELP before anesthesia induction. The head of the patients was kept at the level of xiphisternum of the anesthesiologists in both positions. All patients underwent direct laryngoscopy in the first position followed by a change in position of the patients, a second laryngoscopy, and intubation. CL grading was used to assess the glottic view. In Group I, subjects were placed initially in supine HELP and then in 25 ° backup HELP, followed by tracheal intubation. In Group II, subjects started in 25° backup HELP and were then transitioned to supine HELP and tracheal intubation in supine HELP.

Saturation as non-invasive blood pressure heart rate and hemodynamic changes were recorded and monitored throughout the procedure. The comfort level of the anesthesiologists was assessed in each position during laryngoscopy and oxygen intubation was rated on a 4-point Likert scale. When tracheal intubation failed in the first attempt, subjects were repositioned and a second attempt was made. When the second attempt also failed, an unanticipated difficult airway protocol was adopted and methods used for successful intubation were noted.

The data gathered were statistically analyzed using SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk. NY, USA) for assessment of descriptive measures, Student t-test, ANOVA (analysis of variance), Fisher's exact test, Mann-Whitney U test, and Chi-square test. The results were expressed as mean and standard deviation and frequency and percentages. The p-value of <0.05 was considered.

RESULTS

The present randomized crossover clinical study was aimed to compare the posture and comfort of anesthesiologists during tracheal intubation and laryngoscopy in a supine position with 25 25-degree backup. The study assessed 96 subjects from the age range of 18-60 years having normal airways. The included subjects were randomly divided into two groups. Intubation and laryngoscopy were done by anesthesiologists in supine HELP and 25 25-degree backup HELP position.

The participants in the study were 96 subjects and 24 anesthesiologists participated. The study included 66 female and 30 male subjects. The mean age of the study subjects was 31.3 years and the age range was 26-44 years. The mean BMI of the study subjects was 25.83kg/m2 and the BMI range was 23-28.43 kg/m2. In all the subjects, successful tracheal intubation was seen in the first attempt. In the two study groups, the comfort and joint angles of the anesthesiologists during intubation and laryngoscopy were comparable in the two study groups with $p<0.05$ (Table 1).

It was seen that Comack-Lehane's grading was significantly better in Group I subjects compared to Group II subjects. No subject in the study had a Comack-Lehane grading of 3 in Group I, whereas, in Group II, 4% of subjects had a CL grade of 3 which showed a statistically significant difference with $p=0.01$. No statistically significant difference was seen in the two groups concerning hemodynamics and no incidence of severe hypotension as >20% fall in mean arterial pressure and bradycardia was seen in any subject from either group (Table 2). No difference was seen in the time taken for intubation and no subject in either group felt any complication related to the airway as failure to intubate, desaturation, and trauma.

DISCUSSION

The present study assessed 96 subjects from the age range of 18-60 years having normal airway. The included subjects were randomly divided into two groups. Intubation and laryngoscopy were done by anesthesiologists in supine HELP and 25 25-degree backup HELP position. The study design of the present study was similar to the study design adopted by Chun H et al[7] in 2022 and Nandhakumar J et al[8] in 2021 where a study design similar to the present study was reported by the authors in their respective studies.

It was seen that the participants in the study were 96 subjects and 24 anesthesiologists participated. The study included 66 female and 30 male subjects. The mean age of the study subjects was 31.3 years and the age range was 26-44 years. The mean BMI of the study subjects was 25.83kg/m2 and the BMI range was 23-28.43 kg/m2. In all the subjects, successful tracheal intubation was seen in the first attempt. In the two study groups, the comfort and joint angles of the anesthesiologists during

intubation and laryngoscopy were comparable in the two study groups with $p<0.05$. These results were consistent with the findings of Kumar VH et al[9] in 2020 and Grundgeiger T et al[10] in 2015 where authors assessed subjects with demographics and disease data comparable to the present study in their respective studies.

The study results showed that Comack-Lehane's grading was significantly better in Group I subjects compared to Group II subjects. No subject in the study had a Comack-Lehane grading of 3 in Group I, whereas, in Group II, 4% of subjects had a CL grade of 3 which showed a statistically significant difference with $p=0.01$. No statistically significant difference was seen in the two groups concerning hemodynamics and no incidence of severe hypotension as >20% fall in mean arterial pressure and bradycardia was seen in any subject from either group. No difference was seen in the time taken for intubation and no subject in either group felt any complication related to the airway as failure to intubate, desaturation, and trauma. These findings were in agreement with the results of Akihisa Y et al[11] in 2015 and Rao SL et al[12] in 2008 where Comack-Lehane grading scores reported by the authors in their studies were comparable to the results of the present study.

CONCLUSIONS

Within its limitations, the present study concludes that the comfort and posture of anesthesiologists during tracheal intubation and laryngoscopy are similar in 25-degree backup and supine position in subjects that have easy airways. However, the study had a few limitations smaller sample size, shorter monitoring period, and single-institution nature. Hence, further longitudinal studies with larger sample sizes and longer monitoring are needed to reach a definitive conclusion.

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Joint angles measured at intubation and laryngoscopy	**Group I (n=48)**	**Group II (n=48)**	**p-value**
Elbow flexion (degrees) laryngoscopy	81.5±7.9	82±8.7	0.958
Intubation	75.6±10.2	75.5±1.9	0.345
Wrist deviation (degrees) laryngoscopy	42.5±2.9	42±2.3	0.972
Intubation	39.0±2.3	42.1±3.1	0.243
Neck flexion (degrees) laryngoscopy	49.9±8.1	50.5±6.1	0.917
Intubation	42±8.0	54.1±1.1	0.182
Lower back flexion (degrees) laryngoscopy	17.3±4.2	17.2±3.9	0.917
Intubation	18.1±3.5	15.5±1.9	0.214
Cormack-Lehane grading (n) 1/2/3/4	32/16/0/0	16/30/2/0	**0.01**
Anesthesiologist comfort (n) 1/2/3/4			
Laryngoscopy	34/14/0/0	34/14/0/0	0.642
Intubation	34/14/0/0	38/10/0/0	0.503

Table 1: Comfort of anesthesiologists and joint angles in two groups during intubation and laryngoscopy and intergroup Comack-Lehane grading

Joint angles measured at intubation and laryngoscopy	**Group I (n=48)**	**Group II (n=48)**	**p-value**
Mean arterial pressure (mmHg)			
Baseline	68±4	68±3	0.963
First laryngoscopy	68±4	68±3	0.443
Second laryngoscopy	69±3	68±3	0.142
Intubation	69±3	68±3	0.246
Heart rate (beats per minute)			
Baseline	77±11	78±14	0.585
First laryngoscopy	77±10	78±13	0.784
Second laryngoscopy	79±10	80±12	0.750
Intubation	69±3	68±3	0.246

Table 2: Mean arterial pressure and heart rate in two groups at different time intervals