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COMPARISON OF GLOTTIC VIEWS AND INTUBATION ATTEMPTS IN SUPINE AND 25 DEGREE BACK-UP POSITIONS

Anaesthesiology

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ABSTRACT

Background- Optimal glottic view is a necessity for successful endotracheal intubation and is a cornerstone for general anaesthesia induction. During laryngoscopy, glottis view is dependent on positioning of head and neck. The goal was to compare glottic visualization of Modified Cormack Lehane Grading (MCLS) and Percentage of Glottis Opening (POGO) score, number of laryngoscopy and intubation attempts, use of ancillary equipment for intubation in supine and 25 degrees back-up positions. **Materials and Methods-** Non randomized comparative observational study was conducted in a Tertiary Hospital, which included 300 patients between 18-70 years, ASA 1, 2, 3, excluding patients with difficult airway, BMI more than 30, undergoing emergency surgery and requiring rapid sequence induction. Group S with 150 patients- Intubation done in supine sniffing position, group B with 150 patients- Intubation done in 25 degree back-up position by flexing the operating table at the patient's hips, to an angle of 25 degrees, aligning sternal notch and external auditory meatus. Chi-Square test or Fisher's exact probability test as well as independent sample t test were used for analysis. **Results-** Patients with a higher MCLS and lower POGO score were significant in group S as compared to group B (P value <0.05, P value <0.05 respectively). Although there was no difference in laryngoscopy attempts (P value >0.05), a significant difference in intubation attempts and use of ancillary equipment (P value <0.05) was noted. **Conclusion-** Achieving optimal glottic views are essential, which can be improved using 25 degree back-up position, with lesser use of ancillary equipment.

KEYWORDS

Laryngoscopy, intubation, head elevated laryngoscopy position

INTRODUCTION

Alignment of all the three axes, which include the oral, pharyngeal and laryngeal axes is an important step for successful direct laryngoscopy. In several studies, positioning of head and neck provided the anaesthetist with a good glottic view, minimising the attempts at laryngoscopy, intubation and reducing the rate of trauma and complications. [1]

Apart from the sniffing position and simple head extension positions, some authors placed pillows under the head to elevate it, while others elevated the head end of the table.

We aimed to compare the supine sniffing position and the 25 degree back-up to determine any significant findings or differences noted in laryngoscopy and intubation.

METHODOLOGY

This non randomised comparative interventional study (STROBE study), was carried out in a Tertiary hospital after Ethical Committee approval, from October 2019 to October 2021.

A written informed consent was taken from each patient in the language he/she best understood.

The study included 300 patients of ASA 1, 2, 3, between the ages of 18 to 70 years, who were undergoing elective surgeries under general anaesthesia, divided into two groups:

- Group S- 150 patients- Intubation done in supine sniffing position.
- Group B- 150 patients- Intubation done in 25 degree back-up position.

Patients with difficult airway, BMI more than 30, undergoing emergency surgery or requiring rapid sequence induction were excluded.

A detailed routine Pre-Anaesthesia check-up was done. Standard anaesthesia protocol was followed for all the patients posted for surgery under general anaesthesia. Once the patient was induced and given muscle relaxant (Succinyl choline 1.5mg/kg), laryngoscopy was performed by second year anaesthesia residents, who have successfully performed a minimum of 100 intubations. This was supervised by anaesthesia faculty in the operating room.

A standard sized head ring was placed below the head of the patient in Group S, providing flexion at neck and extension at atlanto-occipital joint, whereas in Group B, with the head ring and same position maintained, there was a back-up given by flexion of the operating table at the level of patient's hips, to an angle of 25 degrees. The sternal notch was on the same plane as the external auditory meatus in both groups. The height of the table remained standardized in both groups, ensuring the head was at umbilicus level of the intubating anaesthetist.

In both groups, we assessed the number of times laryngoscopy had to be performed, Modified Cormack Lehane grading and POGO score based on the laryngeal view, if any external manipulation was required to improve visibility, the need for any ancillary equipment like a stylet, bougie or changing the blade to a McCoy blade, and if multiple intubation attempts were required.

Statistical Analysis

Sample size was calculated based on the standard deviation from the prior studies carried out by Reddy et al[10] , keeping the power at 80%, confidence intervals at 95%, allowable error 15.8% and hence requiring a sample size of 300 patients in order to detect difference between both the groups.

The entire data was statistically analysed using Statistical Package for Social Sciences (SPSS version 22.0, IBM Corporation, USA) for MS Windows. The data on continuous variables was presented as mean and standard deviation (SD). The inter-group statistical comparison of distribution of categorical variables is tested using Chi-Square test or Fisher's exact probability test. Inter-group statistical comparison of means of normally distributed continuous variables was done using independent sample t test. The underlying normality assumption was tested before subjecting the study variables to t test.

RESULTS

Intubation was carried out for both groups, each group having the specific position given prior to laryngoscopy.
The mean age, sex, BMI, Mallampati score, ASA grading of distribution of cases studied did not differ significantly between two study groups (P>0.05).

Of 150 cases studied in Group S, 142 (94.7%) had one attempt of laryngoscopy, 7 (4.7%) had 2 attempts and 1 (0.7%) had more than 2 attempts. Of 150 cases studied in Group B, 149 (99.3%) had one attempt, 1 (0.7%) had 2 attempts at laryngoscopy. Laryngoscopy attempts among the cases studied did not differ significantly between two study groups (P 0.059).

In Group S, 45 (30.0%) had Grade 1 Modified Cormack Lehane score, 49 (32.7%) had Grade 2A, 42 (28.0%) had Grade 2B, 12 (8.0%) had Grade 3A and 2 (1.3%) had Grade 3B. Of 150 cases studied in Group B,

67 (44.7%) had Grade 1, 53 (35.3%) had Grade 2A, 25 (16.7%) had Grade 2B, 5 (3.3%) had Grade 3A and none had Grade 3B.

Modified Cormack Lehane grading among the cases studied differs significantly between two study groups (P 0.008).

The mean ± SD of POGO score in Group S and Group B was 80.00 ± 25.91 and 90.67 ± 19.55 respectively. The minimum – maximum POGO score range in Group S and Group B was 0 – 100 and 50 – 100 respectively. POGO score is significantly higher in Group B compared to Group S (P 0.001).

In Group S, 113 (75.3%) had one attempt, 33 (22.0%) had 2 attempts and 4 (2.7%) had more than 2 intubation attempts. From 150 cases studied in Group B, 139 (92.7%) had one attempt, 11 (7.3%) had 2 intubation attempts and none had more than 2 intubation attempts. The number of intubation attempts is significantly higher in Group S compared to Group B (P 0.001).

In Group S, 32 (21.3%) had the use of ancillary equipment. Among 150 cases studied in Group B, 10 (6.7%) had the use of ancillary equipment.

The use of ancillary equipment is significantly higher in Group S compared to Group B (P 0.001).

Among the 32 cases who needed ancillary equipment in Group S, 24 (75.0%) had used a Stylet, 6 (18.8%) required a Bougie and 4 (12.5%) required only a change to a McCoy blade. From 10 cases who needed ancillary equipment in Group B, 7 (70.0%) had used a Stylet, 1 (10.0%) required a Bougie and 2 (20.0%) required only a McCoy blade. Type of ancillary equipment used did not differ significantly between two study groups (P 0.999, P 0.999, P 0.616 respectively).

In Group S, 72 patients (48.0%) used external cricoid pressure. In Group B, 41 patients (27.3%) required it, and hence the difference is statistically significant (P 0.001).

DISCUSSION

In 1936, while performing direct laryngoscopy, the sniffing position was suggested by Magill, in aligning oral, laryngeal and pharyngeal axes to the line of vision and was thought to be the traditional position for intubation.[2,3,4] In 1994, Bannister and Macbeth put forth the three axes theory which indicated the alignment of pharyngeal and laryngeal axes with neck flexion, which further aligns them with oral axis by extension at atlanto-occipital joint.[3]

In the sniffing position, which is commonly used, the cervical spine below C5 is straight, flexion is present from C4 to C2, and the head is completely extended (occipito–atlanto–axial complex). [5]

Visualization of glottic structures may be improved by elevation of the head and neck beyond the sniffing position in cases of difficult direct laryngoscopy, but conflicting results have been observed regarding ideal head position for direct laryngoscopy.

Head and neck elevation was suggested for improvement in visualization of glottic structures and intubation performance. Several authors have studied using pillows of heights ranging from 3 cm to 9 cm. Schmitt and Mang observed that during difficult direct laryngoscopy, the head and neck elevation beyond sniffing position improved glottic view. During difficult direct laryngoscopy, they studied the impact of head and neck elevation over and above the sniffing position in 21 patients all of whom presented with a Cormack and Lehane grade III view (no division into IIIa or IIIb stated) during direct laryngoscopy in the sniffing position. In 19 patients, the elevation improved laryngeal view by one MCLS grade (P<0.001). In 6 of there patients, this manoeuvre improved laryngeal view, so that parts of the vocal cords were visible. [6].

Park et al stated that better glottic views on laryngoscopy can be provided by a 9 cm head elevation with a pillow.[7]

In 2020, Okada et al for tracheal position compared the ramped position with the sniffing position where 513 patients were included in the study, which was a systematic review and meta-analysis. This study concluded that in the sniffing position there were none of the favourable aspects of the ramped position considering successful first attempt, number of attempts, glottic view, and the time taken to secure the endotracheal tube in the airway. [8]

Although literature comparing intubation in back-up position and supine sniffing position exists, there was limited data available to support the use of 25 degree back-up position for ease of intubation.

The effect of 25 degree back-up on other intubating conditions was analysed by Dixon et al and suggested that preoxygenation in the 25 degrees head-up position provides greater oxygen tensions, hence, increases the safety period for desaturation, more allowable time for intubation and securing the airway.[9]

In 2016, Reddy et al evaluated the positioning effect of 25 degrees back-up sniffing position on glottis view and ease of intubation in 781 patients. They concluded that 25 degree back-up position improved the ease of intubation, although no significant improvement in glottic views was noted. Ancillary laryngeal manoeuvres including backwards upwards rightwards pressure, cricoid pressure and external laryngeal pressure were required less frequently in the back-up position.[10]

In our study, the main findings revealed that it was easier to intubate the patient with a 25 degrees back-up given with greater success rate, than in supine sniffing position.

The number of Laryngoscopy attempts among the cases studied did not differ significantly between two study groups (P 0.059). Improved glottic visualisation as per Modified Cormack Lehane Score can be attributed to head elevation position (P 0.008), which is similar to the observations made by others.

The use of ancillary equipment is significantly higher in Group S compared to Group B (P 0.001). The type of ancillary equipment such as Stylet, Bougie and McCoy blade did not differ significantly between two study groups (P 0.999, P 0.999, P 0.616). The incidence of use of external cricoid pressure is significantly higher in Group S compared to Group B (P 0.001).

Lee et al, in 2007, studied laryngeal views of 40 patients, where POGO score in the 25 degrees back-up position improved significantly as compared to the flat supine position. [5] These results were similar to our finding, which indicated an increased POGO score as the back-up position was given.

In 2003, Levitan et al conducted a study to determine the quality of laryngeal view in 7 fresh human cadavers by increasing head elevation and neck flexion. They concluded that by providing head elevation and neck flexion, significant improvement in POGO scores were noted. [11]
In our study, the POGO score is significantly higher in Group B compared to Group S (P 0.001).

Lee HC et al studied the effect that the height of the operating table had on glottic views during laryngoscopy and concluded that higher operating tables (at the xiphoid process and nipple level of the anaesthetist) provided superior glottic view with less discomfort to the anaesthetist.[12]

Limitations of our study were that it was carried out in a confined number of patients. Manoeuvring the table to lowest height may not be available in all operation theatre settings so as to allow 25 degree back-up. There is a need for randomized controlled trials to extrapolate our findings in obese as well as difficult airway patients.

As this position is not yet routine for intubation of patients in the operating room, we thought it would be informative to study height of the operating table in relation to height of the anaesthetist and the comfort score of the anaesthetist performing the intubation. Data produced in this study could help incorporate this position as standard care, so as to have a smooth and swift intubation.

Based on our observations in this study, we conclude that there was a significant improvement in MCLS grading, with a higher POGO score obtained, with a lesser need for using any ancillary manoeuvres and equipment, when intubating in 25 degree back-up position. Moving the operating table into the back-up position is a simple manoeuvre which does not require purchasing any other equipment.

Table 1) Comparison Of Mean Percentage Of Glottis Opening (POGO) Score

POGO Score	Group S (n=150)		Group B (n=150)		P-value
	Mean	SD	Mean	SD	
POGO Score	80.00	25.91	90.67	19.55	0.001***

Values are mean and SD, P-value by independent sample t test. P-value<0.05 is considered to be statistically significant. ***P-value<0.001.

Table 2) Number Of Intubation Attempts

Number of intubation attempts	Group S (n=150)		Group B (n=150)		P-value
	n	%	n	%	
1	113	75.3	139	92.7	0.001**
2	33	22.0	11	7.3	
>2	4	2.7	0	0.0	
Total	150	100.0	150	100.0	

Values are n (% of cases), P-value by Chi-Square test. P-value<0.05 is considered to be statistically significant. ***P-value<0.001.

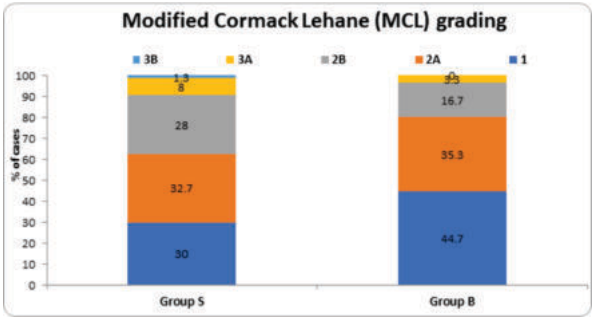

Figure 1) Modified Cormack Lehane Grading

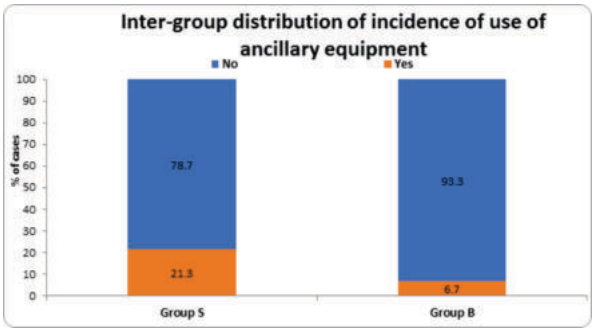

Figure 2) Incidence Of Use Of Ancillary Equipment

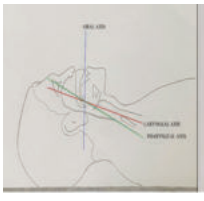

Figure 3: The oral, laryngeal and pharyngeal AXES

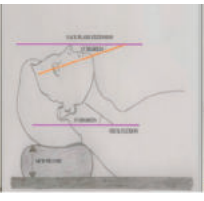

Figure 4: Sniffing Position using a 10cm PILLOW

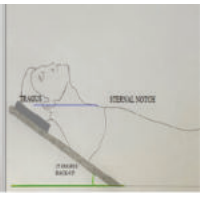

Figure 5: 25 Degree back-up position

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