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Comparison of Laryngoscopic View Obtained by Conventional Head Rise to that Obtained by Horizontal Alignment of External Auditory Meatus and Sternal Notch

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Abstract

Aims:

The aim of this study was to determine the effect of change of patients' position during laryngoscopy on laryngoscopic view and to evaluate the effect of body mass index (BMI) and neck circumference on laryngoscopic view in both the positions.

Methodology:

A prospective, unblinded observational study was done with patients and laryngoscopists acting as their own controls. The study included 300 patients of ASA classes I and II aged more than 18 years who were scheduled to undergo general anesthesia. Detailed airway assessment including neck circumference and BMI of the patients was done. Initially, the patients were placed in the Head-Elevated Laryngoscopic Position (HELP) on the operating table. After proper intravenous induction, an experienced anesthesiologist did direct laryngoscopy with a suitable size Macintosh blade and assessed the C and L grades (HELP score). Immediately, the patients were repositioned to conventional sniff position and the C and L grades reassessed (sniff score). Both the scores were compared later on.

Results:

HELP provided a view better than or equal to sniff in 94% cases, whereas in only 6% of the cases, sniff provided a view better than HELP. HELP provided better view for laryngoscopy. Moreover, neck circumference as a parameter was more helpful in predicting difficult laryngoscopy compared to BMI.

Conclusion:

HELP should be the ideal intubating position in all patients irrespective of ages and sexes with or without predilections for difficult airway.

Keywords: Difficult intubation, head-elevated laryngoscopic position, intubation, laryngoscopy, sniff position

Introduction

Patient's position plays a pivotal role in laryngoscopy. Proper positioning of the head and neck is essential for optimal laryngeal visualization during direct laryngoscopy (DL). An earliest attempt for proper positioning was described by Jackson who recommended full extension of the head and neck on the flat surface.[1,2] Later, Sir Ivan Magill modified it by placing a pillow under the occiput to raise the head and then to extend it to achieve the best laryngeal exposure; he was the one to describe the classical sniffing position for DL.[3]

The sniffing position was followed as an ideal position for DL in the whole of the 20th century. In 2004, Collins *et al.* demonstrated a new position for laryngoscopy called as Head-Elevated Laryngoscopy Position (HELP), which was very useful in visualizing larynx obese patients compared to the classic sniffing position.[4,5]

In HELP position, Collins *et al.* raised the patient's shoulders upward by building a ramp with pillows below the thorax so that the sternal notch is aligned in line with that of the external auditory meatus. This study was done to compare the laryngoscopic view in classical sniffing position to that of HELP position to identify the ideal position for DL.

Methodology

After getting proper clearance from the institutional ethics board, the study was done in the department of anesthesiology of a tertiary teaching hospital in Central India from a period of January 2013 to January 2014. The study design was of a prospective observational study with patients and laryngoscopists acting as their own controls.

Sample size

By adopting the reported improvement or equal effect of HELP position in the study by Lebowitz *et al.*[6] which was of 89% at 5% absolute precision and by taking 99% as desired confidence level, the required sample size calculated was of 261. In addition, 10% of attrition rate was added for any nonresponse possibility. Accordingly, a total number of 287 individuals were required for the current study. We considered a total of 300 individuals to carry out the current study. Moreover, $P < 0.01$ was taken as statistically significant.

After obtaining a proper written consent, 300 patients of ASA classes I and II category scheduled to undergo surgery with general anesthesia requiring endotracheal intubation and satisfying the inclusion criteria were included in the study. All the patients before enrolling into the study were clinically examined and investigated. Detailed airway assessment including neck circumference and body mass index (BMI) of the patients was done. Patients with any signs of difficult intubation such as thyromental distance <6.5 cm, hyomental distance <6 cm, and sternomental distance <12.5 cm; patients with buck tooth; patients with receding mandible, Samson Young score III and IV, and head extension <70°; and patients with craniofacial anomaly were excluded from the study.

After all standard preparations, the patients were attached with routine monitoring devices such as electrocardiogram, pulse oximetry (SpO_2), and noninvasive blood pressure, and an 18-G intravenous cannula was secured. Initially, before preoxygenation, the patients were placed in HELP position. HELP

position was achieved by placing a firm pillow of 10 cm size underneath the head and then making necessary arrangements with the help of multiple drapes and table tilt to align external auditory meatus and sternal notch in a straight line.

All the patients were preoxygenated with 100% oxygen for 3 min with a close-fitting mask in HELP position. Standard intravenous induction was done with fentanyl (3 μg/kg), propofol (2.5–3 mg/kg body weight), and muscle relaxation by vecuronium (0.1 mg/kg body weight). Patients were ventilated for 3 min. Then, an experienced anesthesiologist did laryngoscopy with Macintosh 3 or 4 blades and assessed the Cormack–Lehane grade. For the study purpose, we labeled it as "HELP SCORE."

After the initial assessment, anesthesiologist sprayed 10% lignocaine between vocal cords and on the undersurface of epiglottis. After which the patients were repositioned to conventional sniff position. The anesthesiologist with the same laryngoscope blade reassessed the Cormack-Lehane grade (it was called as SNIFF SCORE) and noted the observation. After the observations, tracheal intubation was done. The results were analyzed using the Statistical package for Social Sciences 16.0 software (IBM Statistical package for Social Sciences 20.0, For Windows, Armonk, Newyork: IBM Corp). The observation was analyzed using Chi-square test.

Results

The age and sex distribution are summarized in Table 1. McNemar Chi-square test was used to analyze the observations made during the study. Table 2 describes the comparison of Cormack–Lehane grades obtained during the sniff position to that of HELP position. Moreover, we found out that HELP position improves C and L views during laryngoscopy compared to that of SNIFF position which was statistically significant ($P = 0.001$ and t value = 24.92). In the present study, we observed that HELP position improves the laryngoscopic view in patients with increased BMI compared to its SNIFF counterpart [Table 3], and the findings were statistically significant.

Discussion

In HELP position, the sternal notch and external auditory meatus are brought into one line. External auditory meatus corresponds to the position of the clivus (external auditory meatus overlies the clivus) and sternal notch to that of the glottis opening. The clivus lies immediately behind the nasopharynx. While placing a patient in HELP position, the nasopharynx comes to lie above the glottis opening (line between the glottis and nasopharynx is sloping upward). This positioning rotates the pharyngeal and laryngeal axis in counterclockwise direction and helps in aligning with that of oral axis. With head extension, laryngoscopic blade insertion, and elevation, the glottic opening is made to be along the line of vision. This is applicable in both obese and nonobese patients.[5]

HELP position improves jaw mechanics during intubation by achieving greater mouth opening and more thyromental space.[7] HELP position by elevating head and shoulder decreases pressure on the thorax from abdominal contents. It facilitates ventilation leading to increased functional residual capacity and tidal volume. It also extends the duration of safe apnea period.[8]

The present study was based on the protocols followed by Lebowitz *et al.*[6] The main difficulty associated with this study was to create a protocol that did not give any advantage to either of the two positions. The ideal study design would have had patients selected at random to receive either the "HELP" or the "sniff" position first and the other second. The logic behind this approach is that an anesthetist who performs a laryngoscopy on a given patient gets to know the landmarks and feel for that patients' airway and will have an easier time attempting a second laryngoscopy on that patient. This logic then would have seemed to favor the sniff position in our study since it was always performed after HELP position. We accepted this limitation because moving an anesthetized patient, particularly an obese one into HELP position, would

have required several assistants and increased injury chances to the patient which was not encountered simply by removing the HELP.

Different patients have different airway anatomies. By studying the effect of two positions on laryngeal view in the same patient, we had eliminated the bias that might have occurred in the study because of different airway anatomies in different patients. To standardize a common reference point for all the anesthetists participating in the study, each anesthetist was shown pictures of different grades of Cormack–Lehane scale before laryngoscopy. Furthermore, the study required the anesthetist perform both laryngoscopies in each study patient so as to standardize the grading.

In 76 cases (25.33%), HELP showed improved C and L grades in comparison to sniff. Fifty-five cases (18.33%) of C and L Grade II by SNIFF position showed Grade I view in HELP position. Of total 24 cases (8%) showing C and L Grade III in SNIFF position, 16 cases (5.33%) showed Grade I and 5 cases (1.66%) showed Grade II in HELP position.

In 206 cases (68.66%), HELP and sniff showed equal C and L grades. In 76 cases (25.33%) cases, HELP showed improved C and L grades in comparison to sniff. Only 18 cases (6%) showed better C and L grade in sniff when compared to HELP. HELP provided equal/improved view in 282 cases (94%) of our study population, which was statistically significant. The observations made in our study are congruent to various studies previously done to evaluate the validity HELP position.[6,7,8,9,10,11,12,13,14]

Our secondary objective was to compare between neck circumference and BMI in accuracy of predicting poor glottic visualization. Our study showed that neck circumference [Table 4] was statistically more accurate in predicting poor glottis visualization compared to BMI. Our study results were congruent with the results of Brodsky *et al.*[14] and Gonzalez *et al.*[11] and showed that neck circumference is a better predictor of poor glottic visualization as compared to BMI.

Conclusion

1. HELP should be the ideal intubating position for all patients (both obese and nonobese) irrespective of age and sex
2. Neck circumference is a more accurate predictor of poor glottic visualization during DL compared to BMI.

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Conflicts of interest

There are no conflicts of interest.

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Figures and Tables

Table 1

Age and sex distribution

Age	Sex		Total (%)
	Male (%)	Female (%)	
<20	9 (4.4)	1 (1.0)	10 (3.35)
20-29	47 (23.0)	19 (19.8)	66 (22.05)
30-39	54 (26.5)	26 (27.1)	80 (26.7)
40-49	44 (21.6)	28 (29.2)	72 (24.0)
50-59	36 (17.6)	14 (14.6)	50 (16.7)
60+	14 (6.9)	8 (8.3)	22 (7.3)
Total	204 (68)	96 (32)	300

$P>0.01$

Table 2

Help and sniff score comparison

Sniff score	Help score (%)			Total
	1	2	3	
1	152 (50.66)	18 (6)	0 (0)	170 (56.66)
2	55 (18.33)	51 (17)	0 (0)	106 (35.33)
3	16 (5.33)	5 (1.66)	3 (1)	24 (8)
Total (%)	223 (74.33)	74 (24.66)	3 (1)	300 (100)

McNemar Chi-square *t* value of 24.92 and *P* value of 0.001

Table 3

Help and sniff position comparison according to the body mass index

Cormack-Lehane grade	<25		>25	
	Help position (%)	Sniff position (%)	Help position (%)	Sniff position (%)
1	151 (72.6)	128 (61.5)	72 (78.3)	42 (45.7)
2	54 (26.0)	69 (33.2)	20 (21.7)	37 (40.2)
3	3 (1.4)	11 (5.3)	0 (0.0)	13 (14.1)
Total	208	208	92	92
Chi-square				
t	8.23		26.91	
P	0.004130		0.000001	

Table 4

Comparison between neck circumference and body mass index for predicting poor glottic visualization

Variables	*t*	*P*
BMI	1.094	0.275
NC	3.390	0.001

Dependent variable: sniff score. BMI=Body mass index, NC=Neck circumference