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Relationship Between Higher Operating Tables And Laryngeal Views For Endotracheal Intubation

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Abstract
Background: *Research on the impact of operating table height on laryngeal vision is crucial in order to reduce anesthesiologist pain during ventilation, one-attempt laryngoscopy and intubation. Therefore, the main goal of this study is to ascertain how various operating table heights affect laryngeal vision during dorsal endotracheal insertion.*
Methods: *This prospective observational study was conducted in the department of anesthesia , among 200 cases undergoing surgery with general anesthesia. Patients aged 18-60 years from both genders and ASA class I and II were included in the study. Cases with BMI > 35 kg/m2, anatomical abnormalities of head and neck and pregnant females were excluded. A total of 200 cases with 100 in group U (umbilicus level) and 100 in group N (Nipple level) were included.*
Results: *On comparing the clinical profile of study participants, age, gender, BMI categories and ASA classes among the cases in group U and group N were similar with no statistical significance. On assessing the association between CL grades and discomfort score between group U and group N, there was a significant association noted.*
Conclusion: *We came to the conclusion that easier mask ventilation is made possible by lower operating table levels, while higher levels—ideally at the nipple level—are better for tracheal intubation and laryngoscopy.*
Key words: *Operating table height, intubation, umbilicus level*

INTRODUCTION

The height of the operating table can affect both the physical and mental strain of a task[1,2]. The relationship between the height of the operating table and the quality of the laryngeal view with direct laryngoscopic intubation has not been thoroughly studied[2]. Heath ML[3] emphasized the advantages of an adjustable operating table and the practical benefits of varying heights—high throughout cannulation to prevent back discomfort, a bit lower for managing the airway, and even lower for short trainees—in an editorial on anesthetist stature and patient positioning. The anesthesiologist views the airway from the outside during DL. Light must pass from the glottic aperture to the observer's eye in order to see through the airway. The method requires a continuous linear passage between the larynx and the observer's eye since light travels in a straight line. It calls for the patient to be positioned correctly, which depends on the height of the operating table and the different airway techniques. Several techniques are used to get into this position[4]. Typically, the airway has three axes. These axes make both acute and obtuse angles with one another while in the neutral state. McGill proposed the sniffing position to align all three axes. The two components of the sniffing position are atlantooccipital extension and cervical flexion. The pharyngeal and laryngeal axes are lined by cervical flexion, while the oral axis is brought into alignment with the first two by atlantooccipital joint extension[5]. One of the effects of poor posture is repeated unsuccessful efforts at intubation because of an incorrectly perceived larynx[6]. It raises the morbidity of patients and also wears out anesthesiologists[7]. An ergonomic correct posture for managing airway in a standing position is one that has a straight back, a tiny bend in the neck forward to observe the patient's mouth cavity, a mild flexion at the shoulder, a supported lower arm, and a relaxed lower body[8]. However, the anesthesiologist may need to adjust their stance in order to enhance the laryngoscopic view and enable single attempt ET intubation. The health of the physician is negatively impacted by incorrect body position, which can also put them at risk for back issues. Therefore, it's critical to think about this workplace risk and its implications[9]. An operator who is overworked may perform poorly on other tasks. A properly positioned table can alleviate discomfort for anesthesiologists by minimizing the need for additional effort when flexion of the neck, lower back, and knee is needed[10]. Therefore, research on the impact of operating table height on laryngeal vision is crucial in order to reduce anesthesiologist pain during ventilation, one-attempt laryngoscopy, and intubation. Therefore, the main goal of this study is to ascertain how various operating table heights affect laryngeal vision during dorsal endotracheal insertion.

METHODS AND MATERIALS

This prospective observational study was conducted in the department of anesthesia
, among 200 cases undergoing surgery with general anesthesia. Patients aged 18-60 years from both genders and ASA class I and II were included in the study. Cases with BMI > 35 kg/m2, anatomical abnormalities of head and neck and pregnant females were excluded. A total of 200 cases with 100 in group U (umbilicus level) and 100 in group N (Nipple level) were included.One day before operation, the airway was assessed by an anesthesia trainee who was blinded to the patient groups. The airway assessments included measurement of inter-incisor distance, thyromental distance, and neck circumference, and MMT. All patients were fasted for 8 Hour before operation. Patients were pre-medicated with i.v. midazolam (0.03mg/kg) 10 min before anesthesia and placed in the supine position with a 6 cm pillow under their head. Routine monitoring, including non-invasive arterial pressure measurement, peripheral oxygen saturation (SpO2), and electrocardiography is used. The height of the operating table was adjusted to place the patient's forehead at the level of one of the two landmarks as determined by the patient group assignment: the umbilicus and nipple level of the anesthetist. After pre-oxygenation, anesthesia was induced with i.v. propofol (1.5 mg/kg) and alfentanil (0.01 mg/kg). For muscle relaxation, i.v. rocuronium (0.6 mg/kg) was administered, and manual ventilation was provided. Gradual increase of inspired sevoflurane to 6–8 vol%. Two minutes after rocuronium injection, tracheal intubation was performed under direct laryngoscopy using a Macintosh curved blade size 3.During mask ventilation, the anesthetist was directed to take 'initial posture,' that is, the natural standing position with his or her eyes on the face mask or on the chest movement of the patient. During tracheal intubation, the anesthetist inserted the laryngoscope into the patient's mouth and evaluated the grade of laryngeal view in the initial posture. In the initial posture, no changes in flexion or extension of the neck, lower back, knee, and ankle of the anesthetist were allowed. Arm, hand, or both movements were allowed to expose the patient's laryngeal aperture. The laryngeal views were graded using the Cormack and Lehane criteria: Grade1, complete visualization of the vocal cords; Grade2, visualization of the inferior portion of the glottis; Grade3, visualization of only the epiglottis; and Grade 4, non-visualization of the epiglottis. An anesthesia trainee who was not aware of the details of the study took pictures of the process of tracheal intubation from either the left or the right side of the anesthetist. After completion of anesthetic induction, the anesthetist recorded their subjective assessment of wrist exertion during mask ventilation and joint strains (exertion of the wrist or arm, flexion of the neck, lower back, or knee) and tip toeing during tracheal intubation. The degrees of task discomfort during mask ventilation or tracheal intubation were graded (1=no discomfort, 2=mild discomfort, 3=moderate discomfort, and 4=severe discomfort).
Data was analyzed using SPSS version 20. Chi square test was used to assess the association between the two groups. p value < 0.05 was considered significant. The Ethical approval registered with Institutional Human Ethical Committee.

RESULTS

On comparing the clinical profile of study participants, age, gender, BMI categories and ASA classes among the cases in group U and group N were similar with no statistical significance (Table 1).

Table 1: Clinical profile of study participants

Variables	Group U	Group N	Total	p value
Age group				
18-30 years	17	14	31	0.7635
31-40 years	24	28	52	
41-50 years	31	33	64	
51-60 years	28	25	53	
Total	100	100	200	

Gender				
Male	69	55	124	0.4314
Female	31	45	76	
Total	100	100	200	
BMI categories				
Normal	48	53	101	0.8446
Overweight	38	31	69	
Obese (BMI 30.1-35)	14	16	30	
Total	100	100	200	
ASA class				
Class 1	41	52	93	0.3135
Class 2	59	48	107	
Total	100	100	200	

Notably, CL grades among the group U were reported as Grade 1 in 48 cases, grade 2 in 29 cases, grade 3 in 16 cases and grade 4 in 4 cases. Similarly in group N, Grade 1 in 69 cases, grade 2 in 25 cases, grade 3 in 5 cases and grade 1 in 4 cases. On assessing the association between CL grades between group U and group N, there was a significant association noted (Table 2).

Table 2: Comparison of CL grades between groups

CL criteria	Group U	Group N	Total	p value
Grade 1	48	69	117	0.0024*
Grade 2	29	25	54	
Grade 3	16	5	21	
Grade 4	7	1	8	
Total	100	100	200	

*Significant

Notably, discomfort scores among the group U were reported as score 1 in 37 cases, score 2 in 31 cases, score 3 in 23 cases and score 4 in 9 cases. Similarly in group N, Score 1 in 76 cases, score 2 in 21 cases, score 3 in 1 cases and score 1 in one case. On assessing the association between discomfort scores between group U and group N, there was a significant association noted (Table 3).

Table 3: Comparison of discomfort scores between groups

Discomfort scores	Group U	Group N	Total	p value
Score 1	37	76	113	<0.0001*
Score 2	31	21	52	
Score 3	23	2	25	
Score 4	9	1	10	
Total	100	100	200	

*Significant

DISCUSSION

The ideal pillow height for the optimum laryngoscopic vision in adult patients going for general anesthesia was established by Pragya Acharya et al[11]. Compared to other head positions, the laryngoscopic view with the 5 cm pillow was noticeably better. Without a pillow, the incidence of challenging laryngoscopy was 32.7%; with a 10 cm pillow, that number dropped to 4%, and with a 5 cm pillow, there were no cases of difficult laryngoscopy. They stated that the optimal laryngoscopic view during direct laryngoscopy can be obtained by using a 5-cm pillow in the "sniffing" position. HC In order to find out how different operating table heights affected the anesthetist's pain during enodotracheal intubation and the quality of the laryngeal vision, Lee et al[12]. conducted a study. The height of the operating table was changed prior to the induction of anesthesia such that the patient's forehead aligned with one of the four landmarks on the anesthetist's body: the nipple (Group N), xiphoid process (Group X), lowest rib margin (Group R), and umbilicus (Group U). They found that Group N had a superior laryngeal view compared to Group U prior to postural alterations. Compared to Groups X and N, Group U had higher objective and subjective assessments of neck or lower back flexion during intubation. The anesthetist's discomfort level prior to the postural adjustment was connected with the improvement in laryngeal view brought about by the postural adjustments. According to their claims, tracheal intubation can be performed with less discomfort and better laryngeal views when operating tables are raised. In Mamta Jain et al.'s[13] study, the table's height is maintained at the level of the umbilicus in group 3, the xiphoid process in group 2, and the midsternum of an anesthesiologist in group 1. They stated that the majority of patients in group 1 (81.7%) reported experiencing considerable discomfort from bag mask ventilation, according to the anesthesiologist. Following the implementation of postural adjustments in groups 1 and 2, there was a notable improvement in CL grade. At lower table heights, more postural adjustments were needed during ET intubation. Since a better vision and intubation were observed at higher table heights, it is advised to employ higher table positioning in relation to the anesthesiologist doing the laryngoscopy for a seamless and successful single attempt ET intubation. In the same study, Mohammad I. El-Orbany et al[14] investigated the impact of shifting head position on the laryngeal vision. 8.38% of cases of difficult laryngoscopy occurred when the head was not lifted, 2.39% when the patient was sniffing, and 1.19% when the patient was sniffing higher. In no single patient was head elevation linked to a lower grade. They came to the conclusion that when laryngoscopic grade in the head-flat position is more than 1, the sniffing position enhances glottic exposure. In certain cases, the raised sniffing posture increases the view to a higher grade. The raised sniffing position should be used as the initial head position prior to direct laryngoscopy while a difficult exposure is anticipated, as head elevation was not linked to a worse grade in any of the subjects. Operating table height and the anesthesiologist's influence over mask breathing, laryngoscopy, and intubation were assessed by Kriti Puri et al[15]. Three distinct operating table levels were used to group the cases: Level X: patient at anesthesiologist's xiphisternum; level A is five centimeters above; level B is five centimeters below. In comparison to B, they found that laryngoscopic view was optimal at levels X and A. Level B offered the most pleasant mask ventilation, while level A offered the least. Maximum discomfort was experienced by 76.6% during laryngoscopy and 60% during intubation at level B. The quickest times for laryngoscopy and intubation were found at Level A. They asserted that while lower levels are better for mask ventilation, greater levels are better for laryngoscopy and intubation. The impact of operating table height on the complexity of mask ventilation and tracheal intubation surgical procedures was investigated by Tsuyoshi Ikeda et al[16]. According to their findings, mask ventilation was most comfortable when the height of the operating table was in line with the inferior edge of the 12th rib. On the other hand, higher table heights were thought to facilitate direct laryngoscopic exposure, with the ideal height for the nipple. While AWS appeared to be slightly more difficult at higher heights, laryngoscopy demonstrated consistent difficulty throughout table height. For mask ventilation, the ideal bed height aligned with that of video laryngoscopy. Compared to Macintosh laryngoscopy, video laryngoscopy provides more flexibility in terms of ideal patient posture, which adds to its benefits during tracheal intubation procedures. Using a videolaryngoscope in the ramping position, Dongho Kang et al[17]. examined the conditions and duration of tracheal intubation. Comparing the umbilical group to the nipple group, the umbilical group experienced a considerably shorter laryngoscopy, tube insertion, and overall intubation time. There was no discernible difference in the two groups' mask ventilation difficulties. The nipple group had a higher IDS score than the umbilical group. In contrast to the higher (nipple) table level, they asserted that the lower (umbilical) table level shortened the time needed for intubation and made videolaryngoscopy less challenging.

CONCLUSION

We came to the conclusion that easier mask ventilation is made possible by lower operating table levels, while higher levels—ideally at the nipple level—are better for tracheal intubation and laryngoscopy. Additionally, if it is not feasible to repeatedly adjust the height of the operating table, the optimal level for the patient might be the anesthesiologist's nipple, where laryngoscopic view is optimal, intubation is quicker, and mask ventilation is generally comfortable. Proper table height can also increase the chances of successfully managing a problematic airway by making the anesthesiologist think that intubation is easier. Furthermore, it is essential to give careful thought to the potential work hazards associated with bad posture and their effects, no matter how little they may seem. For this reason, posture education for aspiring anesthesiologists must be emphasized.

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