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COMPARISON OF EASE ON INTUBATION IN SNIFFING POSITION AND FURTHER NECK FLEXION DURING DIRECT LARYNGOSCOPY IN PATIENTS WITH UNANTICIPATED DIFFICULT AIRWAY

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ABSTRACT

AIMS : The most important step for optimal visualisation of the larynx is proper positioning of the head and neck. The objective of this study was to compare the incidence of difficult laryngoscopy and variables of the Intubation Difficulty Scale (IDS) between the sniffing position (SP) and the further head elevation (HE) (neck flexion) during laryngoscopy.

MATERIALS AND METHODS : Eighty patients were included in this study and randomly distributed to SP group (n=40) or HE group (n=40). SP was attained by flexing the neck on the chest with an incompressible head ring and maximal head extension at the atlanto-occipital joint whereas in the "HE" group,1.5-inch cushion was placed under the head to cause further neck flexion. Difficult laryngoscopy was graded using Cormack Lehane Grading and ease of intubation was assessed using the Intubation Difficulty Scale (IDS).

RESULTS : Patients in the HE group required more than one attempt at intubation, use of ELM, use of alternate techniques, and use of increased force during laryngoscopy and had higher Cormack Lehane grades (III and IV) as compared to those in the SP group.

CONCLUSION : Sniffing position is superior to further neck flexion, as assessed by CLG and IDS and may be used as the standard position for laryngoscopy.

KEYWORDS : Sniffing Position, Further Neck Flexion, Intubation Difficulty Score

INTRODUCTION

The most important step for optimal visualisation of the larynx before performing laryngoscopy is proper positioning of the head and neck. The ability to have a good visualization of the glottis is vital to perform successful tracheal intubation.[1] The sniffing position was first recommended by Ivan Magill in 1936. Since then, routine laryngoscopy is performed in "Sniffing position (SP)" in which neck is flexed [35°] on the chest with a cushion or incompressible head ring under the occiput and the head in extended [15°] at the atlanto-occipital joint. This leads to the alignment of external auditory meatus and sternal notch in the same horizontal plane, making it the most optimal position for glottic visualization and endotracheal intubation.[2] The three axes alignment theory (TAAT), proposed by Bannister and Macbeth states that SP causes alignment of laryngeal, pharyngeal, and oral axes causing line of vision to fall on the glottis. Hence, Sniffing position has been considered as the gold standard for laryngoscopy.[3]

Various studies in the last decade have challenged the need for sniffing position during intubation. One such study by Schmitt and Mang found that elevating the head higher than what is needed for a conventional SP may improve laryngeal exposure in some patients.[4] Lee et al tested the hypothesis that the axial force required for laryngoscopy is less in the extension-extension than the sniffing position by measuring the force axial to the handle of a Macintosh 3 laryngoscope with a difference of 4N – which may not be clinically significant.[5] Levitan et al. stated that increasing HE and laryngoscopy angle (neck flexion) significantly improved percentage of glottic opening (POGO) scores during laryngoscopy.[6]

Gudivada et al while describing the effects of neck positioning on the force required for optimal laryngeal exposure showed that increasing head elevation with further neck flexion improved the laryngeal exposure with less lifting force required.[7] The aim of this study is to evaluate the glottic view in SP and further neck flexion (NF) during direct laryngoscopy with the help of Intubation Difficulty Scale to objectively compare the ease of endotracheal intubations.

MATERIALS AND METHODS

After obtaining ethics committee approval, Eighty patients belonging to American Society of Anesthesiologists (ASA) physical status I and II and aged between 18 and 65 years scheduled for elective surgical procedures and requiring general anesthesia with endotracheal intubation were enrolled in this study. All patients were visited on the day prior to surgery and a detailed preoperative evaluation was done. Weight, Height, Body Mass Index and other demographic details were obtained. The airway assessment included (1) Inter incisor gap - whether ≤3 cm on mouth opening (2) thyromental[8] and sternomental distance[9] - measured from the thyroid notch and upper border of the manubrium sterni to the mentum, respectively, with the head in full extension and the mouth closed (3) temporomandibular joint mobility (4) forward protrusion of the mandible which was assessed by the ability to move the lower teeth in front of the upper teeth (5) Mallampatti score - Modified Mallampati Classification[10] as described by Samsoon and Young (6) any abnormal dentition in the form of loose, protruding, or missing upper incisors or canine teeth (7) neck length from the mastoid process to sternal head of clavicle with head in neutral position (8) the maximum range of head and neck movement <80° or > 80° as described by Wilson *et al*. and (9) presence of short neck, beard, or cervical spondylosis. Patients with ASA Physical Status III and above or any abnormal airway anatomy, reactive airway disease, cervical spine pathology, neck masses, raised intracranial tension, and patients requiring rapid sequence intubation.were excluded from the study.

All patients were advised fasting for 8 hours and premedicated with tablet Diazepam 5mg and Ranitidine 150 mg on the night before the surgery. In the operating room, baseline heart rate-systolic blood pressure, diastolic blood pressure, and peripheral oxygen saturation (SpO_2) were monitored. All patients were preoxygenated with 100% oxygen for 3 minutes, pre-medicated with glycopyrrolate 0.01mg/kg IV and fentanyl 2 mcg/kg IV 5 minutes before induction of anesthesia and induced with propofol (2 mg/kg) till loss of response to verbal commands by the patient. Ability to ventilate (adequate chest rise) with a face mask was checked prior to injection of vecuronium 0.1mg/kg for muscle relaxation to facilitate intubation. Ventilation was done using a mixture of 50% oxygen and 50% nitrous oxide with a fresh gas flow maintained at 10 L/min. Macintosh number 3 or 4 laryngoscope blade was used depending on the laryngoscopist's preference.

Each patient was subjected to laryngoscopy either in the standard sniffing position (SP) or with further neck flexion (HE). The height of the operating table was adjusted to place the patient's forehead at the level of xiphisternum of the laryngoscopist. Sniffing position was achieved by placing an incompressible head ring under the head followed by maximal extension at the atlanto-occipital joint at the time of laryngoscopy. To obtain further neck flexion, in addition to the head ring, a 1.5-inch cushion will be placed under the head.

The laryngoscopic view was graded according to Cormack Lehane

Grading without optimal external laryngeal manipulation (ELM). Intubation was performed with tracheal tube size 7–7.5 mm in females and size 8 and 8.5 mm in males. Intubation difficulty was assessed by seven variables of the Intubation Difficulty Scale[11] as described by Adnet et al. (Fig.1)

STATISTICALANALYSIS

Data collected intraoperatively were summarized and compiled. It was entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA) software. Student's unpaired t test was used for continuous variables and categorical data was analyzed by Chi square test. The 'p' value of <0.05 was considered statistically significant.

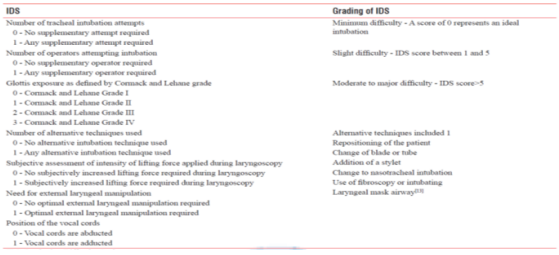

Figure 1 : Intubation Difficulty Scale and grading

VISUALIZATION OF THE LARYNGEAL INLET GRADED USING CORMACK LEHANE GRADING[12]

Grade I- complete glottis is visible
Grade II- posterior glottis is seen but anterior glottis is not visible
Grade III- Epiglottis is seen but not glottis
Grade IV- epiglottis is not seen

RESULTS

All the 80 patients were analyzed, with 40 in each group. The two groups were comparable in terms of age, sex, weight, and body mass index and there was no significant statistical difference in the predictors of difficult intubation between the two groups. (Table 1, Figure 2) Hence, both the groups were considered demographically and anatomically homogenous.

Table 1 : Patient characteristics

PARAMETERS	GROUP SP (N=40)	GROUP HE (N=40)	TOTAL (N=80)	P value
Age (years)	29.6 +/- 8.3	28.7 +/- 8.8	29 +/- 8.5	0.7
Weight (kg)	58.7 +/- 8.3	58.5 +/- 6.3	58.6 +/- 7.4	0.88
Height (cm)	162.8 +/- 6.0	161.5 +/- 5.1	162.4 +/-5.4	0.549
BMI (kg/m2)	22.7 +/- 2.4	23.6 +/- 3.6	23.3 +/- 3.1	0.46
Inter incisor gap (cm)	5.1 +/- 0.6	4.8 +/- 0.4	5.1 +/- 0.3	0.32
Thyromental distance (cm)	8.2 +/- 1.1	7.9 +/- 0.9	7.0 +/- 1.0	0.13
Sternomental distance (cm)	17.0 +/- 1.5	17.4 +/- 1.2	15.4 +/- 1.1	0.6
Males Females	23 17	25 15	48 32	0.9

The distribution of modified Mallampati classification in the study patients was as follows : The total number of patients in Class I of MPC is 41, Class II MPC is 31, Class III MPC is 8 and there was no patient belonging to Class IV.

The distribution of Cormack Lehane grades between the sniffing position group and the extension group are given in Table 3. The incidence of difficult laryngoscopy (Cormack grades III and IV) was 12.5% in the sniffing position group and 22.5% in the simple head extension group.

Table 3 : Distribution of Cormack Lehane Grading

Cormack Lehane Grade	Group SP	Group HE	P value
I	29	20	<0.01
II	6	11	
III	4	6	
IV	1	3	
total	40	40	

The summary of variables of difficult intubation is presented in Table 5. Greater than one attempt at intubation, increased lifting force, an increased need for application of external laryngeal pressure and increased use of alternate techniques (use of stylet/bougie) was observed when the patient was not in SP.

Table 4 : Comparison of the variables of IDS in the two groups

Intubation Difficulty Score	GROUP SP	GROUP HE
N1 (no. of attempts) 0 1 2	 38 2 0	 34 4 2
N2 (no. of operators) 0 1	 40 0	 38 2
N3 (no. of alternative techniques) 0 1	 40 0	 36 4
N4 (Cormack Lehane Grading) 0 1 2 3	 25 10 4 1	 17 14 6 3
N5 (lifting force) 0 1	 38 2	 34 6
N6 (laryngeal pressure) 0 1	 30 10	 25 15
N7 (vocal cord mobility) 0	 40	 40

Comparison of the IDS scores showed a statistically significant difference between the two groups. 14 out of 40 patients in SP group had an IDS score of 1-5 indicating slight difficulty and 1 patient had IDS score >5 indicating moderate to major difficulty. Whereas, 21 out of 40 patients in HE group had an IDS score of 1-5 indicating slight difficulty and 2 patients had IDS score >5 indicating moderate to major difficulty. (Table 4)

Table 5 : Intubation Difficulty Scale score

IDS	GROUP SP	GROUP HE	P VALUE
0	25	17	<0.001
0-5	14	21	
>5	1	2	

DISCUSSION

Visualization of the glottis is the key to the success of direct laryngoscopy and intubation. This requires optimal positioning of the patient's head and neck at the time of laryngoscopy and intubation.[12] Difficult tracheal intubation is defined by the American Society of Anaesthesiologists (ASA) as "when proper insertion of the endotracheal tube by conventional laryngoscopy requires more than three attempts, or more than ten minutes."[13]

Conventional laryngoscopy and intubation requires a direct view of the structures of larynx by alignment of the oral, pharyngeal and the tracheal axes for which the sniffing position has been universally recommended.[14]

Although, the TAAT theory and SP were widely accepted and recommended, the lack of evidence and clinical studies resulted in widespread debate on the legitimacy of these facts. Adnet et al. argued that it is not possible to achieve anatomic alignment of the three axes in the neutral, simple head extension, or the sniffing position, as evidenced by MRI findings and therefore, sniffing position appeared to provide no significant advantage over simple head extension for tracheal intubation.[15] However, this study was criticized because the subjects were not anaesthestized and no laryngoscopy or tracheal intubation was performed.

Gudivada et al. found that there were significant differences in IDS, favoring further head elevation position. However, one patient showed worsening of CL grade by 1.[7] Similarly, Hochman et al. demonstrated that the extension-extension position required less force than the sniffing position and was associated with better laryngeal exposure. Thus, reasoning for the practice of placing cushions behind the

shoulders during intubation in obese patients.[16] Johnson and Goodman stated that there is a lack of standardization of the sniffing position leading to inconsistencies in the findings of these studies.[17]

The results of our study show that more patients had lower IDS (easier intubations) in standard sniffing position when compared to further neck flexion. We observed that a greater number of patients in the HE group required more than one attempt at intubation, use of ELM, use of alternate techniques, and use of increased force during laryngoscopy and had higher Cormack Lehane grades (III and IV) as compared to those in the SP group. Hence, it was found that intubation was easier in the sniffing position than with further neck flexion.

These findings are consistent with observations of Akhtar et al. which were that simple head extension was associated with increased difficulty in intubation as compared to the sniffing position.[18] A similar study by Ambardekar et al evaluated sniffing position and simple head extension and found that laryngoscopy was difficult in 1.67% in sniffing position and 5.67% in simple head extension, hence concluding that sniffing position improves laryngoscopic view.[14]

As every patient was subjected to laryngoscopy in either one of the positions, there was inter individual variation. However, we were able to avoid additional airway manipulation and the resultant stress response. Other limitations of this study were its small sample size and improper blinding due to obvious differences in head positioning.

CONCLUSION

Direct laryngoscopy is a dynamic process which can be improved with multiple maneuvers. Adjusting the head position is an early remedial step which can significantly affect glottic visualization. We conclude that sniffing position confers an advantage over further neck flexion with regard to ease of endotracheal intubation.

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