Comparison of the sniffing position with simple head extension for laryngoscopic view in elective surgical patients

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Citation

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Abstract

This study evaluates sniffing position and simple head extension for glottic visualization during direct laryngoscopy in patients undergoing general anaesthesia. Intubation difficulty with two positions is evaluated.
Method: 300 adult patients posted for elective surgery under general anaesthesia were studied. Anaesthetic procedure included two laryngoscopies. Head position was randomized as Group I (n=150) in the sniffing position during first laryngoscopy and in extension during second; Group II (n=150) was in extension during first laryngoscopy and sniffing position during the second. Glottic visualization was assessed by Cormack Lehane classification. Intubation difficulty scale assessed intubation difficulty. Association of predictive factors like interincisor gap, thyromental distance, Sternomental distance etc. and other conditions associated with difficult intubation like long standing diabetes mellitus, sleep apnea with improvement of laryngoscopic view using sniffing position was studied.

Results:

Laryngoscopic view remained same in both head positions in 235 patients. Out of 300 patients, sniffing position improved glottic visualization 43 patients (14.33%) and simple head extension in 22. Laryngoscopy was difficult in 1.67% in sniffing position and 5.67% in simple head extension. Distribution of Intubation Difficulty Score between two groups was not significantly different.

Conclusion:
Sniffing position improves laryngoscopic view. None of two positions are advantageous over the other for endotracheal intubation. Sniffing position is beneficial especially in presence of conditions known to cause difficult intubation.

INTRODUCTION

Airway management is critical to the care of patients who are undergoing anaesthesia during surgery or who appear in the intensive care units. Endotracheal intubation provides an artificial conduit between the atmosphere and the lungs for the purpose of alveolar gas exchange and protection of the lower airways from aspiration. Endotracheal intubation for the purpose of providing anaesthesia was first described by William MacEwan in 1878. He passed a tube from the mouth in to the trachea using fingers as a guide. Edgar Rowbotham and Ivan Magill [1] gained wide experience of endotracheal intubation during the First World War and subsequently popularized it.

Positioning of the head and the neck is important for optimizing the laryngeal view during direct laryngoscopy. The ‘sniffing position' has been recommended for a long time as the optimal position for direct laryngoscopy. In this position, the neck must be flexed on the chest by elevating the head with a cushion under the occiput and extending the head at the atlanto-occipital joint. Direct laryngoscopy can also be performed with the head in simple extension i.e. flexion of the neck on chest is avoided. This study was carried out to evaluate the glottic view in sniffing position compared with the simple head extension during direct laryngoscopy in elective surgeries. We also evaluated the intubating conditions obtained with the two positions. The complexity of intubation was assessed using a quantitative scale- The Intubation Difficulty Scale. The predictive factors associated with improvement of glottic visualization by the sniffing position maneuver were also studied.

STUDY DESIGN

A prospective randomized study was conducted in 300 patients undergoing elective surgeries under general anaesthesia with endotracheal intubation. All patients were more than 18 years of age belonging to American Society of Anaesthesiologists physical status classification I and II. Those patients requiring rapid sequence induction, having raised intracranial tension or belonging to ASA status III and above were excluded. A written informed consent was obtained for each patient.

A detailed preoperative assessment with respect to history and examination was performed. Airway assessment was performed as follows:

1. Mouth opening: as the interincisor gap measured in centimeters, with the mouth fully opened. A value of less than 3.5cms was considered predictive of intubation difficulty.

2. Thyromental distance [2] : was measured along a straight line from the thyroid notch to the lower border of the mandibular mentum with the head in full extension. A value of less than 6.5cms was considered associated with difficult intubation.

3. Sternomental distance [3] : measured along a straight line from the mentum to the sternal notch with the head in full extension. A value of less than 12cms was considered associated with difficult intubation.

4. Modified Mallampati classification [4] : The patient was seated in front of the observer with the head in neutral position, mouth wide open and maximum protrusion of the tongue without phonation. The visibility of oropharyngeal structures were classified as:

Class I : Visualization of the soft palate, fauces, uvula, anterior and posterior pillars.

Class II : Visualization of the soft palate, fauces and base of uvula.

Class III : Visualization of the soft palate and base of uvula.

Class IV : Visualization of hard palate only.

Mallampati class I and II were considered to predict simple intubation whereas Mallampati class III and IV were considered to be predictors of difficult intubation.

5.Neck extension [5] : The amplitude of head and neck movement was graded as more than 35 and less than 35 . For this, the patient was asked to hold the head erect, facing directly to the front. He was then asked to extend the head maximally. The angle traversed by the occlusal surface of the upper teeth was estimated.

6. Body mass index: calculated as the weight in kilograms divided by the square of the height in meters. Obesity was defined as a body mass index greater than 30kg/m^2 .

7. Presence of pathological conditions: associated with difficulties in laryngoscopy such as malformation of the face, cervical spodylosis, tumors of the airway, longstanding diabetes mellitus, sleep apnea syndrome, loose upper incisors and buck teeth were also recorded.

INDUCTION OF ANAESTHESIA

All the patients were premedicated with Inj. Glycopyrrolate 0.2mg intramuscularly half an hour before the induction. Standard monitoring for anaesthesia was initiated and an intravenous access was secured.

Inj. Midazolam 0.03mg/kg intravenous was given for sedation. Analgesia was provided with Inj. Fentanyl 2 mcg/kg intravenously. All the patients were preoxygenated with 100% oxygen for 4 minutes. Standard induction included Inj. Propofol 2mg/kg intravenously or till the loss of eyelash reflex and Inj. Succinylcholine 1.5mg/kg intravenously. The initial two laryngoscopies (L1 and L2) were performed in all cases with use of a Macintosh number 3-laryngoscope blade for the sake of consistency of the technique. If the operator encountered difficulty with the Macintosh blade, the intubating technique (after L2) could be modified as necessary. Topical anaesthesia was performed with lignocaine spray after L1. After 40seconds L2 was performed and orotracheal intubation was achieved during L2.

Before induction, all the patients were randomized into one of the two groups. Group A included the patients placed in sniffing position during L1 by insertion of a cushion (doughnut, height 7cms) under the head. Laryngoscopic view was noted. Second laryngoscopy (L2) was performed with the patient in simple head extension without a cushion. Laryngoscopic view, intubating parameters were noted and the trachea was intubated.

In group B, the patients were placed in simple head extension when the first laryngoscopy (L1) was performed and the laryngeal view was noted. After 40 seconds, second laryngoscopy (L2) was performed with the patients in sniffing position with a cushion (doughnut, height 7 centimeters) under the head. The laryngeal view and the intubating parameters were noted. During the second laryngoscopy, the trachea was intubated in both the groups.

Glottic visualization during L1 and L2 was assessed by utilization of the Cormack Lehane classification [6], without external laryngeal manipulation. External laryngeal manipulation was permitted after evaluation in order to facilitate topical anaesthesia during L1 or for insertion of the endotracheal tube during L2. The intubation difficulty scale assessed intubation difficulty. This scale is based on the determination of seven parameters recorded by an independent observer after each intubation.

Figure 1

Intubation difficulty scale[7]:

Parameter	Score
1. Number of attempts > 1	N_1
2. Number of operators > 1	N_2
3. Number of alternative techniques (eg. Use of bougie. Change of laryngoscope blade, use of another technique etc.)	N_3
4. Glottic exposure (Cormack Lehane classification). Grade I = 0 points. Grade II = 1 point. Grade III = 2 points. Grade IV = 3 points.	N_4
5. Lifting force applied during laryngoscopy. Little force necessary = 0 points. Subjectively increased force = 1 point.	N_5
6. External laryngeal pressure for improved glottic visualization. No external force applied = 0 points. External pressure necessary = 1 point.	N_6
7. Position of vocal cords at intubation. Vocal cords in abduction = 0 points. Vocal cords adducted blocking tube passage = 1 point. Vocal cords not visualized = 2 points.	N_7

IDS Score:
0 = Intubation without difficulty.
1-5 = Intubation with slight difficulty.
> 5 = Intubation with moderate to major difficulty.

RESULTS

A total of 300 patients were studied out of which, 137 were female and 163 were male.

The groups I and II were comparable with respect to age, sex, height, weight and body mass index. There were 80 males and 70 females in group I and 83 males and 67 females in group II. 130 patients i.e. 86.67% belonged to ASA grade I and 20 patients i.e. 13.33% belonged to ASA grade II in each of the two groups.

Figure 2

Graph 1: Demographic Characteristics

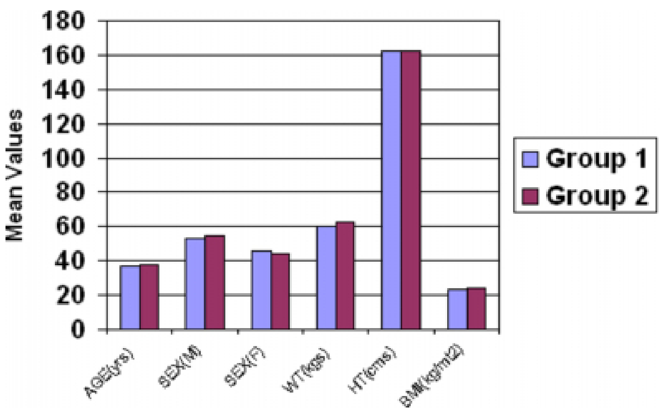


Figure 3

Table 1: Demographic Characteristics

Characteristics	Group I (mean)	Standard deviation for group I	Group II (mean)	Standard Deviation For group II
Total patients	150	-	150	-
Age (years)	37.08	14.31	37.86	14.04
Height (meters)	1.62	0.08	1.62	0.09
Weight (kgs)	60.44	9.82	63.89	11.40
Body mass index (kgs/m2)	22.98	3.48	24.05	3.51

Figure 4

Table 2: Distribution of gender

Sex	Group I	Group II
Males (%)	53.33	55.03
Females (%)	46.66	44.96

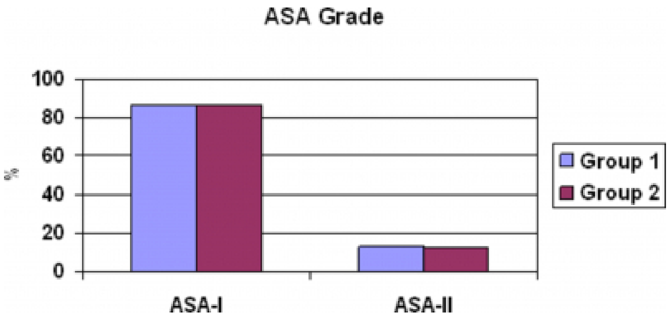
Figure 5

Table 3: Distribution of ASA physical status

ASA Grade	I	II
Group 1	130	20
%	86.67	13.33
Group 2	130	20
%	86.67	13.33

Figure 6

Graph 2: Distribution of ASA Physical Status



Mallampati classification:

The Table 3 depicted below shows the distribution of modified Mallampati classification in the study patients. The total number of patients in Class I of MPC is 229, Class II MPC is 61, Class III MPC is 10 and there was no patient belonging to Class IV.

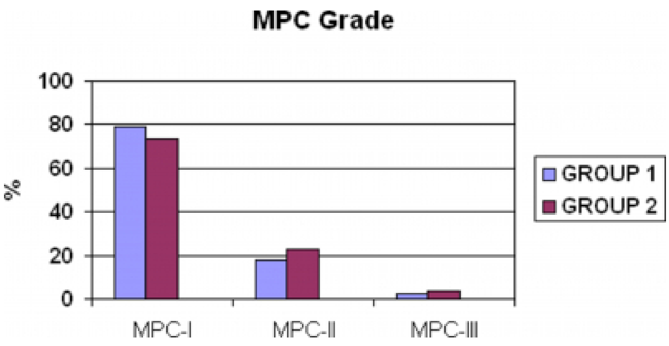
Figure 7

Table 4: Distribution of MPC in study patients

MPC	I	II	III
Group I (n=150)	119	27	4
%	79.33	18	2.67
Group II (n=150)	110	34	6
%	73.33	22.67	4
Total	229	61	10

Figure 8

Graph 3: Distribution of MPC in study patients



Assessment of interincisor gap, thyromental distance and sternomental distance:

Airway Assessment also included measurement of the interincisor gap, Sternomental distance and the thyromental distance. The mean interincisor gap in group I was 4.84 cms and in group II it was 4.79 cms. The mean Sternomental distance in group I was 17.27 cms and in group II was 17.13. The mean thyromental distance was 8.06 cms for group I and 8.28 cms for group II. Thus these parameters were comparable for the two groups.

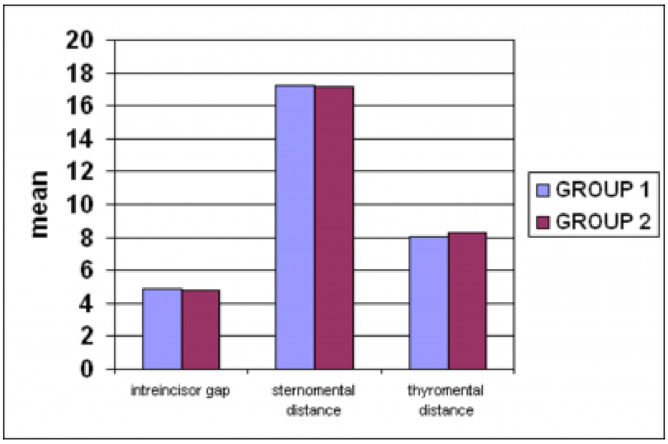
Figure 9

Table 5: Distribution of parameters of airway assessment

Distances (cms)	Group I	Standard Deviation	Group II	Standard Deviation
Interincisor gap	4.84	0.74	4.79	0.71
Sternomental distance	17.27	2.18	17.13	1.86
Thyromental distance	8.06	1.35	8.28	1.21

Figure 10

Graph 4: Distribution of parameters of airway assessment



LARYNGOSCOPIC DIFFICULTY

Laryngoscopies were possible for all patients. A statistical analysis was performed to study the distribution of Cormack Lehane grades between the sniffing position group and the extension group using the chi-square test. It revealed that the distribution was statistically significant. Thus we prove that sniffing position provided a better laryngoscopic view than the simple head extension position.

Figure 11

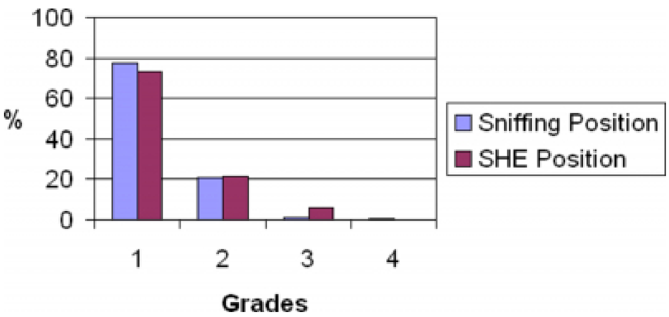
Table 6: Distribution of Cormack and Lehane Grades between the Sniffing position group and the Simple Head Extension group

Cormack and Lehane Grade	Sniffing Position Group (n=300)	Simple Head Extension Group (n=300)
1	233	219
2	62	64
3	4	17
4	1	0

Degrees of freedom: 3
Chi-square = 9.51299339794915
p is less than or equal to 0.025.
The distribution is significant.

Figure 12

Graph 5: Comparison of Cormack and Lehane grades between the sniffing position and the simple head extension groups



1. The laryngoscopic view did not change i.e. remained the same in both sniffing and simple head extension positions in 235 out of the total 300 patients studied.

2. The use of sniffing position improved the glottic visualization (i.e. the Cormack grade decreased in 43 patients (14.33%) out of the total 300 patients in comparison with the simple head extension position. Among the 43 patients for whom the sniffing position improved the laryngeal view, the Cormack grade improved from 2 to 1 in 27 patients, from 3 to 1 in 5 patients and from 3 to 2 in 11 patients.

3. Out of the 300 patients studied, the laryngoscopic view improved in 22 patients in the simple head extension position. But in these patients the improvement in the view was not associated with any positive predictive factors.

4. The incidence of difficult laryngoscopy (Cormack grades III and IV) was 1.67% in the sniffing position group and 5.67% in the simple head extension group.

INTUBATION DIFFICULTY

No intubation was impossible in this series. Intubation without difficulty (IDS score=0) represented 211 (70.33%) out of the 300 intubations. The percentage of intubations with an IDS score greater than 5 (moderate to major difficulty) was 0.67%. The median IDS score values in both the groups was 0.Comparison of the IDS score distribution between the two groups demonstrated no statistically significant differences. This implies that though the laryngoscopic view improved with the use of sniffing position as compared to simple head extension, none of the two positions were advantageous over the other for endotracheal intubation.

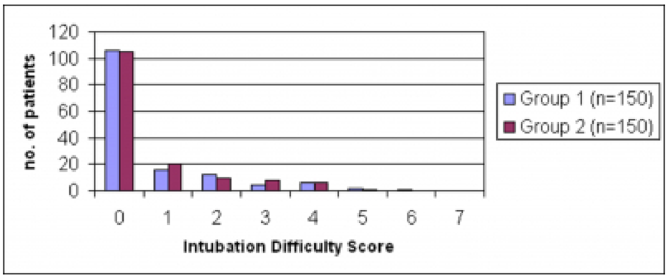
Figure 13

Table 7: Distribution of the Intubation Difficulty Scale score among the patients in the sniffing position group and the simple head extension group.

Intubation difficulty score	Group I (n=150)	Group II (n=150)
0	106	105
1	16	20
2	12	10
3	4	8
4	6	6
5	2	1
6	1	0
7	0	0
8	1	0

Figure 14

Graph 6: Intubation Difficulty Scale score distribution among the patients in sniffing position group versus the simple head extension group during the second laryngoscopy



Predictive factors associated with the improvement of glottic visualization by the sniffing position maneuver:

The predictive factors of intubation difficulty that were assessed are Modified Mallampati class, interincisor gap, Sternomental distance, thyromental distance, Neck extension, body mass index and other conditions associated with difficult intubation like long standing diabetes, loose upper incisors, sleep apnea syndrome, tumors of the airway etc.

For the 43 patients for whom the sniffing position showed an improvement of the laryngoscopic view, correlation with the predictive factors of intubation difficulty was determined.

Figure 15

Table 8: Association of the interincisor gap with change of view in sniffing Position

Interincisor gap			
	<3.5 cms	>3.5 cms	Total
Improvement with Sniffing position	1	42	43
Worsening with Sniffing position	0	22	22
Others (View remains same)	4	231	235
Total	5	295	300

Figure 16

Table 9: Association of the thyromental distance with change of view in sniffing position

Degrees of freedom: 2
Chi-square = 0.488598529004772
For significance at the .05 level, chi-square should be greater than or equal to 5.99.
The distribution is not significant.
p is less than or equal to 1.

Thyromental Distance			
	<6.5 cms	>6.5 cms	Total
Improvement with Sniffing position	1	42	43
Worsening with Sniffing position	0	22	22
Others (View remains same)	14	221	235
Total	15	285	300

Degrees of freedom: 2
Chi-square = 0.512127496872778
For significance at the .05 level, chi-square should be greater than or equal to 5.99.
The distribution is not significant.
p is less than or equal to 1.

The distribution was not statistically significant for restricted mouth opening i.e. inter-incisor gap of less than 3.5cms, reduced thyromental distance i.e. less than 6.5cms. Thus restricted mouth opening and a reduced thyromental distance were not associated with an improved laryngoscopic view with sniffing position.

Figure 17

Table 10: Association of the Sternomental distance with the change in view in sniffing position.

Degrees of freedom: 2
Chi-square = 5.99673329703663
p is less than or equal to 0.05.
The distribution is significant.

Mallampati Class			
	3,4	1,2	Total
Improvement with Sniffing position	5	38	43
Worsening with Sniffing position	1	21	22
Others (View remains same)	4	231	235
Total	10	290	300

Degrees of freedom: 2
Chi-square = 11.2221207105952
p is less than or equal to 0.01.
The distribution is significant.

Figure 18

Table 11: Association of Mallampati classes III and IV with change in view in sniffing position

Sternomental Distance			
	<12 cms	>12 cms	Total
Improvement with Sniffing position	1	42	43
Worsening with Sniffing position	0	22	22
Others (View remains same)	0	235	235
Total	1	299	300

Figure 19

Table 12: Association of neck movement with change in view in sniffing postion

BMI			
	<30 kg/m2	>30 kg/m2	Total
Improvement	14	29	43
Worsening	0	22	22
Others	2	233	235
Total	16	284	300

Degrees of freedom: 2
Chi-square = 73.7157731146901
p is less than or equal to 0.001.
The distribution is significant.

Figure 20

Table 13: Improvement of laryngoscopic view with sniffing position in obese subjects

Neck Movement			
	<35	>35	Total
Improvement with Sniffing position	10	33	43
Worsening with Sniffing position	5	17	22
Others (view remains same)	7	228	235
Total	22	278	300

Degrees of freedom: 2
Chi-square = 31.0548762920567
p is less than or equal to 0.001.
The distribution is significant.

Statistical analysis revealed that the distribution was significant for a Sternomental distance of less than 12cms, body mass index of more than 30kg/m^2 , neck extension of less than 35^o , Mallampati class III and IV and presence of other factors like long standing diabetes, loose upper incisors, sleep apnea etc. Thus sniffing position is beneficial than the simple head extension position in conditions known to cause difficult intubation like obesity, restricted neck movement, short neck, Mallampati class III and IV and other factors like long standing diabetes, loose upper incisors and sleep apnea.

DISCUSSION

Intubation difficulty is commonly identified as a risk factor for morbidity and mortality [8] .

Difficult tracheal intubation is defined by the American Society of Anaesthesiologists (ASA) [9] as when "proper insertion of the endotracheal tube by conventional laryngoscopy requires more than three attempts, or more than ten minutes." Other proposed definitions include failure to intubate, more than two laryngoscopies, more than three attempts in the modified Jackson position, poor visualization of vocal folds etc.

Gillespie (1941) [10] provided the first analysis of the anatomical factors involved in laryngoscopy. According to him, the solution to ease of intubation was to attain adequate depth of anaesthesia and muscular relaxation. Conventional laryngoscopy and intubation requires a direct view of the structures of larynx. The line of vision needed for this demands alignment of the oral, pharyngeal and the tracheal axes [11] . The sniffing position has been in use for all these years and has been used as a gold standard. So we decided to carry out this study to validate the benefit of the systematic use of sniffing position as compared with simple head extension for patients undergoing elective surgeries under general anaesthesia with endotracheal intubation.

The sniffing position was obtained by placement of a 7 cms cushion or a head ring under the head of the patient. It consists of (1) flexing the neck on the chest by elevating the head and (2) extending the head on the neck (atlantooccipital extension) by tilting the head backward with the hand of the operator [12] . The sniffing position is universally recommended for orotracheal intubation in the operating room. The classical rationale for this position is that the alignment of the axes of the mouth, pharynx and the larynx is facilitated, permitting direct laryngoscopy.

Simple head extension position is obtained by extending the head on the neck at the atlanto-occipital joint without placing a head ring under the head.

We chose to standardize the blade for the sake of consistency.

In the course of this study, we have also tried to assess a quantitative score- The Intubation Difficulty Scale [7] that can be used to evaluate the complexity of intubations. It is an objective scoring system, which is a function of seven parameters. These seven factors have been identified in the literature as associated with difficult intubation [13]. An increased number of attempts (N_1) is the parameter most frequently described as being associated with difficult intubation. Introduction of a second operator (N_2) or abandoning one technique for another (N_3) suggests an encountered difficulty, perhaps more so than a simple additional attempt. As such, changing operators or techniques implies two additional points (one for the change and one for the additional attempt).

The quality of laryngoscopy has been quantified using Cormack and Lehane classification [6]. Intubation Difficulty Score is partly influenced by glottic exposure (N_4). However poor visualization of glottis is not always associated with a difficult intubation. Thus the laryngoscopic quality alone is not an adequate measure of difficulty, but forms an important component of the Intubation Difficulty Score.

Increased lifting force (N_5) and external laryngeal pressure (N_6) are frequently used to improve the glottic exposure. This score considers these two factors, which tend to further emphasize the importance of quality of glottic visualization.

Finally, the status of the glottic exposure (N_7) will be affected by laryngospasm and cough, both of which have been identified as increasing the difficulty of intubation.

Furthermore, we also assessed the association of predictive factors with the improvement of laryngoscopic view using sniffing position. The predictive factors included the interincisor gap, thyromental distance, Sternomental distance, Mallampati class, body mass index, neck extension and other conditions known to be associated with difficult intubation like long standing diabetes mellitus, sleep apnea, loose upper incisors and tumors of the airway.

Nichol and Zuck (1983) [14] suggested that the atlanto-occipital distance is a major anatomical factor that determines the ability to extend the head on the neck and exposure of larynx.

Samsoon and Young (1987) [15] modified the Mallampati test as originally described and graded the relative tongue and the pharyngeal size into 4 grades.

They carried out a retrospective study of the patients whose tracheas were impossible to intubate on a previous occasion. The incidence of failed intubations in the obstetric group over a 3-year period was 7 out of 1980 cases, whereas in the surgical group the results were 6 out of 13380 patients.

M.E.Wilson et al (1988) [16] assessed 633 adult patients undergoing routine surgery. They made various measurements of head and neck in an attempt to discover the features associated with difficult laryngoscopy. Accordingly, they identified five risk factors as weight, head and neck movement, jaw movement, receeding mandible and buck teeth. They studied the interincisor gap, measured with the mouth fully open. Patients in whom the interincisor gap was less that 5cms i.e. approximately 3 fingerbreadths, with limited forward protrusion of the mandible were thought to be at increased risk.

In our study the use of sniffing position for direct laryngoscopy was associated with an improvement in laryngoscopic view in 14.33% of the patients when compared with simple head extension ($p< 0.025$).

Laryngoscopic view improved in 7.33% of the patients in the simple head extension position as compared to sniffing position. But in these patients, the improvement in the view was not associated with any positive predictive factors. The incidence of difficult laryngoscopy as defined by Cormack and Lehane Grades III and IV was 1.67% in the sniffing position group and 5.67% in the simple head extension group.

The distribution of the Intubation Difficulty Score between the two groups was not significantly different. Thus, though the laryngoscopic view improved with the use of sniffing position, none of the two positions were advantageous over the other for endotracheal intubation.

For the 43 patients, in whom sniffing position showed an improvement in the laryngoscopic view, correlation with the predictive factors of intubation was determined. It was found that the distribution was not statistically significant for restricted mouth opening i.e. inter-incisor gap of less than 3.5cms, reduced thyromental distance i.e. less than 6.5cms. The minimum interincisor gap and the thyromental distance that we came across in our study were 3cms and 5.5cms respectively. We found that the sniffing position is not particularly advantageous for improvement of laryngoscopic view in patients with restricted mouth opening and reduced thyromental distance. Simultaneously there was no difficulty in intubation also. Patil, Stehlinh and Zaunder [2] asserted that anticipation of difficult intubation could be done by thyromental distance. According to them, if the thyromental distance is 6.5cms- the laryngoscopy is easy; 6cms-6.5cms- the laryngoscopy and intubation are usually difficult but possible and if it is less than 6cms-visualization of glottis may not be possible

Statistical analysis revealed that the distribution was significant for a sternomental distance of less than 12cms, body mass index of more than 30kg/m ^{2} , neck extension of less than 35 ^{o} , Mallampati class III and IV and presence of other factors like long standing diabetes, loose upper incisors, sleep apnea etc. Thus sniffing position is beneficial than the simple head extension position in conditions known to cause difficult intubation like obesity, restricted neck movement, short neck, Mallampati class III and IV and other factors like long standing diabetes, loose upper incisors and sleep apnea.

The first study of optimal patient positioning for orotracheal intubation was published in1913 by Jackson, stressing the importance of anterior flexion of the lower cervical spine, in addition to the extension of the atlanto-occipital joint [17] . The axial alignment of mouth, pharynx and larynx is obtained by extension of the head on atlanto-occipital and upper cervical joints. This position can be obtained by a slight flexion of the neck on the chest whereas the optimal head position is extension of the plane of the face from the horizontal. This head position resembles a person 'sniffing the morning air'.

Hochman et al [18] , evaluated in a prospective investigation in 20 patients, three head-neck positions for laryngoscopic view. They were extension-extension (occiput was placed below the horizontal plane), flexion-extension (sniffing position) and flexion-flexion (chin to the chest). In this study, the glottic exposure improved gradually with progression from extension-extension to flexion-extension and finally to flexion-flexion.

Keith Rose and Marsha Cohen [19] performed a study to describe methods, risk factors and outcomes or airway management. According to them, the risk factors for difficult intubation included male sex, age 40-59 years and obesity. Airway characteristics predictive of difficult tracheal intubation were:

- Decreased mouth opening or the interincisor gap.
- Shortened thyromental distance.
- Poor visualization of hypopharynx.
- Limited neck extension.

D. Savva [3] found no correlation between the interincisor gap and view on laryngoscopy. According to him, laryngoscopy may be more difficult in only those patients in whom the interincisor gap is less than 2cms. He postulated that a thyromental distance of less than or equal to 6.5cms, Sternomental distance of less than or equal to 12.5cms, Mallampati class III and IV and the mandibular protrusion grade II and III are associated with difficult intubations. In our study, we have taken an interincisor gap of less than 3.5cms as a critical distance. We have found no correlation between a reduced interincisor gap and use of sniffing position for an improved laryngoscopic view. However, in patients with a reduced sternomental distance and Mallampati class III, the laryngoscopic view significantly improved with the use of sniffing position.

According to the study carried out by Adnet et al [20] in 456 patients, routine use of sniffing position appeared to provide no significant advantage over simple head extension for tracheal intubation. But in our study, we have found a significant advantage of the sniffing position over simple head extension in improving the laryngoscopic view.

Clearly, during direct laryngoscopy, the main determinant of good glottic visualization is aligning the line of vision of the operator (the line from superior incisors to the posterior portion of the cricoid cartilage) with the laryngeal axis [6] . Thus, the angle between these two axes must be minimized. In an experimental study with the use of Magnetic Resonance Imaging it has been found that this angle decreased during the passage from neutral to sniffing position [21] .

According to Adnet et al [7] , the Intubation Difficulty Scale is a blend of subjective and objective criteria that permit a qualitative and quantitative approach to the progressive nature of the difficulty of intubation. Out of the 5 patients in our series who had as Intubation Difficulty Score of more than 5, two patients had a Cormack Lehane Grade III in the simple head extension position and one patient had a Cormack Lehane grade III in the sniffing position. 3 patients had limited head extension. Out of the 5 patients, 3 required external laryngeal manipulation and an increased lifting force to improve the glottic visualization.

A common technique for managing difficult laryngoscopy is posterior displacement of the larynx by backward pressure on the thyroid or cricoid cartilage. Wilson et al [16] reported that this maneuver reduced the incidence of failure to view any part of the glottis from 9.2% to 1.6%.

Knill [22] reported that the BURP maneuver was useful in improving the visibility of the glottis in two cases of difficult direct laryngoscopy. This maneuver involves displacement of the thyroid cartilage dorsally so as to abut the larynx against the bodies of the cervical vertebrae 2 cms cephalad until mild resistance is met and 0.5-2cms laterally to the right.

Thus in conclusion, we have found that the sniffing position is better for direct laryngoscopy and it is especially beneficial in the setting of known difficult airway. Also, the sniffing position provides an improved laryngoscopic view in patients with obesity, short neck, high Mallampati grades, restricted neck extension and having other associated factors like long standing diabetes, loose upper incisors, sleep apnea.

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