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Original Research Article.

A Hospital Based Prospective Study to Evaluate the Case of Intubation in Sniffing Position and Elevated Sniffing Position by Using Modified Cormack and Lehane Grading

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ABSTRACT

Background: Close monitoring of developments in airway management is required because of the increased number of ETTs in daily practice. Sniffing position has been followed as the standard position for direct laryngoscopy and endotracheal intubation. However, a simple technique like further neck flexion (Elevated sniffing position) that improves the laryngeal view warrants careful evaluation. Hence, we plan to conduct a study to evaluate sniffing position and elevated sniffing position for laryngoscopic view and endotracheal intubation.

Materials & Methods: A hospital based prospective study was conducted on 40 patients scheduled for elective surgery under general anaesthesia requiring endotracheal intubation in Department of Anaesthesiology in Pacific Medical College & Attached group of hospitals, Udaipur, Rajasthan. Patients were randomly allocated into one of the following groups: Group SP (n=20) Endotracheal Intubation was done in sniffing position using Macintosh Laryngoscope. Group ESP (n=20) Endotracheal Intubation were done in Head elevation position using Macintosh Laryngoscope. Modified Cormack and Lehane grading were noted both with or without OELM- optimal external laryngeal manipulation. Mask ventilation was resumed while changing the patient position to maintain adequate oxygenation.

Results: The comparison of mean value of age and BMI was statistical non-significant (P=0.743 & 0.28 respectively) in between groups. Our study showed that the visualization of the glottis as assessed by Cormack and Lehane grades with 11 (55%) patients having a difficult visualization in sniffing group and 2 (10.0%) patients in elevation sniffing position group (*P<0.05**). Changes in CLG from SP to ESP are shown better improvement in ESP group as compared to SP group in our study.

Conclusion: We conclude that elevated sniffing position of the neck was found to be statistically and clinically significant over standard SP.

Keywords: CLG, Sniffing Position, Elevated Sniffing Position, Intubation, IDS.

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INTRODUCTION

Conventional laryngoscopy is performed in the supine position. In these position oral, pharyngeal, and laryngeal axes of the patient are offset, making it difficult to obtain a good view of glottis by the conventional laryngoscope. A slight neck flexion of 25^0 – 35^0 and head extension of approximately 85^0 at atlanto occipital joint helps to align the axes called Magill's (sniffing) position.[1] As successful direct laryngoscopy and intubation requires the alignment of oral, pharyngeal and laryngeal axes, the intubation and visual confirmation are often complicated by the anatomical abnormalities of the upper airway, comorbid illness, position of the patient as well as by the location and other external factors.

In recent decades, video techniques using fibreoptic technology and Airtraq laryngoscopes based on reflecting mirrors are being commonly employed. They have rigid curved blades to match the anatomical alignment thus improving laryngeal view even in patients who cannot be kept in ideal sniffing position.[2]

Close monitoring of developments in airway management is required because of the increased number of ETTs in daily practice. At first, there were only blind or tactile techniques to visualize the larynx using indirect laryngoscopy. This concept was introduced by the Spanish singing instructor Manuel Garcia (1805-1868). He managed to view the vocal cords by placing small

mirrors at the end of instruments that provided specific angles.[3] The first elective oral intubation for anesthesia was performed by William Macewen in 1879. A couple of years later, Joseph O'Dwyer, of the United States, developed a system of metal tubing that could be blindly passed in order to relieve airway obstruction in children suffocating from the pseudomembrane formed in diphtheria infections. An important issue with the O'Dwyer intubation system and its variants was the necessity to perform a blind placement. Another significant advancement in airway management was the development of direct laryngoscopy, which allowed for the visualization of glottic structures. In 1829, Benjamin Guy Babington, a medical student, created the glottiscope.[4] Sniffing position has been followed as the standard position for direct laryngoscopy and endotracheal intubation. However, a simple technique like further neck flexion (Elevated sniffing position) that improves the laryngeal view warrants careful evaluation. But there are few studies in literature which have compared sniffing position with elevated sniffing position. Moreover, there are conflicting results regarding these two positions for laryngoscopic view and endotracheal intubation. Hence, we plan to conduct a study to evaluate sniffing position and elevated sniffing position for laryngoscopic view and endotracheal intubation.

MATERIALS & METHODS

A hospital based prospective study was conducted on 40 patients scheduled for elective surgery under general anaesthesia requiring endotracheal intubation in Department of Anaesthesiology in Pacific Medical College & Attached group of hospitals, Udaipur, Rajasthan.

Inclusion Criteria

1. Aged more than or equal to 16 years of either sex.
2. Physical status ASA I and II

Exclusion Criteria

Patients with

1. Upper airway pathology, height <140 cms, thyromental distance (TMD) <5.5 cms & Mouth opening <3 cm.
2. Neck mass, cervical spine injury & Temporo-mandibular joint ankylosis
3. Pregnancy & obese patients
4. History of obstructive sleep apnea

Randomisation and Group Allocation

Patients will be randomly allocated into one of the following groups.

1. Group SP(n=20) Endotracheal Intubation was done in sniffing position using Macintosh Laryngoscope.
2. Group ESP (n=20) Endotracheal Intubation will be done in Head elevation position using Macintosh Laryngoscope.

Preparation of Patient

All the patients were subjected to detailed history, complete physical as well as systemic examination before surgery. Patient's age, weight and height were recorded to calculate body mass index (BMI).

Anaesthesia Technique

In the operating room, routine monitoring was done including non-invasive blood pressure (NIBP), electrocardiography (ECG) and pulse oximetry (SpO2). Intravenous line was secured using 18 G cannula. Vital signs were recorded before and after the drugs administration.

Sniffing position was made by aligning external auditory meatus to the sternal notch in a horizontal plane by placing folded sheets under the occiput of the patient. Elevated sniffing position were made by further increasing the neck flexion by placing an additional 4 cm high hard pillow under the folded drapes i.e. 4 cm above the sniffing position.

Preoxygenation was done with 100% oxygen for 3 minutes, all patients were received intravenous fentanyl (2mcgkg-1). Inj. Propofol 2-2.5mgkg-1 will be given for induction of anaesthesia. Ventilation was assessed with bag mask ventilation. Injection Atracurium bromide 0.5mgkg-1 was given to facilitate the placement of endotracheal tube. Patients were ventilated with 1 MAC sevoflurane in 50% N_2O and 50% O_2.

Group SP (sniffing position)- Initially elevated sniffing position was made, and patient ventilated in this position following induction of anaesthesia. Mask ventilation was assessed using Han's scale, then laryngoscopy was done using appropriate size macintosh laryngoscope blade and patient's laryngeal view were assessed by modified Cormack and Lehane grading. The 4 cm hard pillow will then be removed while folded drapes were left as such (sniffing position). Again, direct laryngoscopy was done, modified Cormack and Lehane grading were noted in this sniffing position. Now endotracheal intubation was done using appropriately sized ETT and Intubation Difficulty Score were assessed.

Group ESP (Elevated sniffing position)- Initially sniffing position was made and patient were ventilated in this position following induction of anaesthesia. Mask ventilation was assessed using Han's scale, then laryngoscopy was done using appropriate size Macintosh laryngoscope blade and patient's laryngeal view was assessed by modified Cormack and Lehane grading. After this, a hard pillow will be placed under the folded drapes so that the head is now in elevated sniffing position. Again, direct laryngoscopy was done, modified Cormack and Lehane grading were noted in this head elevation position. Now endotracheal intubation is done using appropriately sized ETT and Intubation Difficulty Score were assessed.

Modified Cormack and Lehane grading were noted both with or without OELM- optimal external laryngeal manipulation. Mask ventilation was resumed while changing the patient position to maintain adequate oxygenation. If we are unable to perform endotracheal intubation after 3 attempts, an alternate method to secure the airway were used. Difficult intubation cart was also be kept ready. Further anaesthetic technique was carried out as per case and surgical requirement.

Statistical Analysis

The quantitative variables in both groups were expressed as mean±SD or median (IQR) and compared using unpaired t-test/Mann-Whitney test between. The qualitative variables were expressed as frequencies/percentages and compared using Chi-square/Fisher's exact test. A p-value < 0.05 will be considered statistically significant.

RESULTS

The mean age of patients in group 1 was 36.9 years and 37.69 yrs in group 2. The mean value of BMI in group 1 was 23.32kg/m^2 and in group 2 were 24.54 kg/m^2. The comparison of mean value of age and BMI was statistical non-significant (P=0.743 & 0.28 respectively) in between groups (table 1). Our study showed that the visualization of the glottis as assessed by Cormack and

Lehane grades with 11 (55%) patients having a difficult visualization in sniffing group and 2 (10.0%) patients in elevation sniffing position group (*P<0.05**) (table 2).

Changes in CLG from SP to ESP are shown in this table no. 3. Out of 3 patients, 2 patients with Cormack-Lehane view of 1 in sniffing as well as in ESP and one patient in worsened to 2a. In 7 patients who were in CLG 2a, there was improvement to CLG 1 in 5 patients, remained in same grade in 2 patients. Of 8 patients who were in grade 2b, 1 patient improved to CLG 1 and 5 improved to CLG 2a and 2 remained in same grade. Of 2 patients who were in Grade 3, 1 improved to 2b and 1 patient remained in same grade in group 1. Changes in CLG from SP to ESP are shown in this table no. 4. Out of 6 patients, 2 patients with Cormack-Lehane view of 1 in sniffing as well as in ESP and 4 patients in worsened to 2a. In 8 patients who were in CLG 2a, remained in same grade in 2 patients and 6 patients in worsened to 2b. Of 5 patients who were in grade 2b, 1 remained in same grade and 4 patients in worsened to 3. Of 1 patient who were in Grade 3 remained in same grade in group 2.

The present study showed that distribution of IDS scores for patients in the two groups. In ESP, 15 patients were easily intubated with no difficulty while as in sniffing position group only 9 patients were intubated easily. In ESP, 5 patients had moderate difficulty in intubation while as in SP group 11 patients had moderate difficulty in intubation. Which was statistically significant (P<0.05*) in between groups (table 5).

Table 1: The comparison of Mean value of age and BMI in both groups

Parameter Assessed	Group 1		Group 2		P value
	Mean	SD	Mean	SD	
Age (yr)	36.9	11.64	37.69	12.54	>0.05
Body Mass Index	23.32	5.487	24.54	3.38	>0.05

Student paired "t" Test:

Table 2: Comparison of views obtained during laryngoscopy.

Cormack and lehane Grading	Group 1 (ESP)	Group 2 (SP)	P value
Grade I	18 (90%)	9 (45%)	<0.05
Grade II	2 (10%)	10 (50%)	
Grade III	0 (0%)	1 (5%)	
Total	20 (100%)	20 (100%)	

Table 3: Cross tabulation of Cormack-Lehane grading in position SP to position ESP in group 1.

Position SP	Position ESP					Total
	1	2a	2b	3a	3b	
1	2	1	0	0	0	3
2a	5	2	0	0	0	7
2b	1	5	2	0	0	8
3a	0	0	1	0	0	1
3b	0	0	0	0	1	1

Table 4: Cross tabulation of Cormack-Lehane grading in position SP to position ESP in group 2.

Position SP	Position ESP					Total
	1	2a	2b	3a	3b	
1	2	4	0	0	0	6
2a	0	2	6	0	0	8
2b	0	0	1	3	1	5
3a	0	0	0	0	1	1

Table 5: Intubation difficulty scale score in two groups with P values

IDS Score	Group 1	Group 2	P value
0	15 (75%)	9 (44%)	<0.05*
0-5	5 (25%)	11 (55%)	
Total	20	20	

DISCUSSION

Glottis visualisation is key to the success of direct laryngoscopy and intubation. Optimal position of the patient's head and neck at the time of laryngoscopy and intubation can improve the outcome. Jackson was first to emphasize the importance of position of head for laryngoscopy and intubation.[5] Bannister and Macbeth described the interaction of three axes (oral, pharyngeal, and laryngeal) during laryngoscopy and intubation. They concluded that by flexion of the neck and extension of the head at the atlanto-occipital joint there is an alignment of all three axes.[6]

Sniffing position has been the gold standard of teaching over all these years till Adnet pointed out that there is no alignment of three axes after closely evaluating a radiograph taken during intubation.[7] One observer even went to the extent of saying that there is only involvement of two axes "oral and pharyngeal" and "the tongue".[8] Adnet compared sniffing, simple head extension and neutral positions under magnetic resonance imaging (MRI) scan in eight healthy unanaesthetised volunteers and saw no alignment of all the three axes in any position. However, the angle between laryngeal axis and the line of vision was decreased in sniffing as well as simple head extension position. Thus, these positions are comparable among themselves but better than neutral position.[9]

The mean age of patients in group 1 was 36.9 years and 37.69 yrs in group 2. The mean value of BMI in group 1 was 23.32kg/m^2 and in group 2 were 24.54 kg/m^2. The comparison of mean value of age and BMI was statistical non-significant (P=0.743 & 0.28 respectively) in between groups in our study.

Prakash S et al (2011)[10] Compared with the simple extension group, patients in the sniffing group were older (*P* = 0.022), heavier (*P* = 0.022), and had a greater BMI (*P* = 0.005).

Gudivada et al (2017)[11] found mean value of age of patients was 41.8 yrs, height was 1.6 mt, weight was 55.9 kg and BMI were 22.1kg/m^2.

Intubation difficulty score was used to evaluate intubating conditions. It was developed by Adnet et al in[7] 1999. It is a blend of subjective and objective criteria that permit a qualitative and quantitative approach to the progressive nature of the difficulty in intubation and appears to be the best indicator till date.

In this scale, the value of IDS is '0' if full visualization of the laryngeal aperture is possible during laryngoscopy and vocal cords are seen to be nicely abducted. Each variation from this defined 'ideal' intubation increases the degree of difficulty, the overall score being the sum of all variations from the definition.

The IDS variables were compared between both intubating positions using chi-square test and their statistical significance was attempt intubation, laryngeal pressure, and Cormack-Lehane grading in between groups.

In ESP, 15 patients were easily intubated with no difficulty while as in sniffing position group only 9 patients were intubated easily. In ESP, 5 patients had moderate difficulty in intubation while as in SP group 11 patients had moderate difficulty in intubation. Which was statistically significant (P<0.05*) in between groups.

Schmitt HJ, Mang H (2002)[13] concluded that elevation of the head and neck beyond the sniffing position may improve visualization of glottic structures in cases of difficult direct laryngoscopy, leading to better intubation performance.

Prakash S et al (2011)[10] found that the IDS score [median (IQR)] was 0 (0-2) in the sniffing group and 1 (0-2) in the simple extension group (p = 0.002). There were significant differences between groups regarding intensity of lifting force, external laryngeal manipulation, alternate techniques used, number of attempts, and the stance adopted by anesthesiologist.

Mehmooda Akhtar et al (2017)[14] found that the IDS score differed significantly between sniffing group and simple extension group (*P* = 0.000) with an increased difficulty during intubation in the simple head extension. Patients with simple head extension needed more lifting force, increased use of external laryngeal manipulation, and an increased use of alternate techniques during intubation when compared to SP.

Changes in CLG from SP to ESP are shown better improvement in ESP group as compared to SP group in our study.

Adnet F et al (2001)[12] found that the sniffing position improved glottic exposure (decreased the Cormack grade) in 18% of patients ($p \geq 0.05$) and worsened it (increased the Cormack grade) in 11% of patients, as compared to simple extension. The Cormack grade distribution was not significantly modified between the two groups.

Collins JS et al (2004)[15] found that the "ramped" position improved the laryngeal view when compared to a standard "sniff" position, and this difference was statistically significant (P=0.037).

Singhal SK et al (2008)[16] concluded that glottis visualization and intubation difficulty score are better in sniffing position as compared to simple head extension. It is too early to abandon this gold standard (sniffing position) for direct laryngoscopy and tracheal intubation.

CONCLUSION

We conclude that elevated sniffing position of the neck was found to be statistically and clinically significant over standard SP. However, larger trials with magnetic resonance imaging guided studies are required to draw a definite conclusion regarding the ideal position for laryngoscopy and intubation.

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