Head position for better visualization of glottis to improve first-pass intubation: a narrative review

Ashis Shrestha
Asst. Prof., Dept. of General Practice and Emergency Medicine, Patan Hospital, Patan Academy of Health Sciences, Lalitpur, Nepal

ABSTRACT

Introduction: Sniffing position has been suggested to improve the visualization of the glottis during endotracheal intubation however, there are controversies regarding the various position. Therefore, this review is conducted to evaluate the recent evidence.

Method: Articles available in google scholar on sniffing position and various other positions for intubation was retrieved. Out of 200 articles published from 2018 to 2022, 14 articles were retrieved for review.

Result: The sniffing position was found to be better than the head extension position. However, a few other studies did not give the consistent result to state sniffing position to be better. Head elevation to 5 cm was found to be consistent with aligning the external auditory meatus with the sternal notch. This improved glottis views. This result was also not consistent with all studies. The ramped position was found to be frequently used in obese patients with mixed evidence of benefit. One of the studies reported a modified ramped position in obese females and claimed to have improved laryngeal view.

Conclusion: There is inconsistency in evidence, however as there is no evidence of harm, it is wise to use sniffing position for intubation, ramped or modified ramped position for obese patients.

Keywords: Non-supine tracheal intubation, sniffing position, supine tracheal intubation

CORRESPONDENCE
Dr. Ashis Shrestha
Dept. of General Practice and Emergency Medicine, Patan Hospital, Patan Academy of Health Sciences, Lalitpur, Nepal
Email: ashisshrestha@pahs.edu.np

INTRODUCTION

The sniffing position is accepted as the best position for visualization of the glottis during endotracheal intubation using a laryngoscope. The position was formally described as lower cervical flexion and extension of the head at the atlanto-occipital junction.[1] The ideal angle for lower cervical flexion and extension at the atlanto-occipital junction was 35^0 and 15^0 respectively.[2] The three axes alignment theory was proposed, in which it was thought that the mouth, pharyngeal and laryngeal axis needs to be aligned for direct laryngoscopy.[3] Later it was concluded that it was impossible to align these three axis.[4] Further primary (oropharyngeal) and secondary curves (pharynx-glotto-tracheal) were proposed for clinical application. The primary curve is deviated towards right and secondary towards left, the point of inflection where this two-curve meet was between epiglottis and glottis in the laryngeal vestibule. It was determined that the success of direct laryngoscopy required that the primary curve and laryngeal vestibule align with the line of sight.[5] First, successful direct laryngoscopy requires that the primary curve and the laryngeal vestibule align with the line of sight. This was made possible by the sniffing position.[6] However, there are controversies regarding its superiority over simple head extension, and various studies have suggested that the sniffing position has no advantage on visualization of glottis and first-pass intubation.[7,8] However, are studies that further claim that elevated sniffing position has a greater chance of glottis visualization and first-pass intubation.[9,10] Therefore, to find out the recent evidence on the intubating position for first-pass intubation, this review was done.

METHOD

All published articles on head position for endotracheal intubation were searched using google scholar. The keyword used to search the articles was 'sniffing position', supine tracheal intubation', and non-supine tracheal intubation'. The search was done in February 2020 the articles were limited to the period of 2018 to February 2022. The abstract and title of the first 200 articles listed in google scholar were screened and 14 articles were identified that matched the objective of this review. Out of 14 articles, one was systemic review and meta-analysis, one was narrative review, one was a multicenter randomized pragmatic trial, four were a randomized controlled trial, two were prospective randomized cross over the trial, three were randomized comparative study, one was an observational study and one was a viewpoint. The retrieved articles were categorized under the comparative theme of sniffing position versus head extension position, sniffing position with head elevation at a different level, sniffing position versus ramped up position, and ramped up versus modified ramped up position. The finding of the study was analyzed and detailed data set was not analyzed.

RESULT

The sniffing position has been in practice to get a better view of glottis and improve first-pass intubation in an emergency. A randomized controlled trial was reported in 2021 to evaluate sniffing position with simple head extension suggested better visualization of the glottis with sniffing position. This study including 200 patients concluded that easy intubation and Cormack and Lehane grade I was seen more in the sniffing position group.[11] A randomized controlled trial that was published in 2018 compared sniffing and neutral position using channelled (KingVision®) and a non-channelled (C-MAC® D-blade) video laryngoscope in 200 adult patients. There was no significant difference in laryngoscopy time, intubation time, and success rate between the 'sniffing' and the neutral position when using the KingVision and the C-MAC video laryngoscopes.[12] Similarly, another randomized cross-over study was published in 2019 compared vocal cord view using fiber optic bronchoscope in the neutral and sniffing position. The study suggested that a neutral position improved the view of glottic opening than sniffing position during oral fiberoptic intubation. However, there was no difference in the difficulty of tube insertion between the two positions.[13]

The sniffing position is achieved by a fixed-size pillow kept below the head. The height of the pillow makes difference in the better visualization of the glottis. A comparative study published from Nepal in 2019 compared neutral position with a non-compressible pillow of 5 cm and 10 cm height for laryngoscopic view. The study demonstrated that using a pillow to elevate the head provides a better view compared to laryngoscopy at the neutral position. The study further stated that the 'sniffing' position using a 5-cm pillow had the best views when compared with laryngoscopy with a 10 cm pillow.[14] Another comparative study from Indonesia was published in 2020 comparing fixed height pillows and adjustable pressure infusion bag pillows. The result suggested that the use of pressure infusion bag for adjustable-pillow height provides more success in intubation condition by head elevated position than the fixed height of 10

cm.[15] The study from Nepal however has not mentioned how many patients with difficult airway was in the 5 cm and 10 cm group similarly the study from Indonesia has excluded anticipated difficult airway.

The glottis view is better when external auditory meatus (EAM) and sternal notch are at the same horizontal level. This can be achieved by adjustable-pillow as the height required for the different individuals may be different. A randomized controlled trial published in 2018 concluded that the EAM and the sternal notch give better glottic visualization and intubating conditions, difficult airway was however excluded from this study as well.[16] There is limited evidence showing that sniffing position which is external auditory meatus and the sternal notch at the same horizontal level and 1.5-inch cushion added to achieve further elevation has an advantage.[17] A comparative study done in 2019 comparing laryngoscopy position attained by 7 cm high pillow and that attained by horizontal alignment of an external auditory meatus-sternal notch(AM-S). The study concluded that the AM-S line alignment provides a better laryngeal view, better intubating conditions, and requires lesser time to intubate as compared to a conventional 7 cm-head raise. The mean value for AM-S alignment was 4.9 cm stating that a 5 cm fixed height pillow may achieve a good view.[18]

Table 1a. Summary of articles retrieved for the analysis

S. No.	Authors/Date of publication	Title	Type of study	Summary
1	Singh A et al/2021	Evaluation of Intubating Conditions during Direct Laryngoscopy using Sniffing Position and Simple Head Extension-A RCT	Randomized controlled trial, (N=220)	Easy intubation and Cormack Lehane grade I was seen more in patient in the sniffing position group.[11]
2	Mendonaca C et al./2018	A randomized clinical trial comparing the 'sniffing' and neutral position using channelled and non-channelled video laryngoscopes.	Randomized controlled trial, (N=200)	There was no difference in the ease of intubation between the 'sniffing' and the neutral position in patients undergoing tracheal intubation.[12]
3	Park S et al/2019	Comparison of vocal cord view between neutral and sniffing position during orotracheal intubation using fiberoptic bronchoscope: a prospective, randomized cross-over study.	Prospective randomized crossover trial (N=56)	Neutral position improved the view of glottic opening than sniffing position during oral fiberoptic intubation. However, there was no difference in the difficulty of tube insertion between the two positions.[13]
4	Acharya P/2019	Effect of Head Elevation to Different Heights in Laryngeal Exposure with Direct Laryngoscopy.	Randomized comparative study (N=150)	The use of 5cm pillow in the 'sniffing' position obtains the best laryngoscopic view during direct laryngoscopy.[14]
5	Shankar K et al/2020	Comparison of glottis views with fixed-height pillow versus adjustable-pillow height by pressure infusion bag for successful intubation.	Randomized comparative study (N=100)	Adjustable-pillow height provides more success in intubation condition by head elevated position than the fixed height of 10 cm.[15]
6	Dhar M et al/2018	A randomized comparative study on customized versus fixed sized pillow for tracheal intubation in the sniffing position by Macintosh laryngoscopy.	Randomized comparative study (N=134)	Aligning External auditory meatus and the sternal notch gives better glottic visualization than Customizing pillow for intubation.[16]
7	Mohta M/2018	An aid to airway management.	Viewpoint	Limited evidence available on the role of head elevation beyond the standard sniffing position in airway management.[17]

The glottic view can be improved by elevating the back of the patient. A comparative study published in 2019 in emergency setup compared endotracheal intubation in supine and non-supine (back elevation) positions. This study showed no difference in first-pass success and overall glottis view in the supine and non-supine group. Adverse effects like hypoxia, hypotension were more common in the non-supine group. However, the study, oxygenation did not appear to differ significantly between ramped position versus sniffing positioning, ramped positioning was associated with more difficult intubation, more laryngoscopy attempts, and worse glottis views.[22]

Table 1b. Summary of articles retrieved for the analysis

S. No.	Authors / Date of publication	Title	Type of study	Summary
1	Pachisia A et al/2019	Comparative evaluation of laryngeal view and intubating conditions in two laryngoscopies positions-attained by conventional 7 cm head raise and that attained by horizontal alignment of external auditory meatus - sternal notch line – using an inflatable pillow - A prospective randomized cross-over trial.	Prospective randomized crossover trial (N=100)	External Auditory Meatus-Sternal notch line alignment provides better laryngeal view, better intubating conditions and requires lesser time to intubate as compared to a conventional 7-cm-head raise. The size of pillow used for head raise should be individualised.18
2	Stoecklein HH/2019	Multicenter Comparison of Non-supine Versus Supine Positioning During Intubation in the Emergency Department: A National Emergency Airway Registry(NEAR) Study.	Observational study - secondary data (N=11,480)	ED providers utilized supine position in most ED intubations but were more likely to use non-supine position for patients who were obese or in whom they predicted a difficult airway. There were no differences in first-pass success between groups.19
3	Kumar VH/2020	Patient positioning and glottic visualization: A narrative review	Narrative review	To achieve alignment of external auditory meatus to the sternal notch, a small child required a small pillow, an older child or an adult required a bigger pillow and obese patients needed the ramped position.20
4	Hasanin A et al/2020	Modified-ramped position: a new position for intubation of obese females: a randomized controlled pilot study	Randomized controlled trial (N=60)	The modified-ramped position provided better intubating conditions, improved the laryngeal view, and eliminated the need for repositioning of obese female patients during insertion of the laryngoscope compared to ramped position.21
5	Kaiser SK et al/2018	Randomized Trial of Ramped Position vs Sniffing Position During Endotracheal Intubation of Critically Ill Patients	Multicenter randomized pragmatic trial (N=260)	Ramped position did not improve oxygenation during endotracheal intubation of critically ill patients compared to sniffing position. Ramped position may worsen glottic view and increase the number of laryngoscopy attempts required for successful intubation.22
6	Okada Y et al/2021	Ramped versus sniffing position for tracheal intubation: A systematic review and meta-analysis.	Systemic review and meta-analysis (N=513)	This systematic review and meta-analysis indicated no favorable aspects of the ramped position as compared to the sniffing position.21
7	Tsan SHE et al/2020	Comparison of Macintosh Laryngoscopy in Bed-up-Head–Elevated Position With GlideScope Laryngoscopy: A Randomized, Controlled, No inferiority Trial.	Randomized controlled non-inferiority trial (N=138)	Bed up head extension intubation position was non inferior to glidescope assisted intubation. 24

However, a narrative review was published in 2020 to summarize the evidence on the height of the non-supine group included more obese patients and anticipated difficult airways.[19] There is a practice of intubating patients in non-supine or backup position in an obese patient this is called ramped position. This position was achieved by elevation of the shoulders at 25^0 and the head tilt achieving alignment of the sternal notch and the external auditory meatus.[20,21] A comparative study published in 2018 compared ramped versus sniffing position in the critically ill patient. In this pillow, head position, backup position and head-elevated laryngoscopy position (HELP) for optimal glottic view suggested that 25° backup and HELP position improved glottic view in comparison to supine sniffing position. To achieve alignment of external auditory meatus to the sternal notch, a

small child required a small pillow, an older child or an adult required a bigger pillow and obese patients needed the ramped position.[20] A systemic review and meta-analysis published in 2020 were aimed to determine the efficacy and safety of tracheal intubation in the ramped versus sniffing position. This systematic review and meta-analysis indicated no favorable aspects of the ramped position as compared to the sniffing position.[23] The comparison has also been done using conventional Macintosh and GlideScope for glottis view in ramped position. This non-inferiority randomized controlled trial published in 2020, found that laryngoscopy in the bed-up-head-elevated (BUHE) position was non-inferior to video-assisted laryngoscopy. However, the post hoc analysis specifically examining the primary outcome in Cormack–Lehane 3 patients did not show a statistically significant difference.[24] To improve first-pass intubation modified ramp position was evaluated in obese female. This position was achieved using a special pillow (Hasanin Pillow). The pillow's height and length were 15 cm and 60 cm.[21] A study was done with 60 patients assigned randomly to ramped and modified ramped groups in 2020. The study suggested a lower incidence of difficult mask ventilation, shorter time for glottis visualization, and shorter time for ETT insertion in the modified ramped group.[21] Summary of the study is listed in table 1a and 1b

CONCLUSION

The available evidence is not sufficient to recommend a specific head position for better glottis view during laryngoscopy for endotracheal intubation. However, considering the theory of primary and secondary curves, the sniffing position has been shown to improve the glottis view therefore this position can still be recommended as there is no study stating harm from due to this position. The study further lacks clarity on the information of the obese and non-obese groups. Furthermore, it was seen from the studies that there is a practice of putting obese patients in ramped positions to facilitate a better glottis view. However, the evidence is from the comparison of a mixed group that included both obese and non-obese patients in the same pool. There was only one study that looked into obese females that concluded the modified ramped position to be better. Therefore, in the scenario of the paucity of evidence to conclude, it is a good practice to intubate an obese patient in a ramp-up position.

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