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Original Research Article

COMPARATIVE EFFICACY OF SNIFFING POSITION VERSUS SIMPLE HEAD EXTENSION FOR GLOTTIC VISUALIZATION USING VIDEO LARYNGOSCOPY

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ABSTRACT

Background: Optimal head positioning during endotracheal intubation is critical for successful glottic visualization and ease of intubation. The sniffing position (SP) is traditionally advocated, but its superiority over simple head extension (SHE) remains debated, particularly with video laryngoscopy (VL). **Objective:** To compare the efficacy of SP versus SHE for glottic visualization and intubation ease using VL in patients undergoing elective surgery under general anesthesia. **Materials and Methods:** A quasi-observational study was involving 720 patients (ASA I–II, aged 18–60 years) randomized into two groups (n=360 each): SP and SHE. Glottic visualization was assessed using the Cormack-Lehane (CL) grading system, and intubation ease was evaluated with the Intubation Difficulty Scale (IDS). Statistical analysis employed Chi-square tests, unpaired t-tests, and Mann-Whitney tests ($p<0.05$ significant). **Result:** SP significantly improved glottic visualization, with lower CL grades IIb and III (8.0% vs. 14.2%, $p<0.01$) and reduced mean intubation time (16.67s vs. 19.06s, $p<0.01$) compared to SHE. Single-attempt intubation success was higher in SP (96.1% vs. 89.4%, $p<0.01$), and mean IDS scores were lower (1.2 vs. 1.8, $p<0.01$). **Conclusion:** SP enhances glottic visualization and facilitates easier intubation compared to SHE when using VL, supporting its use as the preferred position for elective surgeries.

INTRODUCTION

Endotracheal intubation is a cornerstone of airway management in general anesthesia, ensuring a secure airway and effective ventilation.[1] Direct Laryngoscopy (DL) has historically been the standard, but video laryngoscopy (VL) has revolutionized intubation by providing enhanced laryngeal visualization without requiring precise alignment of oral, pharyngeal, and laryngeal axes.[2,3] The sniffing position (SP), characterized by neck flexion and head extension with support of pillow, is traditionally recommended to optimize glottic exposure during DL.[4] However, its necessity with VL, which mitigates alignment challenges, is questioned.[5] Simple head extension (SHE), involving head extension without a pillow, is an alternative that may simplify positioning, particularly in resource-limited settings.[6]

Debates persist regarding the optimal head position for VL. The three-axis alignment theory (TAAT) supports SP by suggesting alignment of oral, pharyngeal, and laryngeal axes.[7] Contrarily, studies using MRI challenge TAAT, indicating no anatomical axis alignment in SP.[8] Greenland's two-curve theory proposes that SP reduces oropharyngeal and pharyngo-glotto-tracheal curvatures, enhancing visualization.[9] Recent studies yield mixed results, with some favoring SP for difficult airways, while others find no advantage over SHE in normal airways.[10,11] This study compares SP and SHE for glottic visualization and intubation ease using VL in an Indian cohort, addressing the paucity of region-specific data.

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MATERIALS AND METHODS

Study Design and Setting: A quasi-observational study was conducted in our hospital, from January 1, 2023, to December 31, 2023, after approval from the Institutional Ethical Committee.

Participants: A total of 720 patients (aged 18–60 years, ASA I–II) scheduled for elective surgery under general anesthesia were enrolled after providing written informed consent. Exclusion criteria included emergency surgeries, age <18 or >60 years, limited neck mobility, neck swelling, facial/neck deformities, or anticipated difficult intubation per LEMON criteria.

Sample Size Calculation: The sample size was calculated using the formula:

$N = (Z\alpha + Z\beta)^2 \times 2 \times p(1-p) / d^2$

Where $Z\alpha = 1.96$ (95% confidence, two-tailed), $Z\beta = 0.84$ (80% power, one-tailed), p = proportion of difficult intubation (estimated 0.1), and d = desired difference (8.7%). This yielded 360 patients per group (total N=720).

Randomization and Intervention: Patients were randomized into two groups (n=360 each) using purposive sampling:

- Group A (SHE): Head in simple extension without a pillow.
- Group B (SP): Head on a 7-cm incompressible pillow with neck flexion and head extension.

Procedure: Pre-anesthetic evaluation included clinical history, systemic examination, and airway assessment (Mallampati grading, LEMON criteria). On the surgery day, standard monitors (PR, NIBP, SpO2, ECG, RR) were attached, and anesthesia was induced per protocol. Laryngoscopy was performed using a TUORenkingtaek® VL (disposable blade, MD 11, size 3–5) by an experienced anesthesiologist. Glottic visualization was graded using the Cormack-Lehane (CL) system, and intubation ease was assessed with the Intubation Difficulty Scale (IDS). A PVC-cuffed endotracheal tube was used, and anesthesia was maintained per standard protocols. Vitals and adverse events (e.g., sore throat, hoarseness) were monitored intra- and postoperatively for 24 hours.

Statistical Analysis: Qualitative data were presented as frequencies/percentages and analyzed using Chi-square tests. Quantitative data (mean ± SD) were compared using unpaired t-tests (normal data) or Mann-Whitney tests (non-normal data). A p-value <0.05 was considered significant. Analysis was performed using SPSS v26.0, with graphical representations in Microsoft Excel 2021.

RESULTS

Of 720 patients, 64% were male, with a mean age of 34.11 years (p=0.11 between groups). Anthropometric parameters (height, weight, BMI) and ASA grades (66.1% grade I, 33.9% grade II) were comparable (p>0.05). Mallampati grading predicted difficult intubation in 13.9% of SHE cases versus 7.5% in SP (p<0.01).

Glottic Visualization: SP showed significantly lower CL grades IIb and III (5.8% and 2.2%, total 8.0%) compared to SHE (10.3% and 3.9%, total 14.2%, p<0.01).

Intubation Ease: Mean intubation time was shorter in SP (16.67s ± 3.2) than SHE (19.06s ± 3.8, p<0.01). Single-attempt intubation succeeded in 96.1% of SP cases versus 89.4% in SHE (p<0.01). IDS scores were lower in SP (mean 1.2 ± 0.9) than SHE (1.8 ± 1.2, p<0.01), with IDS >5 in 1.9% of SP versus 3.9% of SHE cases (p<0.01). No significant differences were observed in the number of operators (p=0.128), alternative techniques (p=0.16), lifting force (p=0.198), external laryngeal manipulation (p=0.275), or vocal cord position (p=0.065).

Adverse Events: No significant differences in adverse events (e.g., sore throat, hoarseness) were noted between groups.

Table 1: Demographic and Baseline Characteristics

Parameter	Simple Head Extension (SHE, n=360)	Sniffing Position (SP, n=360)	p-value
Mean Age (years)	34.11 ± 10.2	34.11 ± 10.1	0.11
Gender (% Male)	64% (230/360)	64% (230/360)	0.51
Mean BMI (kg/m²)	20.85 ± 3.1	20.85 ± 3.0	>0.05
ASA Grade I (%)	66.1% (238/360)	66.1% (238/360)	0.93
ASA Grade II (%)	33.9% (122/360)	33.9% (122/360)	0.93
Mallampati Grade III/IV (%)*	13.9% (50/360)	7.5% (27/360)	<0.01

*Note: Mallampati grading predicted difficult laryngoscopy/intubation.

Table 2: Glottic Visualization (Cormack-Lehane Grades)

CL Grade	SHE (n=360)	SP (n=360)	p-value
Grade I (%)	75.0% (270/360)	80.0% (288/360)	-
Grade IIa (%)	10.8% (39/360)	12.0% (43/360)	-
Grade IIb (%)	10.3% (37/360)	5.8% (21/360)	<0.01
Grade III (%)	3.9% (14/360)	2.2% (8/360)	<0.01
Grade IV (%)	0.0% (0/360)	0.0% (0/360)	-
Total Difficult (IIb + III) (%)	14.2% (51/360)	8.0% (29/360)	<0.01

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Table 3: Intubation Ease Metrics

Parameter	SHE (n=360)	SP (n=360)	p-value
Mean Intubation Time (seconds)	19.06 ± 3.8	16.67 ± 3.2	<0.01
Single-Attempt Success (%)	89.4% (322/360)	96.1% (346/360)	<0.01
Multiple Attempts (%)	10.6% (38/360)	3.9% (14/360)	<0.01
Mean IDS Score	1.8 ± 1.2	1.2 ± 0.9	<0.01
IDS Score >5 (%)	3.9% (14/360)	1.9% (7/360)	<0.01

Table 4: Secondary Intubation Parameters

Parameter	SHE (n=360)	SP (n=360)	p-value
Single Operator (%)	95.8% (345/360)	98.1% (353/360)	0.128
Alternative Techniques (%)	4.7% (17/360)	1.9% (7/360)	0.16
High Lifting Force (%)	15.8% (57/360)	12.2% (44/360)	0.198
External Laryngeal Manipulation (%)	11.9% (43/360)	9.2% (33/360)	0.275
Vocal Cord Adduction (%)	12.5% (45/360)	8.1% (29/360)	0.065

DISCUSSION

This study demonstrates that SP significantly enhances glottic visualization and intubation ease compared to SHE when using VL. The lower incidence of CL grades IIb and III in SP aligns with Greenland's two-curve theory, suggesting reduced airway curvature facilitates better visualization.[9] The shorter intubation time and higher single-attempt success in SP corroborate findings by Sahay et al,[11] who reported improved glottic exposure with SP. The lower IDS scores in SP reflect reduced intubation difficulty, consistent with Prakash et al,[13] who noted SP's superiority in intubation ease.

Contrary to Adnet et al.'s findings, which questioned SP's anatomical basis,[8] our results support SP's clinical efficacy, possibly due to VL's enhanced visualization capabilities. The lack of significant differences in lifting force or external manipulation suggests VL mitigates some challenges associated with SHE, yet SP remains superior. The Indian cohort's demographic profile, with a mean BMI of 20.85 kg/m², may influence results, as obesity can exacerbate intubation difficulty in SHE.[14]

Limitations include the quasi-observational design and exclusion of patients with anticipated difficult airways, limiting generalizability. Future studies should explore SP's efficacy in difficult airway scenarios and diverse populations.

CONCLUSION

SP is superior to SHE for glottic visualization and intubation ease using VL, with better CL grades, shorter intubation times, higher single-attempt success, and lower IDS scores. We recommend SP as the standard position for VL in elective surgeries.

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