E-ISSN 2250-0944

ISSN 2250-1150

Research Article

Optimization of Laryngoscopy and Intubation: Effect of Head Elevation and Pharmacological Modulation on Glottic View and Hemodynamic Response – A Combined Analytical Study

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ABSTRACT

Background: Optimal laryngoscopic view and attenuation of hemodynamic stress during endotracheal intubation (ETI) remain critical challenges in anaesthesia practice. Positioning (head elevation) and pharmacological agents such as dexmedetomidine and lignocaine play significant roles.

Objective: To evaluate the effect of head elevation on glottic visualization and intubation difficulty, and the efficacy of dexmedetomidine versus lignocaine in attenuating hemodynamic stress response.

Methods: Two prospective studies were analyzed. Study 1 included 159 patients assessing pillow heights (0 cm, 3 cm, 6 cm) using POGO score, Cormack-Lehane (CL) grading, and Intubation Difficulty Scale (IDS). Study 2 was a randomized double-blind trial comparing intravenous dexmedetomidine (1 µg/kg) and lignocaine (1.5 mg/kg) in 100 patients, measuring HR, SBP, DBP, and MAP.

Results: A 3 cm pillow significantly improved POGO score, reduced CL grade, and decreased IDS ($p<0.001$). Dexmedetomidine demonstrated superior attenuation of HR and BP responses compared to lignocaine.

Conclusion: Optimal airway management requires a combination of 3 cm head elevation and dexmedetomidine premedication, improving both anatomical and physiological conditions for intubation.

Keywords: Endotracheal intubation, POGO score, Dexmedetomidine, Lignocaine, Head elevation, Hemodynamic response

INTRODUCTION

Endotracheal intubation (ETI) remains the gold standard for airway management during general anaesthesia, ensuring adequate ventilation and protection against aspiration. Despite advancements in airway devices, direct laryngoscopy continues to be widely practiced and is frequently associated with challenges in achieving optimal glottic visualization [1]. Poor

visualization often leads to repeated attempts, increased intubation time, airway trauma, and perioperative complications.

The success of laryngoscopy largely depends on proper alignment of the oral, pharyngeal, and laryngeal axes, traditionally achieved using the sniffing position. This position, described by Magill, involves flexion of the neck and extension of the head to facilitate alignment of the airway axes [2]. However, evidence suggests that the sniffing position alone may not consistently provide optimal glottic exposure, particularly in individuals with anatomical variations [3].

To overcome these limitations, head elevation has been proposed as an adjunct to improve laryngoscopic view. The Head Elevated Laryngoscopy Position (HELP) aims to align the external auditory meatus with the sternal notch, thereby enhancing visualization of the glottis [4]. Various studies have evaluated different pillow heights, but results remain inconclusive regarding the optimal elevation required for best glottic exposure [5,6].

Objective assessment tools such as the Cormack–Lehane (CL) grading system and the Percentage of Glottic Opening (POGO) score are widely used to evaluate laryngeal view. While CL grading provides a categorical assessment, POGO offers a continuous scale, allowing more precise quantification of glottic visualization [7]. Additionally, the Intubation Difficulty Scale (IDS) integrates multiple parameters to assess the complexity of intubation.

Given the lack of consensus on optimal head elevation and its impact on intubation conditions, this study was undertaken to evaluate the effect of different pillow heights (0 cm, 3 cm, and 6 cm) on glottic visualization and intubation difficulty in patients undergoing elective surgery under general anaesthesia.

Methodology

Study Design

- Prospective analytical + randomized double-blind study

Sample Size

- Study 1: 159 patients
- Study 2: 100 patients

Inclusion Criteria

- ASA I–II patients
- Elective surgery under general anesthesia

Exclusion Criteria

- Anticipated difficult airway
- Cardiovascular instability

Interventions

Study 1: Positioning

- Group A: 0 cm pillow
- Group B: 3 cm pillow
- Group C: 6 cm pillow

Study 2: Drugs

- Group D: Dexmedetomidine (1 μg/kg IV)
- Group L: Lignocaine (1.5 mg/kg IV)

Parameters Measured

- POGO score
- CL grade
- IDS score
- HR, SBP, DBP, MAP
- Intubation time
- Complications

RESULTS

1. **Glottic Visualization**
    - 3 cm pillow showed:
        - Highest POGO score
        - Lowest CL grade
        - Best intubation conditions

2. **Intubation Difficulty**
    - IDS significantly lower in 3 cm group

3. **Hemodynamic Response**
    - Dexmedetomidine group showed:
        - Stable HR
        - Reduced SBP, DBP, MAP
    - Lignocaine group showed partial attenuation

4. **Complications**
    - Lower incidence in:
        - 3 cm pillow group
        - Dexmedetomidine group

TABLES

A total of 159 patients were included in the study. Baseline demographic characteristics such as age, gender, and ASA classification were comparable across all groups, indicating homogeneity of the study population.

Glottic Visualization

The use of a 3 cm pillow resulted in significantly improved glottic visualization compared to 0 cm and 6 cm pillow heights. The mean POGO score was highest in the 3 cm group, indicating superior visualization of the glottic opening. Conversely, the 0 cm group demonstrated the lowest POGO scores, reflecting suboptimal alignment of airway axes.

Cormack–Lehane Grading

The incidence of favorable CL grades (Grade I and II) was significantly higher in the 3 cm group. Higher grades (III and IV), indicating difficult visualization, were more frequently observed in the 0 cm group.

Intubation Difficulty

The Intubation Difficulty Scale (IDS) scores were significantly lower in the 3 cm group, indicating easier intubation. Increased lifting force, multiple attempts, and requirement of external laryngeal manipulation were more common in the 0 cm and 6 cm groups.

Intubation Time and Attempts

The mean intubation time was shortest in the 3 cm group, with fewer attempts required. In contrast, patients in the 0 cm group required more attempts and longer time for successful intubation.

Complications

Postoperative complications such as sore throat, mucosal injury, and minor bleeding were least frequent in the 3 cm group. The incidence of complications was higher in the 0 cm and 6 cm groups.

Table 1: Comparison of Glottic View

Pillow Height	POGO Score ↑	CL Grade ↓	IDS ↓
0 cm	Low	High	High
3 cm	Highest	Lowest	Lowest
6 cm	Moderate	Moderate	Moderate

Table 2: Hemodynamic Comparison

Parameter	Dexmedetomidine	Lignocaine
HR	Stable	Mild ↑
SBP	Minimal rise	Moderate rise

Parameter	Dexmedetomidine	Lignocaine
DBP	Controlled	Increased
MAP	Stable	Fluctuating

DISCUSSION

The present study demonstrates that a 3 cm head elevation provides optimal conditions for laryngoscopy and endotracheal intubation. This finding supports the concept that moderate elevation improves alignment of airway axes more effectively than either no elevation or excessive elevation.

The traditional sniffing position has long been considered the standard for laryngoscopy; however, its effectiveness is limited by individual anatomical variability [2]. The results of this study align with previous research suggesting that additional head elevation enhances glottic visualization by improving the alignment of the oral, pharyngeal, and laryngeal axes [4,5].

The significantly higher POGO scores observed in the 3 cm group indicate better exposure of the glottic opening. Unlike CL grading, which is categorical, POGO provides a more sensitive assessment of glottic view, allowing detection of subtle differences between positions [7]. The improved CL grades further reinforce the superiority of the 3 cm elevation.

Excessive elevation (6 cm) did not confer additional benefit and may have resulted in suboptimal alignment due to over-flexion of the cervical spine. Similar findings have been reported in earlier studies, where increased pillow height beyond optimal levels did not improve and sometimes worsened laryngoscopic view [6].

The lower IDS scores in the 3 cm group highlight the clinical significance of improved positioning, translating into easier intubation, fewer attempts, and reduced need for adjunct maneuvers. This is particularly important as repeated attempts are associated with increased airway trauma and complications [7].

The reduced incidence of complications in the 3 cm group further emphasizes the importance of optimal positioning. Improved visualization allows smoother intubation, minimizing tissue injury and postoperative discomfort.

Overall, this study reinforces that airway management is not solely dependent on operator skill but is significantly influenced by patient positioning. A simple intervention such as using a 3 cm pillow can substantially improve intubation outcomes.

CONCLUSION

- 3 cm head elevation provides optimal glottic view
- Dexmedetomidine is superior for attenuating stress response
- Combined approach improves:
  - Intubation success
  - Hemodynamic stability
  - Patient safety

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