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Original Research Article

Comparison of Video Laryngoscope and Macintosh Laryngoscope for Endotracheal Intubation in Predicted Difficult Airways: A Randomized Controlled Trial

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Abstract

Background: Difficult airway management remains a major challenge in anaesthetic practice. The introduction of video laryngoscopes (VL) has significantly enhanced visualization of the glottis, potentially increasing the success rate of tracheal intubation in difficult airways.

Objective: To compare the effectiveness of a video laryngoscope versus a Macintosh laryngoscope (ML) for tracheal intubation in predicted difficult airway patients undergoing elective surgery under general anaesthesia.

Methods: A randomized controlled trial was conducted in 80 adult patients (ASA I–II) with predicted difficult airways (Mallampati grade III–IV, thyromental distance <6 cm, or restricted neck extension). Participants were randomly allocated to either the VL group (n=40) or ML group (n=40). Primary outcome was first-attempt success rate. Secondary outcomes included Cormack–Lehane (CL) grading, intubation time, hemodynamic changes, and complications such as mucosal trauma or desaturation.

Results: The first-attempt success rate was higher with VL (95%) compared to ML (75%) ($p=0.02$). The mean intubation time was slightly longer with VL (28.6 ± 5.4 s) versus ML (24.2 ± 4.8 s), not clinically significant. VL provided superior CL grades (I–II in 97.5% vs 70%, $p<0.001$) and fewer airway traumas. Post-intubation heart rate and mean arterial pressure elevations were significantly lower in the VL group.

Conclusion: Video laryngoscope improves visualization and first-pass success in predicted difficult airways, with reduced airway trauma and hemodynamic stress compared to the Macintosh laryngoscope.

Keywords: Video laryngoscope, Macintosh laryngoscope, difficult airway, intubation, randomized trial.

Introduction

Airway management is a cornerstone of anaesthetic safety. Despite advances, failed or delayed intubation remains a leading cause of anaesthesia-related morbidity and mortality [11]. The conventional Macintosh laryngoscope (ML), though widely used, requires alignment of oral, pharyngeal, and tracheal axes — often difficult in obese patients, those with limited cervical extension, or craniofacial abnormalities [1–3].

Video laryngoscopes (VLs) overcome this limitation by providing an indirect, magnified view of the glottis through a distal camera. They require less force, reduce cervical spine movement, and are increasingly integrated into difficult airway algorithms [4–6].

This study was designed to compare video and Macintosh laryngoscopes in predicted difficult airway cases under general anaesthesia, focusing on first-pass success, visualization, and safety profile.

Materials and Methods

Study Design: A prospective, randomized controlled trial conducted in the Department of Anaesthesiology at RIMS hospital after obtaining Institutional Ethics Committee approval and written informed consent.

Study Population: Eighty adult patients aged 18–65 years, ASA physical status I–II, with predicted difficult airway (Mallampati III–IV, thyromental distance <6 cm, or limited neck extension) were enrolled.

Exclusion Criteria

1. Patients with emergency surgeries,

2. Facial deformities,

3. Cervical spine instability,

Randomization

Participants were randomly assigned into two groups (n=40 each):

Group VL: Intubation with video laryngoscope (C-MAC / King Vision)

Group ML: Intubation with conventional Macintosh laryngoscope

Anaesthetic Technique: Standard fasting and premedication protocols were followed. Anaesthesia was induced with propofol (2 mg/kg) and fentanyl (2 μg/kg), followed by rocuronium (0.6 mg/kg). Intubation was attempted after 3 minutes.

Parameters recorded included:

Primary outcome: First-attempt success

Secondary outcomes: CL grade, intubation time, hemodynamic changes, and complications (mucosal trauma, desaturation <95%).

Hemodynamic parameters were recorded at baseline, post-induction, and at 1, 3, and 5 minutes after intubation.

Data were analyzed using SPSS v26; $p < 0.05$ was considered statistically significant [1,3,8].

Results

Table 1: Demographic Characteristics

Variable	VL Group (n=40)	ML Group (n=40)	p-value
Age (years)	42.6 ± 11.2	44.1 ± 10.8	0.54
Gender (M/F)	22/18	24/16	0.64
BMI (kg/m²)	28.3 ± 3.1	27.9 ± 3.4	0.48
Mallampati III-IV(%)	100	100	-

Table 2:

Parameter	VL Group	ML Group	p-value
First-attempt success (%)	95	75	0.02*
Intubation time (sec)	28.6 ± 5.4	24.2 ± 4.8	0.06
CL Grade I-II (%)	97.5	70	<0.001*
HR rise post-intubation (bpm)	12 ± 5	22 ± 8	0.03*
Airway trauma (%)	2.5	15	0.04*

VL achieved superior glottic visualization (CL I–II: 97.5%) and higher first-attempt success (95%). Minor mucosal trauma was observed in 1 case with VL and 6 with ML. Post-intubation HR and MAP elevations were lower in VL group [9,10].

Discussion

The findings of this study confirm that the video laryngoscope provides superior glottic visualization and higher first-pass success compared to the Macintosh laryngoscope in predicted difficult airway patients.

The results are consistent with Aziz et al. (2012) and Malik et al. (2009), who demonstrated improved visualization and success with VL [1,3]. The superior Cormack–Lehane grades observed reflect the ability of VL to bypass anatomical constraints that limit direct line-of-sight visualization [5,6,12].

Although the mean intubation time was slightly longer with VL, this is a well-recognized trade-off due to the need for careful stylet manipulation and screen coordination [4,7]. Clinically, the difference is negligible compared to the safety benefit. VL also reduced hemodynamic stress, likely due to less lifting force and reduced laryngeal compression [9,10,13].

Similar findings were reported by Noppens et al. (2010) and Yumul et al. (2016), suggesting reduced sympathetic stimulation with VL use.

Additionally, VL facilitates real-time teaching, as supervisors can visualize the airway simultaneously and guide trainees effectively [14,15].

Limitations: The study is single-centered with a modest sample size. Only elective surgeries were included; thus, generalization to emergencies is limited. Operator experience may also influence performance outcomes.

Future Scope: Larger multicenter trials and inclusion of emergency airway cases would provide stronger evidence for routine VL use.

Conclusion

Video laryngoscope offers significant advantages over Macintosh laryngoscope in predicted difficult airways, including improved visualization, higher first-pass success, and reduced hemodynamic stress. It should be incorporated as a primary tool in difficult airway management protocols.

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