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Nasotracheal intubation, direct laryngoscopy and video laryngoscope

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Abstract
Background: Nasotracheal intubation (NTI) is performed after administering general anesthesia, where an endotracheal tube is inserted through the nose into the trachea, allowing delivery of anesthetic gases while providing clear access to the mouth and throat. It's commonly used in dental, oropharyngeal, and maxillofacial surgeries. Video laryngoscopy, including the Glidescope, provides an indirect view of the glottis via a camera, improving success in difficult airways.
Aims of the study: To determine the effect of using video laryngoscope for nasotracheal intubation regarding improvement in: ease of intubation, time of intubation and lowering postoperative moderate to severe sore throat.
Methods: The study was a parallel group, randomized controlled trial conducted at Al Sadr Medical City from 1st of September 2023 to 1st of September 2024, involving 50 patients undergoing elective oral and maxillofacial surgery. Patients were randomly divided into two groups: intubation with direct laryngoscopy or McGRATH MAC Video Laryngoscope. Data collected included demographics, BMI, intubation time, ease, attempts, and postoperative sore throat severity.
Results: The study compared 50 patients undergoing nasotracheal intubation using either a direct laryngoscope (DL) or video laryngoscope (VL). Both groups were similar in socio-demographic and clinical characteristics ($p > 0.05$). Significant findings included longer intubation time with VL (31.16 ± 3.9 vs. 16.36 ± 3.14 minutes, $p=0.001$), more difficult intubations with VL (40% vs. 0%, $p=0.001$), the intubation was successful from the first attempt among all patients in the first group vs 76% of patients in the second group ($p=0.009$).
Conclusion: The study found no significant socio-demographic differences between groups. Direct laryngoscopy resulted in shorter intubation times, easier intubation, higher first-attempt success rates, and similar postoperative sore throat prevalence.

Keywords: Nasotracheal intubation, direct laryngoscopy, video laryngoscope, McGrath MAC, airway management

Introduction

Nasotracheal intubation (NTI) is a commonly performed airway management technique in anaesthesia, particularly for dental, oral, and maxillofacial surgeries where unrestricted access to the oral cavity is required [1]. The procedure involves inserting an endotracheal tube through the nasal passage into the trachea after general anaesthesia induction, thereby ensuring continuous ventilation while leaving the mouth unobstructed for surgical access [2]. A sound understanding of the relevant anatomy—specifically the nasal vestibule, nasal cavity, nasopharynx, oropharynx, hypopharynx, and larynx—is vital for the safe execution of NTI. The nasal cavity extends from the nostrils to the posterior septum and communicates with the nasopharynx [3]. It is lined with ciliated pseudostratified columnar epithelium rich in vascular structures, such as Kiesselbach's plexus, making it susceptible to epistaxis [4]. Variations like septal deviation, turbinate hypertrophy, or nasal polyps can complicate the passage of the tube; thus, preoperative assessment of the nasal airway helps to select the more suitable nostril and minimize complications [5].

NTI is indicated in situations requiring oral surgical access or when the airway is threatened by obstruction, particularly in conscious patients, as it elicits less gag reflex and provides better tolerance than oral intubation [6]. Common indications include oropharyngeal and maxillofacial procedures, mandibular reconstruction, and extensive oral surgeries. However, the procedure is contraindicated in conditions that increase the risk of trauma or intracranial entry, such as suspected skull base fractures, midface instability, epiglottitis, or bleeding disorders. Relative contraindications include nasal polyps, choanal atresia, or recent nasal surgery.

Among the complications associated with NTI, epistaxis is the most frequent, occurring to varying degrees in nearly all cases [7]. Other complications include bacteremia, tissue trauma, and, rarely, perforation of nasopharyngeal or retropharyngeal structures. In patients with severe facial trauma, the procedure should be avoided due to the risk of intracranial placement of the tube [8].

Recent advances in airway management have introduced video laryngoscopy (VL) as an alternative to traditional direct laryngoscopy (DL) [9]. Video laryngoscopes, such as the Glidescope, incorporate a high-resolution camera at the blade tip, projecting the image of the glottis and surrounding anatomy onto a monitor [10]. The Glidescope offers several advantages: improved visualization of the vocal cords, higher success rates in difficult airway scenarios, reduced force and trauma during intubation, and enhanced teaching opportunities [11]. Moreover, its ability to record procedures is useful for clinical documentation and training [12]. However, drawbacks include higher cost, reliance on battery power, and the need for regular maintenance and calibration [13].

Conversely, direct laryngoscopy remains more accessible and affordable, requiring no technology and minimal maintenance. It is widely available in low-resource settings and simple to use for experienced practitioners [14]. Nonetheless, it demands greater physical force and may pose difficulties in patients with limited neck mobility or anatomical variations, potentially leading to airway trauma or failed intubation [15].

Comparatively, video laryngoscopy demonstrates higher success rates, faster intubation times, and fewer complications such as nasal and pharyngeal trauma [16]. It also serves as an effective educational tool for

anaesthesiology trainees [17]. This study aims to evaluate the impact of using a video laryngoscope during nasotracheal intubation in improving the ease and speed of intubation and reducing the incidence of postoperative moderate to severe sore throat [18].

Material and Methods

The study is a parallel group, randomized controlled trial to determine the effect of using a video laryngoscope for nasotracheal intubation regarding improvement in ease of intubation, time of intubation and lowering postoperative moderate to severe sore throat. Where, the study was conducted at Al Sadr medical city in AL Najaf city, during the period from 1st of September 2023 to 1st of September 2024. After the approval of the Iraqi Board of Medical Specialization and following authorization from the local ethical committee, patient consent was obtained prior to the operation

Fifty patients aged more than 18, ASA of grades I and II, BMI < 35 kg/m2, who were presented for elective oral and maxillofacial surgery under GA with nasotracheal intubation at Al Sadr medical city. They were included in the study and divided into two groups.

Group 1: (The direct laryngoscopy group): Twenty-five patients were intubated using a standard laryngoscope for direct visualization of the larynx.

Group 2: (the Glidoscope group): twenty-five patients were intubated through using of McGRATH MAC Video Laryngoscope (macintosh style blades) for indirect visualization of the larynx.

Patients with a history of difficult intubation, with basilar skull fractures, recent nasal surgery, nasopharyngeal obstruction (nasal polyps), patients with morbid obesity with BMI > 35, and patients receiving thrombolytics or anticoagulants have been excluded.

A questionnaire was developed for the study, and it includes the socio-demographic data including age, gender, educational level, residency and occupation, and American Society of Anesthesiologists score (ASA) and Cormak Lehane grade were assessed. Cormack Lehane grade was assessed, The MCLS was challenged by the Percentage of Glottic Opening score. Also, intuitively described, this measures the glottic opening on a scale of 0-100% with 0% being a non-visualized glottis [19].

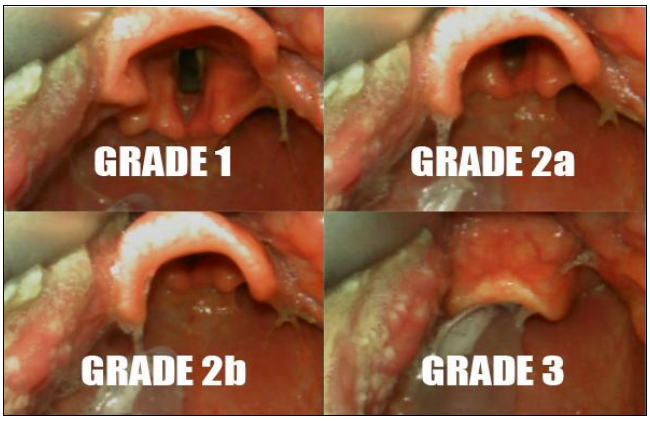

Fig 1: Cormack Lehane grade while Grade 1: full view of the glottis, Grade 2a: partial view of the glottis, Grade 2a: partial view of the glottis. Grade 3: epiglottis only, Grade 4: neither glottis or epiglottis identified.

Participants enrolled in the study underwent an anthropometric measure which included: measuring a hieght tape, and weight was measured using a weight scale, and then BMI was calculated (calculated as weight in kilograms divided by height in meters squared). Participants' BMI was then categorized into underweight (<18.5), normal weight (18.5–24.9), overweight (25–29.9) and obese (>30). The time required for intubation was recorded in seconds, starting from the removal of the bag mask and ending after the confirming bilateral breath sounds.

Thus. if the anesthesiologist had been success from the first intubation attempts, if not then the number of attempts required was counted, the number of endotracheal tube exchanges after placement, and the use of Magill forceps. The intubation success was defined as the placement of endotracheal tube and confirmed by equal bilateral breath sounds, end-tidal CO2 waveform, and lack of cuff leak. While the failed attempt was defined as the laryngoscope removal before the insertion of the endotracheal tube and restarting bag-mask ventilation. If the Tube exchanges was needed during the procedure, then its recorded. The Magill forceps were used if the nasotracheal tube was unable to be passed through the vocal cords with manipulation of head position, cricoid pressure, and gentle advancement of the tube. Magill forceps usage during intubation was recorded.

The patients were followed postoperatively to assess the severity of post-op sore throat. The sore throat was assessed at day one post operatively and recorded as no sore throat, mild, moderate, and severe. Informed consent was obtained from study participants, and they were assured about the confidentiality of the interview. As, the data set was checked for any missing data, then it was entered into the Statistical Package for the Social Sciences (SPSS) program version 24 which was used to code and analyze data. For the quantitative data the t-test was used, and the X2-test and Fisher's Exact tests were used for the qualitative data, to assess the association between groups and a P-value ≤ 0.05 was considered significant.

Results

The study included 50 patients who were presented for elective maxillofacial surgery and divided into two groups, 25 patients were intubated by a direct laryngoscope and the other 25 Patients were intubated by a video laryngoscope. The mean age for the DL group was 30.64 years and 35.04 years for the VL group and the two groups were matched so p-value=0.381. 72% of patients in the DL group were males and 52% of patients in the second group. Still, there is no significant difference between groups, p-value= 0.145. Regarding their occupation, 32% of patients in the first group were students and 32% of those in the VL group were housewives.

The highest percentage of patients in both groups lived in urban areas. There are no significant differences regarding all socio-demographic characteristics between the groups p-value >0.05. All these data are presented in Table 1.

Table 1: Socio-demographic characteristics among participants

Variables		Direct laryngoscope (N=25)	Video Laryngoscope (N=25)	p-value
Age	Mean ±SD Range	30.64±17.5 14-75	35.04 ±17.66 16-65	0.381
	<20	8 (32.0)	5 (20.0)	
	20-	6 (24.0)	12 (48.0)	
	30-	2 (8.0)	0 (0.0)	
	40-	7 (28.0)	2 (8.0)	
	>50	2 (8.0)	6 (24.0)	
Gender	Male	18 (72.0)	13 (52.0)	0.145
	Female	7 (28.0)	12 (48.0)	
Occupation	Students	8 (32.0)	7 (28.0)	0.267
	Housewife	7 (28.0)	8 (32.0)	
	Employee	6 (24.0)	4 (16.0)	
	Self-employee	4 (16.0)	2 (8.0)	
	Retired	0 (0.0)	4 (16.0)	
Residency	Rural	4 (16.0)	8 (32.0)	0.185
	Urban	21 (84.0)	17 (68.0)	
Education	Illiterate	5 (20.0)	2 (8.0)	0.282
	Primary	4 (16.0)	4 (16.0)	
	Secondary	10 (40.0)	7 (28.0)	
	College and higher education	6 (24.0)	12 (48.0)	

Table 2 shows the anthropometric measurements among participants; the mean weight was 71.16 kg in the DL group and 72.8 kg in the VL group and no significant difference was noticed since p-value=0.579. The mean height was 170.0 cm in the DL group and 168.56 cm in the VL group and p-value=0.582 was not significant. The mean BMI was 24.47in the DL group and 25.68 in the DL group and there is no significant difference as the p-value > 0.05.

Table 2: The anthropometric measurements among participants

Variables		Direct laryngoscope (N=25)	Video Laryngoscope (N=25)	p-value
Weight	Mean ±SD	71.16 ±11.56	72.8 ± 9.01	0.579
Height	Mean ±SD	170.0 ±7.8	168.56 ±10.4	0.582
BMI	Mean ±SD	24.47± 2.6	25.68 ± 3.03	0.137
	Normal (18.5-24.9)	10 (40.0)	12 (48.0)	
	Overweight (25-29.9)	15 (60.0)	11 (44.0)	
	Obese class I (30-34.9)	0 (0.0)	2 (8.0)	

The distribution of clinical tests among participants is presented in Table 3. Regarding the ASA grade II, 48% of those in the DL group and 72% of the patients in the VL group, p-value=0.082 which is not significant. The Cormack Lehane grade II was present among 48% of patients in the DL group and 60% of patients in the second group. P-value =0.395.

Table 3: The distribution of clinical tests among participants

Variables		Direct laryngoscope (N=25)	Video Laryngoscope (N=25)	p-value
ASA	I	13 (52.0)	7 (28.0)	0.082
	II	12 (48.0)	18 (72.0)	
Cormack Lehane grade	I	13 (52.0)	10 (40.0)	0.395
	II	12 (48.0)	15 (60.0)	

Table 4 shows the difference in the clinical parameters among patients. The mean time required to intubate patients with DL was 16.36 seconds and 31.16 seconds using the VL, p-value=0.001 which means a significant statistical difference. Regarding the ease of intubation, 44% of patients had easy intubation in the DL group and 40% of patients in the VL group had difficult intubation. There is a significant difference between the groups since p-value=0.001. The intubation was successful from the first attempt among all patients in the first group vs 76% of patients in the second group. p-value = 0.009.

The magil was used for all cases, and there's no tube exchange was needed.

Table 4: The difference in the clinical parameters among participants

Variables		Direct laryngoscope (N=25)	Video Laryngoscope (N=25)	p-value
Time to intubate	Mean ±SD	16.36± 3.14	31.16± 3.9	0.001
Ease of intubation	Easy	11 (44.0)	2 (8.0)	0.001
	Moderate	14 (56.0)	13 (52.0)	
	Difficult	0 (0.0)	10 (40.0)	
The success of the first attempt	Yes	25 (100.0)	19 (76.0)	0.009

	No	0 (0.0)	6 (24.0)	
Magil use	Yes	25(100.0)	25 (100.0)	1.000
	No	0 (0.0)	0 (0.0)	
Tube exchange	Yes	0 (0.0)	0 (0.0)	1.000
	No	25(100.0)	25 (100.0)	

Table 5 shows the prevalence and severity of postoperative sore throats among patients. The sore throat was assessed at day one post operatively. The sore throat was mentioned among 40% vs 56% of patients in the first and second groups respectively. There are no significant statistical differences between the two groups, p-value=0.258.

Table 5: The prevalence and severity of postoperative sore throat among patients

Variables		Direct laryngoscope (N=25)	Video Laryngoscope (N=25)	p-value
Post-operative sore throat	No sore throat	15 (60.0)	11 (44.0)	0.258
	Mild	10 (40.0)	14 (56.0)	
	Moderate	0	0	
	Severe	0	0	

Discussion

This study compared outcomes between patients intubated using direct laryngoscopy (DL) and those intubated with video laryngoscopy (VL), particularly the McGRATH MAC device [20]. Although VL is often promoted for improved visualization and success in difficult airways, this research found that DL demonstrated shorter intubation times, easier maneuverability, and higher first-attempt success [21]. The findings add to the ongoing debate about whether video laryngoscopes should replace direct laryngoscopes in routine airway management [22].

Demographically, both groups were similar in age, gender, occupation, residency, and education, indicating that socio-demographic factors did not influence intubation outcomes. The male predominance in the DL group (72 %) versus the VL group (52 %) was not statistically significant. These observations align with previous studies by Par *et al*. (2014) and Waddington *et al*. (2009) [23], who reported that variables such as age and gender do not affect intubation difficulty across different techniques [24].

Likewise, anthropometric factors such as weight, height, and BMI showed no significant differences between groups. Most participants were within normal or overweight BMI categories. This differs from Gaszynski *et al*. (2023) [25], who found that in morbidly obese patients, VL provides superior visualization. The absence of obese participants in the present study could explain why this advantage was not observed [25].

Regarding ASA classification and Cormack-Lehane grading, both groups had comparable distributions. Although VL theoretically enhances glottic visualization, this study found no significant difference, echoing findings from previous research suggesting that visualization quality is comparable between DL and VL in many clinical contexts [26]. However, some studies—such as Garg *et al*. (2023) and Amaniti *et al*. (2019) [28]—argued that VL significantly improves Cormack-Lehane grades, particularly in challenging airways [27]. The discrepancy may stem from operator experience, device type, or patient selection, underscoring the influence of user proficiency in VL performance [28].

A key result was the intubation time, which was markedly longer in the VL group (31.16 ± 3.9 s) compared with DL (16.36 ± 3.14 s). This contrasts with findings by Ruetzler *et al*. (2024) [29] showing that VL can reduce or match DL times when used by experienced operators [29]. The prolonged VL times in this study likely reflect a learning-curve effect, as operators require additional coordination between screen visualization and manual tube manipulation. Prior studies confirm that VL performance improves substantially with training, suggesting that the observed differences may diminish as experience increases [30].

Concerning intubation difficulty, DL was rated easier: 44 % of DL patients had only mild difficulty versus 8 % in the VL group, where 40 % encountered severe difficulty. This contradicts earlier reports (Lewis *et al*., 2016; Ruetzler *et al*., 2024) [31, 29] indicating that VL generally facilitates easier intubation, especially in anatomically difficult airways. Blade design may explain part of this difference—the study used a Macintosh-style VL blade, which might not offer the same advantage as hyperangulated designs in every airway configuration. Operator inexperience further contributed to this discrepancy [31].

The first-attempt success rate was also higher with DL (100 %) than VL (76 %), a result opposite to many studies, such as Sugata *et al*. (2023), who found VL to enhance first-pass success in difficult cases. Again, familiarity with the VL device is likely the decisive factor; as clinicians become more adept, success rates typically rise. This underlines the necessity of structured training programs before widespread VL adoption [32].

Postoperative complications such as sore throat was similar across groups, with slightly higher mild cases in the VL cohort (56 % vs. 40 %), but no severe cases in either group. These results correspond with Kapadia *et al*. (2021) [33], who noted that better visualization with VL does not necessarily reduce minor postoperative symptoms. Thus, both techniques appear safe in terms of airway trauma [33, 34].

Overall, this investigation challenges the general perception of VL superiority. Under the study conditions—moderate sample size, non-obese patients, and operators at varying experience levels—direct laryngoscopy produced faster intubation, easier handling, and higher first-pass success without increased complications. The findings emphasize that operator experience and case selection play critical roles in determining which method is most effective. Continued comparative studies with larger, diverse populations and standardized operator training are essential to clarify whether the apparent benefits of VL translate into consistent clinical advantage across all airway scenarios.

Conclusion

In conclude, this study compared the effectiveness of direct and video laryngoscopy in airway management. The results demonstrated that while both techniques are effective and safe, direct laryngoscopy provided faster intubation, greater ease of use, and a higher first-attempt success rate. However, postoperative sore throat rates were comparable between the two groups, suggesting similar safety outcomes. This study has reached into several findings and recommendations:

Findings

1. The direct laryngoscopy group showed significantly shorter intubation times compared to the video laryngoscopy group.
2. Patients intubated with direct laryngoscopy experienced easier intubation, with fewer cases of severe difficulty than those in the video laryngoscopy group.
3. The success rate on the first intubation attempt was significantly higher in the direct laryngoscopy group.
4. The prevalence of postoperative sore throat was similar in both groups, with no significant difference observed.

Recommendations

1. Larger, randomized, multicenter trials are recommended to confirm these findings and enhance their generalizability.
2. Because video laryngoscopy involves a learning curve, more extensive and structured training programs should be implemented to improve practitioner proficiency and reduce intubation time.
3. Further research should investigate the performance of video laryngoscopy in different surgical settings where its advantages may be more evident.
4. Future studies should assess a wider range of postoperative complications to provide a comprehensive understanding of the safety and efficacy of both intubation methods.

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