Original Article

Comparative evaluation of glidescope videolaryngosocope and conventional macintosh laryngoscope for nasotracheal intubation in patients undergoing oropharyngeal cancer surgeries: A prospective randomized study

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Abstract

Background and Aims: Nasotracheal intubation in oropharyngeal cancer patients is challenging owing to anatomical alterations. Various videolaryngoscopes have been compared to conventional laryngoscope and also amongst each other in different clinical scenarios; the supremacy of videolaryngoscopes over conventional laryngoscope in oropharyngeal cancer patients is yet to be established. We compared the efficacy of glidescope videolaryngoscopes and Macintosh laryngoscope for nasotracheal intubation in patients posted for routine oropharyngeal cancer.
Material and Methods: 120 ASA I and II oropharyngeal cancer patients scheduled for elective surgery were randomized to undergo nasotracheal intubation after induction of general anesthesia with glide scope video laryngoscope (Group GVL, N = 60) or Macintosh laryngoscope (Group L, N = 60) as per group allocation. Time to glottic view, total intubation time (primary objective), hemodynamic fluctuations, and additional manoeuvres to aid intubation were recorded.
Results: Time to visualize the glottic opening (9.20 ± 4.6 sec vs 14.8 ± 6.3 sec) (P = 0.000) and the total intubation time was significantly less in group GVL (35.6 ± 9.57 sec vs 42.2 ± 11 sec) (P = 0.001). Glidescope videolaryngosocpe provided better glottic views and resulted in significantly fewer manoeuvres to facilitate NTI (P = 0.009). The median numeric rating scale (NRS), hemodynamic parameters and complications were similar in both the groups.
Conclusion: Glidescope videolaryngosocpe is better than conventional Macintosh laryngoscope for intubation times and need of manoeuvres to facilitate intubation and should be a preferred device for NTI in patients with oropharyngeal cancer.

Keywords: Airway management, nasotracheal intubation, oropharyngeal cancers, videolaryngoscopes

Introduction

Nasotracheal intubation (NTI) in oropharyngeal cancer patients is challenging due to decreased mouth opening, reduced submandibular compliance and anatomical deformities of oropharyngeal structures.[1,2] Various modifications in techniques of NTI have been described from its inception in 1902.[3] A FFB-aided intubation has been considered as "gold standard" for anticipated difficult airway but its usefulness is limited by its availability and long learning curve. Videolaryngoscopes (VLs) are simpler and safer alternatives to FFB and require psychomotor

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skills comparable to conventional laryngoscopes.[4] Various authors have suggested that VLs improved the laryngeal view and the number of intubation attempts was reduced compared to conventional laryngoscope.[5,6] Videolaryngoscopes have been compared to other modalities of airway management in the anticipated difficult airway but the results are varied owing to lack of standardized population, infrequent and unpredictable incidences of the difficult airway (DA), and different criteria for the assessment of DA.[4,7-9] The GlideScope video laryngoscope (GVL) (Verathon Medical Inc., Bothell, WA, USA) has a 60 degree angulated blade and has been shown to facilitate NTI in maxillofacial surgeries.[7,10] The literature on the effectiveness of GVL for intubation in patients with oropharyngeal cancers is limited. VL like GVL reduce the force required during laryngoscopy and may cause reduced distortion of tissues.[11] This may be important especially in patients with oropharyngeal cancers. So, we compared GVL with conventional Macintosh laryngoscope for NTI in oropharyngeal cancer patients under general anesthesia.

Material and Methods

After institutional ethics committee's approval and written informed consent, 120 ASA Grade I and II patients (18-70 years) planned to undergo elective head and neck cancer surgery [Figure 1] and requiring nasal intubation as a part of anesthetic management were included in the study. The study was registered with clinical trial registry India before the start of the trial. (CTRI number CTRI/2016/07/007085).

A thorough preoperative airway assessment (inter-incisor distance, Mallampati grading, thyromental distance, and sternomental distance) was done by an anesthesiologist not involved in the study. Patients with an inter-incisor distance less than 1.5 cm, history of previous difficult intubation, nasal cavity polyps or any growth, coagulation disorders, and risk of pulmonary aspiration were excluded.

An otorhinolaryngologist blinded to the study protocol examined the nostrils for patency and abnormality with a rigid nasal endoscope. The more patent nostril was selected; in cases where both nostrils were patent, we chose the nostril opposite to the side of surgery for intubation. Drops of xylometazoline 0.05% were instilled in both the nostrils 15 minutes before the induction of anesthesia. After shifting the patient in the operation room, ASA standard monitors were attached followed by random allocation of patients to Macintosh laryngoscope (Group L; N = 60) or GVL (Group GVL; N = 60) groups based on the opaque sealed envelope just before anesthesia induction. All patients received intramuscular glycopyrrolate 0.2 mg half an hour before shifting the patient to the operating room and intravenous fentanyl 2 ug/kg before the intubation. All patients received 2 mg/kg propofol for anesthesia induction and muscle relaxation was achieved by vecuronium, 0.1 mg/kg after confirming mask. Thereafter, a nasopharyngeal airway lubricated with lignocaine jelly was introduced to dilate the nostril. All the patients were ventilated with sevoflurane 2-4% in 100% oxygen for 3 minutes; NTI was attempted with appropriate size cuffed flexo-metallic ETT (7.5 mm ID in males and # 7.0 mm ID in females). A fixed-length (distance between the nostrils to the angle of the

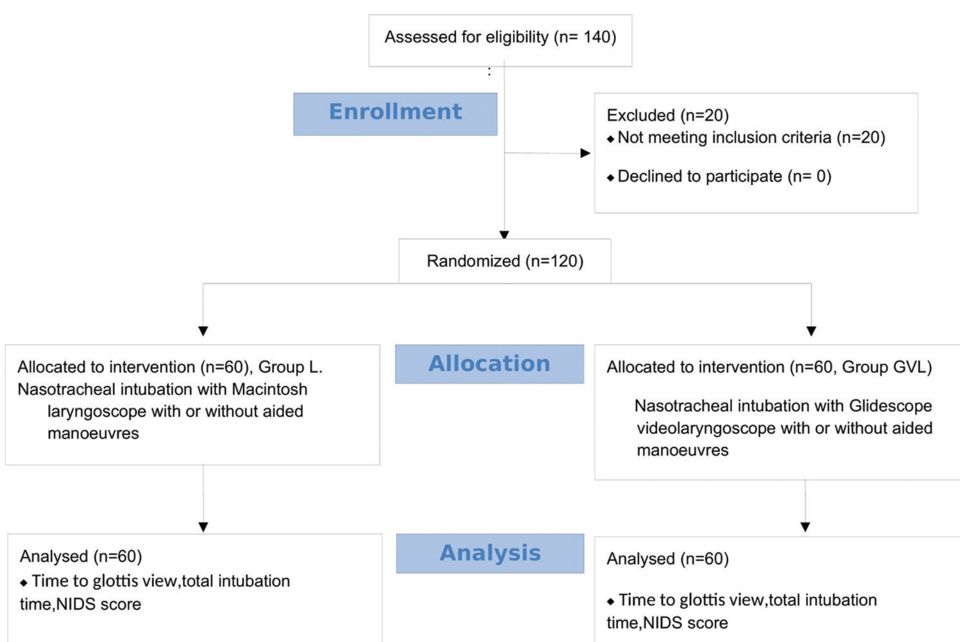

Figure 1: Consort diagram of the study

mandible) of the lubricated ETT was inserted into the selected nostril with the concavity facing caudally. Thereafter, the appropriate laryngoscope (Macintosh or GVL) blade as per group allocation was inserted to confirm its location. Cormack Lehane grading was noted and the chosen flexometallic endotracheal tube was advanced further towards the glottis under direct laryngoscopic/videolaryngoscopic view. Inability to align the ETT tip towards the laryngeal inlet was overcome by the "cuff inflation technique"[12] where sequential inflation of ETT cuff is done by air in 5 ml aliquots up to a maximum 20 ml by an assistant to align the tube into the laryngeal inlet as described in cuff inflation technique by Xue *et al.*[12] where the average volume of cuff inflation was 12.5 ± 3.2 mL with a range from 8-18 ml. Additional manoeuvres like optimal external laryngeal manipulation (OELM), jaw thrust, tube rotation and need of Magill's forceps were considered to facilitate intubation depending upon the need. Position of ETT was confirmed with square wave capnograph. The anesthesia was maintained with sevoflurane in oxygen: air to maintain anesthetic depth to 1.2 MAC and ventilation was controlled to maintain normocapnia. The observer endpoint was the total time required for successful intubation which was defined as the time between insertions of macintosh laryngoscope or GVL blade in the oral cavity to the display of square wave capnograph on the monitor. The ease of intubation was graded by the intubating anesthetist on a numerical rating between 0 and 10 with 0 being the easiest and 10 being the most difficult nasotracheal intubation for the anesthetist. The hemodynamic parameters like heart rate and mean arterial pressure were measured and recorded at baseline and every minute after intubation for 10 minutes.

Statistical analysis

SPSS (version 17, IBM corporation Company headquartered in Armonk, New York, United States) was used to enter data and for statistical analysis. No study in the literature had compared Macintosh laryngoscopy and GVL-guided NTI in oropharyngeal cancers So, we based this clinical equivalence trial on our pilot study of 10 patients in each group by an experienced anesthesiologist. Based on these results we observed an intergroup difference of 15 seconds with an SD of 11 seconds. (Group GVL 45.2 ± 10.4, Group L: 60.3 ± 10.8 s). Taking 10 seconds as a superiority margin, a sample size of 60 cases was calculated in each group with a power of 80%. Quantitative data were represented in mean ± SD, median and interquartile range. Qualitative data is represented in numbers and percentages. Unpaired student *t*-test was applied for normally distributed data and the Mann Whitney U test was applied if any quantitative data violated normality to compare between the groups. The linear mixed model is applied for hemodynamic parameters to compare between the groups and for within the time points. Chi-square/Fischer exact test was used to compare categorical data like ASA physical status, gender, and sore throat.

Results

A total of 140 patients were recruited and 20 patients were excluded as they did not meet the inclusion criteria. In the present study, demographic profile and physical characteristics were similar in both the groups [Table 1]. Airway characteristics like inter incisor gap, thyromental distance and sternomental distance were comparable in both the groups [Table 1].

Time to visualize the glottic opening was significantly less in group GVL (9.20 ± 4.6 sec) than group L (14.8 ± 6.3 sec) (Table 1, $P = 0.000$) [Figure 2]. The total intubation time was also significantly less in group GVL (35.6 ± 9.57 sec) than group L (42.2 ± 11 sec) (Table 1, $P = 0.001$) [Figure 3]. The median numeric rating scale (NRS) was 7 in both the groups ($P = 0.66$). There was no statistical difference in hemodynamic parameters between the two groups (What all hemodynamic parameters were noted and at what times; please include that in the Methods as well). The incidence of complications like airway trauma, epistaxis and cuff rupture was similar in both the groups. [Table 1]. Similarly, the incidence of cuff inflation and tube rotation for achieving successful NTI was similar in both the groups but other manoeuvres used to aid intubation were significantly less used ($P = 0.009$) in group GVL compared to group L.

Discussion

NTI is often difficult in patients with head and neck cancer due to limited mouth opening, reduced pliability of the soft tissues of the oropharynx and distorted anatomy due to oropharyngeal mass. FFB has remained a standard of care in these cases, but its usefulness may be limited in some setups due to unavailability of equipment, long learning curve, and inadequate experience of the anesthetist. The wide availability of various videolaryngoscopes has led to their increased use in various situations of airway management with special emphasis on the anticipated difficult airway.[13] Various devices are commercially available like C-MAC (Karl Storz GMBH and Co.), McGrath (Aircraft Medical Limited, Edinburgh, UK), Pentax airway scope (Pentax Medical Company, Montvale, New Jersey, USA), and the GVL system. Most of the available literature has compared the use of such devices with each other or with the conventional laryngoscopy in the anticipated and unanticipated difficult airway in orotracheal intubation.[13-15]

Table 1: Patient demographics, airway assessment parameters, and intubation characteristics

Patient characteristics	Group L (*n*=60)	Group GVL (*n*=60)	*P*
Age (years)	49.30±10.5	53.08±8.7	0.80
Weight (kg)	62.73±8.93	65.5±13.3	0.56
Height (cm)	164.50±7.5	165.13±8.6	0.73
Mouth opening (cm)	2.77±0.79	2.76±0.62	0.93
Thyromental distance (TMD) (cm)	7.21±0.78	7.14±1.06	0.68
Mallampati grade (1/2/3/4)	7/20/33/0	5/21/34/0	0.23
CL grade (I/IIA/IIB/IIIA/IIIB/IV)			
With OELM	5/23/26/6/0/0	18/27/7/8/0/0	0.000
Without OELM	0/8/18/21/1/12	16/20/12/12/0/0	0.000
Time to glottic view (seconds)			
Mean (SD)	14.8 (6.3)	9.20 (4.6)	0.000
Mean difference (CI)	5.6 (3.6-7.6)		
Total time for NTI (seconds)	42.2±11.4	35.6±9.5	0.001
Mean difference (CI)	6.55 (2.7-10.3)		
NRS (ease of intubation) Median (minimum, maximum)	7 (5,10)	7 (5,9)	
Complications (blood on the tube on extubation/ETT cuff rupture/airway trauma/nasal bleeding)	2/0/2/0	1/1/4/1	0.246
Manoeuvres required			
Cuff inflation	31.7%	28.3%	0.69
ETT rotation	50%	38.5%	0.19
At least on one of the manoeuvres needed to guide ETT	71.7%	48.3%	0.009

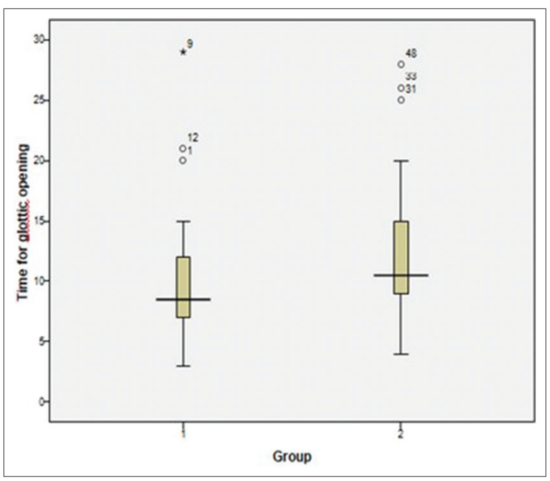

Figure 2: Box and whisker plots illustrating time to glottis view (in minutes) in group I (GVL) and Group II (Macintosh laryngoscope). The inner horizontal line within the box represents the median time of NTI and the outer horizontal lines of the box represent the 25th and 75th quartiles. The horizontal lines of the whiskers represent the 95% confidence intervals

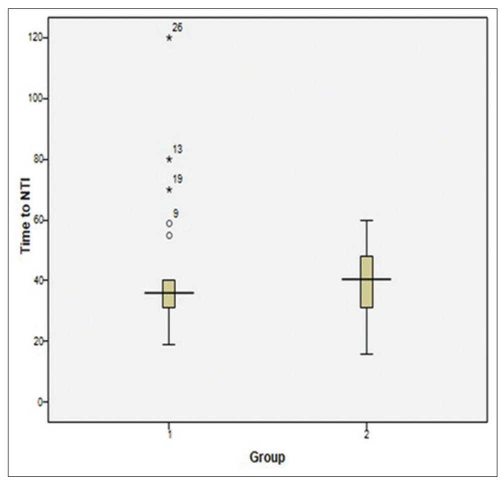

Figure 3: Box and whisker plots illustrating time to nasotracheal intubation (in minutes) in group I (GVL) and Group II (Macintosh laryngoscope). The inner horizontal line within the box represents the median time of NTI and the outer horizontal lines of the box represent the 25th and 75th quartiles. The horizontal lines of the whiskers represent the 95% confidence intervals

The literature comparing conventional direct laryngoscopy with videolaryngoscopes for nasotracheal intubation in the anticipated difficult airway is limited.

In this study, the time of glottis view was significantly less with GVL (9.20 ± 4.6 sec versus 14.8 ± 6.3 sec) than Group L. This is in concordance with the previous studies where VLs lead to a better and early laryngeal view.[16] Jones *et al.*[7] also reported that GVL improved the glottis view and shortened the time to NTI. The total time for NTI was also significantly lesser in group GVL (35.6 ± 9.5 s versus 42.2 ± 11.4 s). This can be attributed to the design of GVL (60 degrees angled blade) which directs its tip towards vallecula which improves the glottic view and results in increased successful endotracheal intubation rates in the difficult airway.

With a conventional laryngoscopy, the tip of its blade lifts the epiglottis by applying pressure on the hyoepiglottic ligament to align the different axes and thus optimize the visualization of the glottis. However, this tends to lift the larynx away from the tip of the advancing ETT (inserted nasally) in the posterior pharyngeal wall. So, we need external aids like

Magill's forceps to guide the ETT into the glottis. Besides, laryngoscopy with a conventional Macintosh laryngoscope requires a higher force (approximately 35–50 N) to align the three axes (oral, pharyngeal, and laryngeal) for glottic visualization.[17] This may increase the trauma which may be disastrous in a patient with head and neck malignancy.

VLs like GVL by their design (60 degrees angled blade) require less upward lifting force (5–14 N) to obtain a good glottis view. Since the lifting of the glottis during laryngoscopy is minimal, the nasotracheal tube is better aligned to the glottis and it is easier to insert it into the trachea with minimal instrumentation. Ease of intubation which was measured by a numeric rating scale (NRS) of the anesthetist also had similar median values of 7. The main reasons that can be attributed to comparable NRS between the two groups are the homogenous and comparable population in both the groups having similar physical and airway characteristics. The intubations were performed by trained and well-experienced anesthetist under general anesthesia. Even though there was a significantly increased use of manoeuvres with conventional laryngoscopy, ease of intubation using NRS was found to be similar in both the groups due to the considerable expertise of the intubating anesthetist with both the devices. Presumably, the NRS of ease of intubation between two groups would have been different in inexperienced hands.

Glidescope was found to be a suitable alternative for awake nasal intubation when compared to flexible fibreoptic bronchoscope in oropharyngeal cancer patients with difficult airway.[18] A difference of seven seconds in intubation times is statistically and can have significant clinical impacts during NTI in compromised airways like stridor, airway oedema, and patients with reduced oxygen reserve like obesity. The intubation in the study was done in ASA I and II patients by experienced anesthesiologists. However, the intubation responses may be more in ASA II or more patients, especially in experienced hands. Use of fewer manoeuvres is important during intubation in patients with head and neck cancer which may have a friable tumour and manipulation in the oropharyngeal cavity may increase the risk of bleeding and hemodynamic disturbances.

The study was limited by the inability to blind the intubating anesthesiologists to the laryngoscope used. All intubations were done by experienced anesthesiologists routinely intubating such patients. The results may vary in less experienced anesthesiologists. The gold standard for intubation is FFB but we decided to use one of the two laryngoscopes because of our cumulative experience in intubating such patient in a high-volume center. We do not suggest the GVL as a replacement to FFB. Lastly, the study only compared GVL with conventional laryngoscope because of its easy availability in our institute. Further multicenter studies are required to further support the usefulness of VLs in patients with oropharyngeal cancer.

Conclusions

The Glidescope provided better laryngoscopic views in a shorter time and reduced the time to nasotracheal intubation as compared to the Macintosh laryngoscope in patients with oropharyngeal cancer. It also reduced the need for manoeuvres to guide the endotracheal tube and maybe a better alternative for intubating patients with oropharyngeal cancer under general anesthesia.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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