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Original Research Article

Compare Glidescope and Fiberoptic bronchoscope guided endotracheal intubation in anticipated difficult airway with respect to-Ease, time, faliure, success and complication of intubation

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Abstract

Background: Managing difficult airway is a daunting task because of the complications that come along with it. Difficulty could be encountered due to limited mouth opening, restricted neck flexion extension, facial trauma or distorted anatomy due to carcinoma or previous surgical scar. **Objective:** To Compare Glidescope and Fiberoptic bronchoscope guided endotracheal intubation in anticipated difficult airway with respect to-Ease,time, faliure, success and complication of intubation. **Methods:** The present Randomised Control Trial was carried out among all patients admitted for elective surgeries of different specialities like Oral and Maxillofacial Surgery, Head, Neck and Oral Cancer, ENT, General Surgery, Orthopaedics in Anaesthesiology department at Rohilkhand Medical College and Hospital Bareilly, U.P. were included. **Result:** All the patients of both the groups belonged to ASA grade I and II with Mallampati grade III and IV and age between 19-65 years. While performing intubation Modified CL grading and POGO score were evaluated which yielded in non-significant difference. Further, moving forward to successful insertion of endotracheal tube into tracheal lumen, was achieved in all the patients of both the groups exhibiting the usefulness of GSVL and FOB in patients having difficult airway. Along with the comfort of intubation and improved glottic vision attained by Glidescope, the time taken for intubation using GSVL (67.79 ± 20.79) seconds was quite lesser than fiberoptic bronchoscope (89.03 ± 20.52) seconds which was statistically significant. Even though both the devices have proven to be excellent aid for intubation in difficult scenarios, Glidescope additionally achieved faster intubation

Conclusion: Fiberoptic bronchoscope intubation required more time and demanded a change of performing anaesthesiologist as compared to Glidescope, but it depends upon skill and familiarity of the performer with the device rather than complexity of device on its own.

Keywords: Glidescope, Fiberoptic bronchoscope guided endotracheal intubation, anticipated difficult airway, Ease,time, faliure, success and complication of intubation

INTRODUCTION: Difficult mask ventilation is a condition when an unassisted anaesthesiologist is unable to reverse the signs of inadequate ventilation during positive pressure mask ventilation. Predicting difficult airway reduces the detrimental outcomes during airway management. Some factors include obesity, Mallampati grading, mouth opening, neck movements (limited flexion and extension), receding mandible, bucked teeth (protruding maxillary incisors), thyromental distance and sternomental distance (short neck). Difficult intubation is when proper insertion of endotracheal tube requires more than 3 attempts with the same blade or more than 10 minutes or use of an alternate device or technique following failed intubation with direct laryngoscopy[1,2].

The Modified Cormack and Lehane classification (1984) is the major and most widely classification of view of glottis, laryngeal view during difficult laryngoscopy [1,3]. It has become gold standard for the classification of airway. Due to its extensive description of laryngeal structures, this grading system is not only used in clinical practise but is also included in research regarding airway[5]. Hence, it is a part of predictors for difficult intubation.

Another scoring widely used is Percentage of Glottic Opening (POGO) which is visualised during direct laryngoscopy. The posterior most point is the interarytenoid

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

notch and the anterior most point is the anterior commissure. It can be used as an efficient comparative modality for outcomes between various intubation techniques[2,4].

Intubation of not only an anticipated, even an unanticipated difficult airway is associated with uncertain and undesirable hemodynamic response. Reflex increase in sympathetic activity results in tachycardia, arrhythmia and hypertension due to endotracheal intubation. Laryngoscopy is a noxious stimulus which causes adverse response in various systems including respiratory and cardiovascular. The hemodynamic response is attenuated by various factors like technique of intubation e.g., direct laryngoscopy, Glidescope Video Laryngoscope (GSVL), Fiberoptic Bronchoscope (FOB) and light wand. Drugs administered as pre-medication and induction also affect the circulatory responses to laryngoscopy and endotracheal intubation. It also depends upon the time required for intubation and number of attempts needed to successfully intubate[5].

The best means of managing anticipated difficult airway is still a topic of considerable debate. There are only limited studies which provide evidence comparing intubation time, number of attempts required for intubation, change of performer, hemodynamic response before and after intubation, success rate, dental injuries, post intubation sore throat and hemodynamic parameters between Glidescope and Fiberoptic Bronchoscope. None of the studies habe take into account all of these factors at once, thus need of this study

Material and Methods: The present Randomised Control Trial was carried out among all patients admitted for elective surgeries of different specialities like Oraland Maxillofacial Surgery, Head, Neck and Oral Cancer, ENT, General Surgery, Orthopaedics in Anaesthesiology department at Rohilkhand Medical College and Hospital Bareilly, U.P. were included. Duration of study was 1 year i.e 1stNovember 2020 to 31st October 2021

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

Sample Size: Total 68 patients were included

Inclusion Criteria:

1) American society of Anaesthesiologists (ASA) grade I (normal healthy) and II (patients with mild systemic disease)[6].
2) Mallampati grade (MPG) III (soft palate and hard palate visible), IV (only hard palate visible)[7].
3) Limited neck mobility
4) Age group 19-65 years

Exclusion Criteria:

1) Ischemic heart diseases, myocardial infarction, Chronic Obstructive PulmonaryDisease (COPD)
2) SpO_2 <95% on room air
3) Nil mouth opening

METHODOLOGY

Random division of all the 64 patients were carried out into two groups: Group "A" and "B".

Group "A"- patients were nasally/orally intubated with GSVL
Group "B"- patients were nasally intubated with flexible Fiberoptic bronchoscope

Pre-anaesthetic monitoring and pre-medication

Tablet Ranitidine 150 mg and tablet Alprazolam 0.25 mg were given orally, 30 minutes before dinner, the night before surgery and at 6 a.m in the morning of surgery with 2 sips of water. Nil per oral (NPO) was advised in all patients for 6 hours for solid food and 2 hours for clear fluid. Blood is to be arranged as per surgical loss.

In the pre-operative room, all patients were prepared for difficult intubation by nebulization with 4% Lignocaine (plain) 3 mL half an hour before surgery, instillation

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

of two drops of oxymetazoline nasal drops in each nostril and Inj. Glycopyrrolate 0.2 mg was administered by intramuscular route. Each patient was secured with wide bore (16G or 18G) intravenous cannula in non-dominant hand; followed by which patients were taken to operation theatre. Vitals and consent were checked and nil per oral was confirmed..

Induction of anaesthesia and intubation

Preoxygenation with 100% O_2 for 3-5 minutes with the help of best fit anatomical face mask through closed circuit was done. Patients were induced with Inj. Propofol 2.0 mg/kg through intravenous route in wide bore veins, with the rate of 18 mg/15sec. After achieving end point of induction, which was observed by loss of verbal commands, we performed check ventilation by observing bilateral chest rise through bag and mask ventilation.

1) **Glidescope –** after keeping the head in neutral position, the Glidescope laryngoscope blade was introduced through midline and advanced till glottis was visualised on the screen. The endotracheal tube (ET) of the appropriate size with stylet inside it was introduced nasally or orally through vocal cords and then the stylet was removed.

2) **Flexible Fiberoptic bronchoscope** – the head was kept in neutral position. After checking nasal patency and ruling out Deviated Nasal Septum (DNS), the bronchoscope cord was inserted into one of the nostrils with better nasal patency. Flexometallic endotracheal tube of appropriate size was rail roaded over bronchoscope. After applying 2% lignocaine jelly over the desired nostril, FOB was guided through oropharynx, hypopharynx and visualisation of vocal cords was done with the aim of visualising cartilaginous rings of trachea. The trachea was entered and bronchoscope was advanced until the carina was in

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

view and finally endotracheal tube was advanced over the scope into the trachea. In all patients, of both groups, Inj. Succinylcholine 1.5 mg/kg IV was given after proper visualisation of vocal cords, just before intubation and after disappearance of muscle fasciculations ETT was advanced through trachea.

Following endotracheal tube placement by GSVL and FOB, cuff was inflated with 5-10 ml of air through pilot balloon with cuff pressure of 20-30 cmH_2O and closed circuit was connected. $EtCO_2$ monitor was attached and capnograph was monitored.

I. The confirmation for endotracheal tube placement for intubation done by Glidescope was done through under vision.

II. For intubation done by fiberoptic bronchoscope, tube placement was confirmedby visualisation of tracheal rings and carina.

III. For confirmation of bilateral equal ventilation, adequate chest rise and end tidalcarbon dioxide (Et CO_2) was noted.

All parameters regarding intubation (MPG classification, successful intubation, attempts required for intubation, intubation time, mucosal/dental injury, oesophageal intubation, additional maneuver to facilitate intubation, change of performer, modified Cormack Lehane score and POGO score) were recorded & entered in the designated case record form. Recording of heart rate, blood pressure (systolic and diastolic), mean arterial pressure, arterial O_2 saturation at baseline, after induction of anaesthesia, then immediately before intubation and subsequently after 1 minute, 3 minutes, 5 minutes and 10 minutes of intubation was done. Maintenance of anaesthesia was done with O_2 and N_2O in the ratio 40:60, Isoflurane with the MAC of 0.6 and Inj. Vecuronium with the loading dose of 0.08-0.12 mg/kg IV was given. The maintenance dose of vecuronium 0.02 mg/kg body weight IV was administered intermittently at the interval of 15-20 minutes.

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

Inj. Ondansetron 4 mg IV was given 30 minutes before closure. Isoflurane was turned off 45 minutes before closure, N_2O was turned off before the last suture.

For reversal of anaesthesia at the end of surgery, Inj. Neostigmine 0.05mg/kg IV and Inj. Glycopyrrolate 0.008 mg/kg IV were administered. After pharyngo-tracheal suctioning and regaining of consciousness including eye opening and limb movements, extubation was performed in deep phase of inspiration.

Intubation Parameters

For view of glottis during difficult laryngoscopy, Modified Cormack and Lehane grading was used, higher the grade more is the difficulty faced during intubation[8].

A scale for the assessment of visualisation of airway during endotracheal intubation is Percentage of Glottic Opening (POGO), which was assessed during direct laryngoscopy[9].

Adverse effects or complications following intubation included post-operative sore throat, hoarseness of voice and oxygen desaturation.

Results: Mean age of patient in group A was (41.44 ± 9.88) and in group B was (39.09 ± 11.59) years. There was no significant difference in mean age of patients in between group A and group B (*p*-0.371).

Out of 34 patients, in Group A there were 25 male and 9 female while in Group B there were 27 male and 7 female. There was no significant difference in gender of patients inbetween group A and B (*p* value - 0.583).

Mean weight of patients in group A was (57.88±9.88) and in group B was (57.50±13.37) kg. No statistically significant difference in mean weight of patients of both the groups (*p* value- 0.894).

In both the groups (A and B), all (34) patients were successfully intubated. There was

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

no failed intubation in any group. No statistically significant difference in successful intubation in between patients of both the groups (*p* value – 1.000) were found.

Out of 34 patients, there were 5 patients in Group A with the percentage of 14.70 % and 2 patients in Group B with percentage of 5.88 % who had mucosal injury. The *p* value was 0.425 which was statistically not significant.

In all patients, trachea was successfully intubated in both groups (group A and B, n=34). Nopatient had oesophageal intubation, *p* value – 1.000, which was statistically notsignificant.

Out of 34 patients in both groups, there were 6 patients in group A and 1 patient in group B, who required additional maneuver, while 28 patients and 33 patients did not require any maneuver in group A and B respectively with *p* value - 0.110 which was statisticallyinsignificant.

Out of 34 patients in both groups, 1 patient in group A and 8 patients in group B required changeof performer, while 33 patients in group A and 26 patients in group B did not require change of performer respectively with *p* value - 0.031 was statistically significant.

Table 1: Distribution of Modified Cormack Lehane grade in group A and B

Modified Cormack Lehane grade	Group A n=34	Group B n=34	*p*-value
1	0	0	0.841#
2a	16	12	
2b	11	16	
3	6	5	
4	1	1	
Total	34	34	

#statistically not significant.

Modified Cormack Lehane grading was observed during intubation. Out of 34 patients in both groups, no patient in both the groups A and B had grade 1, 16 patients in group A and

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

12 patients in group B had grade 2a, 11 patients in group Aand 16 patients in group B had grade 2b, 6 patients in group A and 5 patients in group B had grade 3 and 1 patient in both groups observed to have grade 4 respectively. *p* value of 0.841 was statistically insignificant.

Table 2: Comparison of POGO SCORE among group A and B

POGO SCORE	Group A n=34	Group B n=34	*p*-value
100%	16	17	0.779#
50%	17	16	
0%	1	1	
Total	34	34	

#statistically not significant.

Percentage of glottic opening was evaluated, out of 34 patients in both groups, 100% glottic opening was found in 16 patients of group A and 17 patients of group B, 50% glottic opening seen in 17 patients of group A and 16 patients of group B and no glotticopening was observed in 1 patient of both the groups respectively. There was no statistically significant difference in POGO score in between patients of group A and B(*p* - 0.779).

Table 3: Comparison of adverse effects among group A and B

Adverse Effects	Group A n=34	Group B n=34	*p*-value
YES	2	3	1.000#
NO	32	31	
Total	34	34	

#statistically not significant.

Out of 34 patients, 2 patients of group A and 3 patients of group B experienced adverse effects while 32 patients of group A and 31 patients of group B did not experience adverse

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

effects. There was no statistically significant difference in adverse effects in between patients of group A and B (*p* value – 1.000).

Table 4: Comparison of ASA grade among group A and B

ASA Grade	Group A n=34	Group B n=34	Total	*p*-value
I	5	7	12	0.525#
II	29	27	56	
Total	34	34	68	

#statistically not significant.

Out of34 patients in both groups, there were 5 patients in group A and 7 patients in group B who belonged to ASA grade I whereas 29 patients in group A 27 patients in group B belonged to ASA grade II. *p* value of 0.525 was statistically insignificant.

Table 5: Comparison of MPG among group A and B

MPG	Group A n=34	Group B n=34	Total	*p*-value
III	25	23	48	0.595#
IV	9	11	20	
Total	34	34	68	

#statistically not significant.

Out of 34patients in both the groups, 25 patients in group A and 23 patients in group B had MPGgrade III while 9 patients in group A and 11 in group B had MPG grade IV respectively. There was no statistically significant difference in MPG in between patients of group A and B (*p* value - 0.595).

Table 6: Comparison of intubation time in group A and B

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

	Group A n=34	Group B n=34	
	Mean ± SD	**Mean ± SD**	***p*-value**
Intubation time (in seconds)	(67.79 ± 20.79)	(89.03 ± 20.52)	<0.001*

*statistically significant

Meanintubation time of patients in group A was (67.79 ± 20.79) and in group B was (89.03 ± 20.52) sec. There was statistically significant difference in intubation time in betweenpatients of group A and B (*p* value - <0.001).

Discussion: In our study we observed that all the patients of both the groups A and B were successfully intubated and there was no failed intubation in any group. No statisticallysignificant result was found on comparing successful intubation of both the groups with*p* value of 1.000.

Similar to our study **Ko *et al* (2015)** found 100% success rate in intubation performed by fiberoptic bronchoscope, but contrary to our findings they found success rate of only 96% with Glidescope, may be because rather than using actual human subjects they used human anatomical models, in whom sliding the tongue was not required during intubation. Hence, because of the anatomical variations tube insertion was also difficult in some subjects[10].

In consensus to our study, **Law JA *et al* (2015)** observed 100% success rate when intubation was carried out by FOB in 1,554 patients, in a reviewed retrospective database carried out in Canadian tertiary care centre[11].

Contrary to our study **Aziz MF *et al* (2016)** evaluated cases intubated by Glidescope and found successful intubation in 97% of the cases. The reason for failure being altered anatomy of the neck, presence of surgical scar or mass or technical failure in others including loss of video input and in some cases neuromuscular blocker was not given before intubation so relaxation was inadequate[12].

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

In our study we observed that 25 patients of group A and 22 patients of group B were successfully intubated in first attempt, with first attempt of success rate being 73.5% in group A and 64.7% in group B respectively. Whereas 8 patients of group A and 9 patients of group B were intubated in second attempt and 1 patient of group A and 3 patients of group B required 3 attempts to successful intubate the trachea. The result was not significant, *p* value of 0.846.

Abdelmalak *et al* (2011) compared tracheal intubation in obese patients with GSVL and FOB and similar results were encountered, ninety-five (95%) of the first attempts were successful with the Glidescope and 86% first-attempt success rate with the flexible Fiberoptic bronchoscope[13].

In consensus to our study **Abdel latif *et al* (2014)** compared intubation parameters between GSVL and FOB and found success rate of intubation in first attempt of GSVL (80.6%) to be higher than FOB (75%) indicating the ease of intubation more in GSVL[14].

Similar to our findings, **Mahran EA *et al* (2016)** compared FOB and GSVL in difficult airway and achieved success rate of intubation in first attempt higher in group intubated by GSVL (81.5%) than group intubated with FOB (78.8%). There was no significant difference between them in terms of success rate of the first attempt[15].

Thus, all of the above mentioned studies came to the conclusion that first attempt success rate of intubation for GSVL is more than FOB.

In our study, we found that time required for intubation in group A was (67.79 ± 20.79) seconds and in group B was (84.03 ± 20.52) seconds with *p* value of <0.001 which statistically significant, depicting that intubation was faster with Glidescope than with fiberoptic bronchoscope.

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

Prolonged time taken for intubation can lead to hypercarbia, which in turn could cause tachycardia and raise in blood pressure both of which was seen with fiberoptic group in our study.

In consensus to our study **Aqil M *et al* (2014)** compared intubation performed with Glidescope and fiberoptic bronchoscope and discovered that intubation time with Glidescope was (43.55 ± 22.59) seconds and with fiberoptic was (58.96 ± 36.84) seconds[16].

In accordance with our observation **Abdellatif *et al* (2014)** found the intubation time using Glidescope was lesser (73.6 ±31.1) seconds than with fiberoptic (84 ± 37.9) seconds[14].

Mahran EA *et al* (2016) carried out a randomized control trial in oral cancer patients with difficult airway and compared intubation parameters between FOB and GSVL groups and concluded that GSVL intubation took lesser time than intubation performed using FOB which was (70.85 ± 8.88) seconds and (90.26 ± 9.41) seconds respectively[15].

Similar to our findings **Micpovilyte *et al* (2018)** found that time required for intubation in GSVL group was (73.6 ± 31.1) seconds and that in FOB group was (84 ± 37.9) seconds, showing that intubation done using fiberoptic required more time as compared to Glidescope but was not statistically significant[5].

Similarly, **Jiang J *et al* (2018)** compared intubations using Glidescope and fiberoptic bronchoscope in a systematic review and meta analysis of randomized control trials of 6 studies and concluded that intubation time was shorter when conducted by GSVL than using FOB with p value <0.01. Time difference was 40.4 seconds lesser in GSVL group[17].

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

Thus, as per our study and various other studies we conclude that intubation time using Glidescope is lesser than with fiberoptic.

In our study we observed that mucosal/dental injury occurred in 5 patients (14.7%) in groups A and 2 patients (5.8%) in group B respectively out of 34 patients of each group with *p* value of 0.425, as shown in table-5 and figure-5. No statistically significant difference was present between the groups.

Unlike our study **Abdelmalak *et al* (2011)** found mucosal injury in 3% of patients in each groups intubated by FOB and GSVL as mucosal bleeding, which was statistically not significant[13].

Unlike our observation **Mahran EA *et al* (2016)** didn't find any mucosal or dental injury post intubation in the groups intubated by GSVL and FOB, may be because they included patients with Mallampati grade 2 and 3 whereas we included MPG 3 and 4 which comparatively makes the intubation more challenging[15].

We did not experience any oesophageal intubations in both groups and the trachea was successfully intubated in all the 34 patients of group A and B with *p* value of 1.000.

In our study we found that additional maneuver were required during intubation in terms of BURP (backward upward rightward pressure), jaw lift and manual in line stabilisation (MILS). 6 patients in group A and 1 patient in group B out of 34 patients in both groups required additional maneuver with *p* value of 0.110.

Similarly, **Aqil M *et al* (2014)** encountered the demand for external neck manipulation more in Glidescope because of curvature of the blade. Jaw thrust maneuver was applied to all the patients of fiberoptic bronchoscope group which made intubation easier[16].

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

Similarly, **Arslan ZI *et al* (2015)** experienced more maneuvers for optimisation when intubation was carried out with Glidescope similar to our study but unlike our study the result was statistically significant[18].

It was observed in our study that a change of performer was required in 1 patient in groups A and 8 patients in group B out of 34 patients of each group respectively with *p* value of 0.031 which is statistically significant. Group intubated using FOB witnessed more change of performers may be due to complexity of procedure.

Modified Cormack Lehane grade was observed in our study as shown in table-9 and figure-9. None of the patients belonged to grade 1, (16 v/s 12) patients in grade 2a, (11 v/s 16) patients in grade 2b, (6 v/s 5) patients in grade 3 and (1 v/s 1) patient in grade 4 in group A and B respectively with *p* value of 0.841 which was not significant as both the groups included patients with comparable difficult airway.

Percentage of Glottic Opening (POGO) score was observed in all the patients assessing the ease of intubation. Out of 34 patients of each group (16 v/s 17) had 100% score, (17 v/s 16) had 50 % score and (1 v/s 1) had 0% in groups A and B respectively with *p* value of 0.779 which is statistically not significant.

Benjamin *et al* (2006) concluded that by use of Glidescope, glottic view showed improvement and further caused ease of intubation which was helpful in difficult airway scenarios[19].

Choi GS *et al* (2011) also described the improvement of laryngeal view during intubation with Glidescope[20].

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 10, 2024

In our study adverse effects in the form of post operative sore throat and hoarseness of voice were seen in 2 vs 3 patients in group A and B respectively with *p* value of 1.000 which is statistically insignificant.

Similar to our study **Abdelmalak *et al* (2011)** observed post operative sore throat in both groups intubated by Glidescope and fiberoptic bronchoscope with *p* value of 1.000 being statistically insignificant[13].

Conclusion: Mucosal/dental injury and post operative sore throat were found as comparable. Fiberoptic bronchoscope intubation required more time and demanded a change of performing anaesthesiologist as compared to Glidescope, but it depends upon skill and familiarity of the performer with the device rather than complexity of device on its own.

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