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EASE OF INTUBATION USING HUGEMED VIDEOLARYNGOSCOPE IN PATIENTS WITH ANTICIPATED DIFFICULT INTUBATION – A COMPARISON BETWEEN CHANNELED AND NON-CHANNELED BLADES.

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ABSTRACT **Background:** Video laryngoscope is a portable ergonomic design enabling clinician to improve chances of first attempt success of intubation. Channeled and non-channeled blade of video laryngoscope may result in different performance. We compared ease of tracheal intubation using channeled Hugemed video laryngoscope blade with non-channeled blades in patients with anticipated difficult intubation. **Patients and Methods:** A total of 60 consenting patients of either sex, ASA I-III physical status, with predicted difficult intubation undergoing surgery in our institute were enrolled in our study with two groups of 30 each. Group C: Intubated with channeled Hugemed video laryngoscope blade, Group NC: Intubated with non-channelled Hugemed video laryngoscope blade. The t test and the Mann-Whitney U test were used respectively to compare means. **Results:** The time required for glottic visualization was comparable between two groups, but the time taken for intubation was shorter for channeled group as compared to non-channeled group. **Conclusion:** Use of Channeled blade reduces time required for intubation when compared to non-channeled blade in patients with anticipated difficult intubation.

KEYWORDS : Channeled Hugemed video laryngoscope, Non-channeled Hugemed video laryngoscope, Anticipated difficult intubation

INTRODUCTION

The failure in securing the airway significantly increases the risk of mortality and morbidity during resuscitations. Several challenging airway algorithms now include the use of video laryngoscopes because of the overwhelming evidence showing their importance in cases of difficult or failed intubation. [1,2]

The creation of the video laryngoscope was a significant step forward in the effort to increase the intubation success rate. By allowing laryngeal visibility with minimal lifting power, video laryngoscope devices improved laryngeal visualization, particularly in patients with a difficult airway.[3,4] Video laryngoscopes also expanded the user's field of view, allowing them to see more of what was going on around them. A few of the many other device types that have been created include the Macintosh type (C-MAC), hyper angulated devices like the Glide Scope, and speciality channeled and non channeled devices like the King Vision and Hugemed. There is a learning curve and a specific method for using each equipment that is required for a successful intubation.[5] Channeled and non-channelled blades are not always present on the same video laryngoscope.

Hugemed video laryngoscope is a compact design, its 2.0M-pixel camera, high-resolution full-view display, and special anti-fog features aid in more often succeeding on the first attempt and lowering the risk of harm during the intubation process. It has various sized and designs of blades. It has disposable as well as reusable channeled and non channeled blades of various sizes (infant / paediatric / adult). (Figure1)

Figure 1 Hugemed Video Laryngoscope With Reusable And Disposable Blade

Research has been conducted to examine the differences and similarities across a wide range of device designs. [6,7,8,9]. However, there is a paucity of studies comparing the intubation using channeled and non channeled blades present on same video laryngoscope. To best of our knowledge, no study has compared channeled and non channeled blades of Hugemed videolaryngoscope. Hence, in this study, we compared the performance of Hugemed video laryngoscope. Primary objective was to compare the ease of tracheal intubation and secondary objective was to compare the first attempt success rate of tracheal intubation using channeled and non channeled video laryngoscope blade.

Patients and Method

The present prospective, observational study was carried in tertiary care centre after approval from institutional ethical committee. The study was also registered with the Clinical Trials Registry-India (CTRI/2024/01/061451).

In a previous study done by Amit shah [5] et al, the mean time taken for endotracheal intubation was 15.24 (10.6) and 28.57(14.09) respectively in channelled and non-channelled group. Using Open Epi software (version 3.01), with 95% confidence interval and 95% power the sample size was estimated as 23 for each group. Considering 10% dropout, 30 patients were studied in each group.

A total 60 consenting patients who were posted for various operations in General Surgery OT were included in this study. Patients of either sex, age between 18 to 65 years, with ASA I – III, physical status, with anticipated difficult intubation Scheduled to undergo elective surgery under General anaesthesia with endotracheal intubation were included in the study. Patient with high risk of gastric regurgitations, pregnant patients were excluded from study.

To avoid bias associated with difference in skill and professional experience, the same investigator performed all videolaryngoscopic intubation. The investigator who performed laryngoscopy was well versed with videolaryngoscopy in general and two blade variants.

A standard institutional protocol for routine pre anaesthetic checkup and laboratory investigations was followed. A thorough airway examination was carried out.

The patients having one of following features of MPC class III & IV, Restricted mouth opening < 2 finger breadths, Restricted neck

extension, BMI > 30 kg/m2, Neck circumference > 40 cm, SLUX -1, ULBT 3 were considered to be anticipated difficult intubation. The anaesthesia was administered as per the standard OT protocol.

Patients were pre-oxygenated with 100% oxygen in 15^0 head high position. The premedication and induction agent were at the discretion of attending anaesthesiologist. All patients were paralyzed with Inj. Succinylcholine 2 mg/kg to facilitate tracheal intubation. Laryngoscopy was done after 60 seconds using the Hugemed video laryngoscope and endotracheal intubation was carried out. In case of non-channeled blade, intubation was facilitated using an introducer. Intratracheal insertion was visually verified by seeing the tube after it had gone through the vocal cords and by measuring end-tidal CO2 levels. The patients were divided as per the type of blade used for laryngoscopy into Group NC: Patients intubated using Non channeled blades and Group C: Patients intubated using Channeled blades. We noted values of time required for visualization of larynx, time needed for completion of tracheal intubation, best glottis view (CL Grade), requirement of external Laryngeal Manoeuvre, number of attempts, number of operators, any blood stain on the blade and SpO2.

All responses were tabulated in Microsoft Excel 2019 spreadsheet. Graphical representations were made whenever necessary using Microsoft excel 2019. The t test and the Mann-Whitney U test were used, respectively, to compare means. The Chi-square test or Fisher's exact test was used to compare the percentages. The tests were conducted using a two-tailed design, and the significance threshold was set at $p<0.05$ (five-percent level of significance). To analyse the data, we used version 25 of IBM's SPSS statistics software.

RESULTS

In this prospective observational study, out of 60 patients, intubation of 30 patients was attempted with channeled video laryngoscope blade and other 30 patients were attempted with non-channeled video laryngoscope

Both groups were similar with respective to demographic and baseline airway data as shown in table 1.

Table 1: Baseline Demographic Variable And Baseline Airway Data

Demographic variable	Group C	Group NC	P value
Age (year)	41.3 +/-13.53	42.07 +/- 13.21	0.825
Gender (M:F)	16:14	13:17	0.601
Height	155.27 +/- 5.30	155.33 +/- 4.43	0.958
Weight (Kg)	78.16 +/- 19.02	79.26 +/- 16.59	0.812
BMI	32.45 +/- 7.72	32.58 +/- 7.13	0.943
MO(1:2:3)	1:13:16	0:10:20	0.260
MPC(I:II:III:IV)	0:9:13:8	1:7:14:8	0.918
ULBT(I:II:III)	2:26:2	0:25:5	
SLUX(I:II)	8:22	9:21	0.774
Restricted neck extension (Y:N)	15:15	17:13	0.268
NC (cms)	37.47 +/- 3.17	36.93 +/- 2.86	0.497

All 60 patients with anticipated difficult intubation were analysed for following parameters as shown in table 2.

Similar glottic view (Cormac Lehane) was obtained in channeled and non-channeled group. Optimisation manoeuvre required to improve glottic view were comparable in both groups. Laryngeal visualization times were similar across the two groups as seen in figure 2.

Table :2 Tracheal Intubation Data

Intubation Parameter	Group C	Group NC	P value
Time taken to visualise larynx	17.73 +/- 3.42	18.63 +/- 4.73	0.4
Time for complete intubation	34.63 +/- 7.6	44.2 +/- 7.16	< 0.05
Best glottic view Cormac Lehane gr. (1:2:3)	2:26:2	0:26:4	0.055
External laryngeal maneuverer (Y: N)	15:15	17:13	0.067
Total attempts (1:2)	27:3	28:2	0.358
Trauma (Y: N)	1:29	2:28	1.0

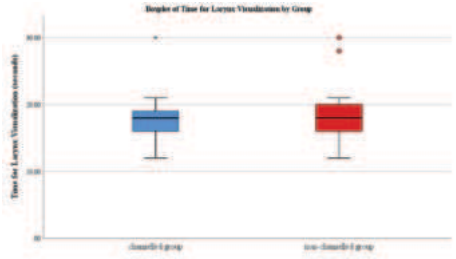

Figure 2: Boxplot Representing Comparison Of Time For Larynx Visualization Between Two Groups.

Time taken for intubation was faster in channeled group (34.63 +/- 7.6) than the non-channeled group (44.2 +/- 7.16), p value <0.05 as shown in fig.3

In both categories, intubation of patients who were expected to be difficult needed no more than one operator. There was no necessity to change the device in both channeled and non-channeled blade groups. There was no any incidence of desaturation noted in both groups.

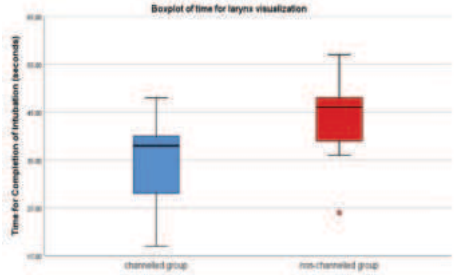

Figure 3: Boxplot Representing Comparison Of Time For Completion Of Intubation Between Two Groups.

DISCUSSION

The use of a video laryngoscope improves the glottic view and lowers the possibility of intubation failure, making it one of the best options for patients with anticipated difficult airways.[10] Most video laryngoscopes when designed are either hyper angulated non-channeled, angulated channeled or Macintosh type [11,12]. Very few had incorporated two different types of blade (like channeled and non-channeled types) in one single device. Channeled video laryngoscopes provide the advantage of a dedicated passage for directing the endotracheal tube, removing the need for the stylet to direct the tube towards the glottic opening. However, there are certain situations where a channel may not be helpful and one needs a non-channeled type of device. Many studies have been done comparing different types of video laryngoscopes as well as different blades of same video laryngoscope[13,14,15,16].

We did a prospective observational study in in 60 patients to compare the ease of tracheal intubation using channeled video laryngoscope blade with non channeled blades in patients with anticipated difficult intubation. The ease of tracheal intubation was compared on the basis of time for visualization of larynx, time for completion of tracheal intubation, best glottis view (CL Grade), External Laryngeal Maneuverer required, number of attempts, number of operators, any blood stain on the blade and SpO2. Secondary objective was to compare the first attempt success rate of tracheal intubation using channeled and non channeled video laryngoscope blade.

The results of our study showed no statistically significant difference in the time to visualize larynx between the two groups. None the less, the amount of time needed to intubate the patient was much less for the channeled group than the non-channeled group. The mean time to visualize larynx through Channeled and non channeled.

In the channeled group, intubation took substantially less time than in the non-channeled group. The average time it took for complete intubation for the channeled group was 34.63 +/- 7.6 minutes, compared to 44.2 +/- 7.16 seconds for the non-channeled group. Similar findings were noted by Amit Shah et al [5] which compared channeled and non-channeled blades of Kings vision however time required for intubation was 15.24 ±10.6 seconds in the channeled

group and 28.57 ±14.09 seconds (P< 0.001) in the non-channeled. Similarly, Peter Biro et al[1] study Channeled and non channeled. Time to visualise larynx was similar across two groups. Channeled blades reduced intubation time from 29 (25-51) {non channeled} seconds to 17 (12-27) seconds (median and range; p<0.001).

Shalini Bajpai et al's study [17] demonstrated Channeled blade of Kings vision video laryngoscope required lesser time (8.5±3.03S) for glottis visualization than Non-Channeled blade (7 ± 2S) but intubation time was shorter for the channeled (24 ± 8.5) as compared to non- channeled (44 ± 5) group. Similar to our research, these authors also found that intubation could be completed more quickly with a channeled blade; whereas Peter Biro et al. [1] found no difference in glottis visualization time between the two groups, Shalini Bajpai et al [17] found that the channeled group needed more time. In contrast to our findings, Marc Kreige et al [18] (King vision video laryngoscope) research found that the non-channeled group required less time (median 40 seconds) to complete tracheal intubation than the channeled group (median 59 seconds). Comparable rates of first-attempt success and glottis visibility were seen between the two groups, as in our study. These studies compared the channeled and non channeled blades of video laryngoscopes present in one device only. Other studies were done comparing the channeled blade of one laryngoscope to non channeled blade of another laryngoscope, that is two different types of video laryngoscope were compared having channeled and non channeled blades. In patients with cervical spine immobilization, Chandy et al. [19] performed a study contrasting the King Vision (channeled blade) and CMAC (D blade) video laryngoscopes. Compared to the King Vision channeled blade (22.43± 12.65 s), CMAC D blade took lesser time (13.61 ±10.89 s) for glottis visualization. (p 0.001). Procedure time was comparable across the two scopes, although intubation with the King vision scope required much less time (10.78 ±7.1 sec vs. 24.02 ±14.9 sec). Again, their study confirmed that the intubation process went more quickly using a channeled blade. On the other hand, the non-channeled group required less time to see the glottis, which is consistent with the findings of the study done by Shalini Bajpai et al. [17]

In addition to above studies few studies were performed in manikin comparing channeled and non-channeled blades. The success rates of intubation were compared between the channeled and non-channeled blades of the King Vision video laryngoscope and the McGrathh MAC video laryngoscope on manikin in a study done by Shi Hao Chew ID et al [6]. The time to intubation was considerably lower with the King Vision channeled and McGrath than with the King Vision non-channeled (41.3±20.3s and 38.5±18.7s against 53.8±23.8s, p<0.004). The time for glottis visualization was not included in their study. The results obtained were comparable with our study. The intubation times were shorter with the Channeled blade, however McGrath MAC also showed shorter intubation times than Kings Vision non channeled blades. With the exception of the intubation duration, our research found no statistically significant differences between the two groups. A similar study done on manikin by Jiri Votruba[20] et al aimed to compare the performance of disposable non-channeled and channeled blades of the King Vision™ videolaryngoscope in simulated cervical spine injury. They found similar results. Intubation time with the channeled blade was shorter, with a median time of 13 s (IQR 9-19) vs. 23 s (14.5-37.5), p < 0.001, while times to visualization of the larynx were similar in both groups (p = 0.54). The result obtained were comparable to our study. Success rates were similar in both groups, but intubation with the non-channeled blade required more attempts (1.52 vs. 1.05; p < 0.001).

Various Studies comparing the efficacy of video laryngoscopes with channeled and non-channeled who did not have an anticipated difficult airway have been done; however, only a small number of studies have focused on patients having anticipated difficult intubation. Brozek et al [13] compared the use of the channeled King Vision Video laryngoscope vs the non-channeled Glidescope for orotracheal intubation in patients with a body mass index (BMI) of 35 or higher. Similar findings were noted by Brozek et al, who found time to first breath on capnograph was shorter for tracheal intubation with channeled blades 36s (34-39) vs. 42s (40-50) in the Glidescope group (p = 0.007). In another study Yoshihiro Hirabayashi et al[21] in their meta-analysis on channeled videolaryngoscopes found higher success rate (RR 1.103, 95%CI 1.042 to 1.167, P <0.00069) and shorter duration for instrumentation (MD-10.873 s, 95%CI-18.588 s to-3.158 s, P< 0.0057) also first-attempt intubation was improved for difficult intubations. These results were comparable with our study.

Mostly the studies were carried out in patients with normal airway or under simulated conditions of airway difficulty. There are not many studies done in patients in the anticipated difficult intubation. Even the studies done on anticipated difficult intubation contained only one criterion while our study sought to cover the majority of criterion for anticipated difficult intubation.

In our study, in channeled group 15 patients and in the non-channeled group 17 patients required external laryngeal manoeuvre. 3 patients had trauma while intubating out of which 1 was from channeled group and 2 were from non channeled group. There was no incidence of desaturation in either of the 2 groups. Not more than 1 operator was required in any of the groups.

While the majority of patients were successfully intubated in the first attempt, 3 patients in the channeled group and 2 patients in the non-channeled group needed a second attempt. Our study showed that using a channeled blade to perform an intubation takes less time than using a non-channeled blade, especially for anticipated difficult intubations. Since the channeled blade has incorporated tube guide, therefore it is easier to direct TT towards the glottis, also the channel running on the right edge creates a dip which enables tube to be easily visualized throughout the course, while this dip is missing in case of non-channelled blade, therefore it is challenging to concurrently control the tracheal tube and VL while maintaining the best glottic vision.

Our study has few limitations. First, single user approach was done in the study, to avoid bias associated with individual skill differences among multiple users. However, this can be a limitation as single user approach only represent individual skill level. Second, we only used single brand videolaryngoscopes with channeled and non channeled blade. Hence, we cannot extrapolate the results to other videolaryngoscopes, as each device is slightly different in design, with different blade, angles and capabilities. The study outcome can be improved by multiple user approach and comparing channeled and non channeled blades of different videolaryngoscope.

CONCLUSION

When comparing video laryngoscopes with channeled and non channeled blades, the channeled group's time to complete intubation was less than the non channeled group. This can be because of the presence of a channel, it is easier to guide TT towards glottis and also the presence of channel creates a dip, making it easier for visualizing the tube while inserting. Therefore, we came to the conclusion that Channeled blades are better than non-channeled blades in patients with anticipated difficult intubation.

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