

A COMPARISON OF CONVENTIONAL BLADE LARYNGOSCOPY WITH VIDEO-ASSISTED BLADE LARYNGOSCOPY IN THE MANAGEMENT OF PREDICTED DIFFICULT AIRWAY –A RANDOMIZED CONTROL STUDY

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Abstract

Background: Laryngeal mask airways are introduced to handle difficult airway scenarios and play a pivotal role in ventilation. Video Laryngoscope provides an indirect glottic view, allowing for less tissue damage, leading to its successful use in awake intubations. Vs Several studies have reported that Video Laryngoscope provided better glottic views than other laryngoscopes when used by novice personnel or in mannequin studies simulating difficult airway scenarios. This study investigated whether a Video Laryngoscope can improve the glottic view and intubation conditions in patients with a potentially difficult airway compared with a Conventional Laryngoscope. **Materials and Methods:** This prospective randomized controlled study was conducted at the Department of Anesthesiology, Thanjavur Medical College Hospital, between January-December 2020 on 60 patients with predicted difficult airways posted for elective surgeries requiring general anaesthesia. The patients were randomized and divided into two; Group A comprised 30 intubated using a Conventional Laryngoscope. Group B comprised 30 patients who were intubated using a Video Laryngoscope. **Results:** Among the 60 patients, 41 were males, and 19 were females. There was no significant difference in age, height, weight, and BMI between groups. Cormack Lehane's grading of visualizing vocal cords was better and showed a significant improvement with video laryngoscopy compared to conventional laryngoscopy, with a p-value of 0.001. Successful intubations were significantly shorter with video laryngoscopy for anticipated difficult intubation, with a p-value of 0.04 and a mean laryngoscopy time of 0.85 mins \pm 0.39 mins in Group A and 0.79 mins \pm 0.57 mins in Group B. However, the intubation time was insignificant for anticipated difficult intubation, with a p-value of 0.12. **Conclusion:** Cormack Lehane Grading-based visualization of glottic view improved with the use of Video Laryngoscope compared to Conventional Laryngoscope, and the number of attempts taken for intubation was reduced.

INTRODUCTION

General anaesthesia has various effects on the respiratory system, including loss of airway patency, loss of protective airway reflexes, periods of hypoventilation, and apnoea. Securing a patent airway is paramount to ensure adequate ventilation and oxygenation. Traditional methods of airway management include ventilation via face mask and endotracheal intubation. With the advent of the Laryngeal Mask Airway, airway management has

improved. The American Society of Anesthesiologists (ASA) defines difficult intubation as 'an intubation during which the insertion of the endotracheal tube takes more than 10 min, or requires more than three attempts by an experienced anesthesiologist'. Data suggest that difficult airway problems account for almost 30% of deaths occurring during anaesthesia.^[1,2] The incidence of difficult intubation reported in the literature varies markedly between studies, ranging from 0.05 to 18%.^[3-5] The incidence of difficult intubation depends on the difficulty encountered, showing a range of 1- 18% of

all intubations to about 2/10,000-1/million for "cannot ventilate-cannot intubate" (CICV) situations. CICV scenario occurs in 1 in 5,000 cases for general anaesthesia, but only 1 in 50,000 patients will need an emergency surgical airway. Nevertheless, 25% of anaesthesia-related deaths are attributed to CICV.^[6] The most feared and serious complications of a difficult airway are death, cardiopulmonary arrest, brain injury, and airway trauma. Apart from these, the anesthesiologist should also monitor the patient to evaluate for further complications such as aspiration, pneumothorax, oedema, or possible bleeding. Difficult tracheal intubation (DTI) remains relatively constant among anaesthesia-related patient injuries. It is the third most common respiratory-related event leading to death and brain damage in the American Society of Anesthesiologists closed claims analysis.^[7] Difficult laryngoscopy can be anticipated when the Mallampatti grading is either III or IV. One of the most frequently used criteria for diagnosing difficult intubation is Cormack and Lehane's classification. They define intubation as more or less difficult according to the view of the glottis afforded at laryngoscopy.

Success in securing a difficult airway's patency lies in anesthesiologists' hands by developing the required skills and utilizing various airway gadgets. New airway devices are being continuously introduced into the clinical arena, with unique properties that can be used in any required clinical situation. Laryngeal mask airways, introduced to handle difficult airway scenarios, play a pivotal role in ventilation. Over the last few years, video-assisted endoscopic techniques have successfully been introduced into various surgical disciplines. Today, several elaborate video laryngoscopes are commercially available. While some devices feature a conventional Macintosh blade form, others have a distinct design. A pronounced curvature resembling oropharyngeal and hypopharyngeal anatomy enables a widened view.

Video Laryngoscope provides an indirect glottic view without aligning the oral-pharyngeal-tracheal axis with a camera and light source on the tip of its blade. This reduces tissue damage during laryngoscopy, making it successful in awake intubations. Several studies have reported that Video laryngoscopes provided better glottic views than other laryngoscopes when used by novice personnel or in mannequin studies simulating difficult airway scenarios. This study investigated whether a Video Laryngoscope can improve the glottic view and intubation conditions in patients with a potentially difficult airway compared with a Conventional Laryngoscope.

MATERIALS AND METHODS

This prospective randomized controlled study was conducted at the Department of Anesthesiology, Thanjavur Medical College Hospital, between

January 2020-December 2020, on 60 patients with predicted difficult airways posted for elective surgeries requiring general anaesthesia. Institutional Ethical Committee approval and informed consent were obtained.

Inclusion Criteria

Patients aged between 18 and 60 years of either sex with ASA physical status I and II, with Mallampatti score greater than 2, reduced mobility of atlantooccipital joint (less than 15 degrees), mouth opening less than or equal to 38mm, and thyromental distance less than or equal to 65mm were included.

Exclusion Criteria

Patients who were unwilling, patients with any indication for rapid sequence induction, and patients with known or predicted difficult face mask ventilation were excluded.

Methods

The subjects were randomized into groups A and B by simple randomization. Group A comprised 30 patients who were intubated using a Conventional Laryngoscope. Group B comprised 30 patients who were intubated using Video Laryngoscope. All the subjects were shifted to the operating table and connected to standard monitors (Pulse oximetry, Non-Invasive Blood Pressure Monitor, Electrocardiography). Peripheral intravenous lines were secured, and maintenance fluids were connected. Inj. Glycopyrrolate (4micg/Kg), Inj. Midazolam (0.04mg/Kg) and Inj. Fentanyl (2micg/Kg) was the premedication given intravenously to the subjects belonging to both groups. The subjects in both groups were pre-oxygenated with 100% oxygen for 5 minutes at a flow rate of 8L/min. The induction agent used was Inj. Propofol (2mg/Kg) intravenously and depolarizing muscle relaxant Inj. Succinylcholine (1.5 mg/Kg) intravenously. Until this step, the same protocol was followed for both groups.

For the Conventional Laryngoscope, McIntosh blades size 3 or size 4 were used for intubation in the subjects belonging to group A. For the Video Assisted Laryngoscope, Standard Blade 3 or Channeled Blade, size 3, was used for intubation in the subjects belonging to group B.

In all the 60 patients, intubation was performed by the same person who had been trained with Video Assisted laryngoscopy in a mannequin and had trial intubations with video-assisted laryngoscopy in 20 patients (10 patients with standard blade size 3 and 10 patients with channelled blade size 3). In both groups, the anesthesiologist who performed the intubation assessed Cormack Lehane's grading. Laryngoscopy time, intubation time, and number of attempts taken to intubate successfully were recorded by an observer (Anesthesiology resident).

Statistical Analysis

The data collected were entered into a Microsoft Excel sheet, and statistical analysis was done. Continuous variables were analyzed using an independent t-test. Categorical variables were

analyzed using the Chi-square test. A p-value of < 0.05 was considered statistically significant.

RESULTS

Among the 60 subjects, 30 were intubated with Conventional laryngoscopy (Group A), and the remaining 30 were intubated with Video laryngoscope (Group B). Group A contained 17 males and 13 females, and Group B contained 24 males and six females

Age was comparable between the two groups. The mean age in Group A was 37.6 years \pm 13.46 years; in Group B, it was 36.63 years \pm 14.56 years; the p-value was 0.79. Height, Weight, and Body Mass Index were comparable between the two groups, and the mean height of the subject belonging to Group A was 162.57 cm \pm 4.83 cm, and in Group B was 161.90 cm \pm 4.02 cm, and the p-value was 0.56. The mean weight of the subjects who belonged to Group A was 69.23 kg \pm 7.82 kg, and those who belonged to Group B were 69.31 Kg \pm 8.09 Kg, and the p-value was 0.97. The mean Body Mass Index of the subjects in groups A and B were comparable. Group A had a mean BMI of 25.89 Kg/m² \pm 2.75 Kg/m², and subjects in group B had a mean BMI of 26.47 Kg/m² \pm 3.04 Kg/m², and the p-value was 0.44. There was no significant difference in age, height, weight, and BMI between groups [Table 1].

Among Mallampati Grading, in Group A, 6 cases were classified as MPG III and 23 cases were classified as MPG IV. In Group B, 3 cases were classified as MPG III, and 26 were classified as MPG IV. In both groups, in one case, MPG couldn't be assessed.

Airway assessment mainly used the mouth opening, Thyromental Distance, and Mallampati Grading. Mean mouth opening among Group A and Group B subjects were around 2.18 \pm 0.48 finger breadth and 2.13 \pm 0.39 finger breadth, respectively, and the p-value was 0.66 [Table 2].

In Group A, 8 cases with a thyromental distance of < 65 mm and 22 cases were > 65 mm. In Group B, 9 cases with a thyromental distance of < 65 mm and 21 cases were >65 mm [Table 3].

Cormack Lehane's grading with video laryngoscopy was around 2.17 \pm 0.98, and Conventional laryngoscopy was 2.63 \pm 0.66. This showed a significant improvement in visualizing the vocal cords with a video laryngoscope compared to a Conventional laryngoscope with a p-value of 0.001. The total number of attempts taken for successful intubations in Group A was 1.77 \pm 0.43 times, and in Group B was 1.50 \pm 0.57 times. The p-value was 0.04, and there was a statistical significance in the number of attempts for intubation when intubated with video laryngoscope compared to Conventional laryngoscope for anticipated difficult intubation. In Group A, the mean laryngoscopy time was 0.85 mins \pm 0.39 mins; in Group B, the mean laryngoscopy time was 0.79 mins \pm 0.57 mins. Though the laryngoscopy time was less with the use of Video Laryngoscope, the p-value was 0.62, which was statistically insignificant. In group A, the mean time for intubation was around 2.71 mins \pm 0.89 mins; in group B, the mean time for intubation was around 2.28 mins \pm 1.23 mins respectively. The p-value was 0.12, which showed a statistically insignificant change in the intubation time using a Conventional and video laryngoscope for anticipated difficult intubation [Table 4].

Table 1: Demographical data

| Frequency | | 18-29 | 30-39 | 40-49 | 50-60 |
|-----------|---------|-------|-----------|---------|-------|
| Age | Group A | 14 | 3 | 4 | 9 |
| | Group B | 14 | 5 | 6 | 5 |
| BMI | | <18.5 | 18.5-24.9 | 25-29.9 | >30 |
| | Group A | 0 | 8 | 21 | 1 |
| | Group B | 1 | 9 | 19 | 1 |

Table 2: Mallampati Grading between groups

| Frequency | MPG I | MPG II | MPG III | MPG IV | It couldn't be assessed |
|-----------|-------|--------|---------|--------|-------------------------|
| Group A | - | - | 6 | 23 | 1 |
| Group B | - | - | 3 | 26 | 1 |

Table 3: Thyromental distance between groups

| Frequency | <65 mm | >65 mm |
|-----------|--------|--------|
| Group A | 8 | 22 |
| Group B | 9 | 21 |

Table 4: Cormack Lehane grading, number of attempts for intubation, laryngoscopy time, and intubation time.

| | Group A | Group B | P-value |
|-----------------------------------|-------------------|-------------------|---------|
| Cormack Lehane grading | 2.63 \pm 0.669 | 2.17 \pm 0.983 | 0.001 |
| Number of attempts for intubation | 1.77 \pm 0.43 | 1.5 \pm 0.572 | 0.04 |
| Laryngoscopy time | 0.855 \pm 0.394 | 0.793 \pm 0.576 | 0.62 |
| Intubation time | 2.715 \pm 0.892 | 2.285 \pm 1.233 | 0.12 |

DISCUSSION

This study deduced that the Mallampati grading was one of the parameters to assess anticipation in difficult intubation. This parameter was also comparable among the two groups in such a way that it was not a confounding factor in assessing the results. Cormack Lehane grading was taken into account as a parameter for glottic view. When compared to a Conventional laryngoscope, the glottic view improved with the use of a Video laryngoscope. This was statistically significant (p-value 0.001) and was comparable to the study by Gotz Serocki et al. in which the video laryngoscopes proved to be efficient in glottic visualization compared to Conventional laryngoscopy.^[8] Cochrane systematic review analysis by Lewis SR et al. regarding video laryngoscopy versus Conventional laryngoscopy for adult patients requiring tracheal intubation showed that video laryngoscopy improved glottic view.^[9] In a study by Haozhen Zhu et al., glottis views significantly improved with King Vision Video Laryngoscope compared to using a Conventional Laryngoscope in nasotracheal intubation.^[10]

The time taken for laryngoscopy (0.79 mins \pm 0.10 mins) was less with video laryngoscope compared to Conventional laryngoscope (0.85 mins \pm 0.39 mins), but statistically, it was insignificant (p=0.62). The study by Gotz Serocki et al. showed similar results where there was no statistically significant change in the time taken for laryngoscopy when using video laryngoscope compared to Conventional laryngoscope.^[8] A conventional laryngoscope, being more routinely used, aids in performing laryngoscopy in a short period. With frequent and routine use of Video Laryngoscope, there may be a chance of shorter laryngoscopy time with the use of Video Laryngoscope.

The time taken for intubation with Conventional laryngoscopy was around 2.71 mins \pm 0.89 mins, and with the use of King vision channelled blade video laryngoscopy, intubation time was around 2.28 mins \pm 1.23 mins. There was a statistically insignificant improvement in the intubation time using a Video laryngoscope. This correlates with the Cochrane review analysis by Lewis SR et al., which showed no significant improvement in the intubation time with video laryngoscope compared to Conventional laryngoscope.^[9] A randomized control trial by Malik MA et al., which compared Pentax AWS, Gildescope, and Conventional Laryngoscope in predicted difficult intubation, also showed insignificant differences in the duration of intubation among these devices.^[11] This was in contrast to the study by Serocki et al., in which intubation was faster comparatively using a Conventional laryngoscope.^[8] In a study by Marc Kriege et al., intubation time was prolonged using a video laryngoscope during the training period compared to a Conventional laryngoscope.^[12] The reason for the prolonged intubation time may be due to the learning curve

required with that of the video laryngoscope. Regular use of Video Laryngoscope for intubation may aid in better learning of its use and improve our comfort in using video laryngoscope for intubation. As we considered the number of attempts taken to achieve successful intubation, a video laryngoscope offered a statistically significant number of attempts compared to a Conventional laryngoscope. This was comparable to the study by Shah S et al., which showed fewer attempts required for intubation with a video laryngoscope than a Conventional laryngoscope.^[13] A study by Enomoto Y et al. showed that a Video laryngoscope improved the intubation success rate compared to a Conventional laryngoscope in patients with restricted neck movements.^[14]

A study by Michael F. Aziz et al. showed that video laryngoscopy resulted in more successful intubations on the first attempt than a Conventional laryngoscope.^[15] This was in contrast to a Cochrane review analysis of Video Laryngoscopy versus Conventional Laryngoscopy for adult patients requiring tracheal intubation by Lewis SR et al., which showed that there was no proven difference in the number of attempts required for successful intubation with video laryngoscope compared to that of a Conventional laryngoscope.^[9] In this study, though the time taken for laryngoscopy and intubation in patients with anticipated difficult airway did not show a statistically significant difference with the use of video laryngoscope compared to that of Conventional laryngoscope, the number of attempts taken for successful intubation with video laryngoscope was less compared to that of Conventional laryngoscope.

The more attempts taken to intubate a patient under general anaesthesia increases the risk of injury to the vocal cord, increases the risk of aspiration, and may also lead to laryngospasm and desaturation. Video Laryngoscopy for anticipated difficult intubation in this study showed a significant reduction in the number of attempts taken for successful intubation in subjects with anticipated difficult airways. Compared to Conventional laryngoscopes, video laryngoscopes showed proven benefits when used in patients with anticipated difficult intubation.

CONCLUSION

This study showed that Cormacke Lehane's Grading-based visualization of glottic view improved with a Video Laryngoscope compared to a Conventional Laryngoscope. The number of attempts taken for intubation is reduced with a Video Laryngoscope in patients with predicted difficult airways compared to that of a Conventional Laryngoscope. Video Laryngoscope did not help in improving the laryngoscopy time and intubation time compared to the use of a Conventional Laryngoscope in patients with predicted difficult airways.

This study concluded that the Cormack Lehane grading of the larynx improved with the use of a Video Laryngoscope, and the number of attempts taken for intubation was reduced with the use of a Video Laryngoscope in patients with predicted difficult airway compared with Conventional Laryngoscopy and Intubation.

Limitations

The limitation of this study was the use of a video laryngoscope by the resident anesthesiologist. Through trial intubations with difficult airways, mannequins were performed adequately. With experience and numerous encounters with difficult airways in routine practice, there are chances of better results.

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