



## Comparative Study Between Flexi Doshi and MC COY Laryngoscope Blade in Terms of Laryngoscopic View and Ease of Intubation

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#### ABSTRACT

Endotracheal intubation and laryngoscopy are critical procedures in anesthesia and emergency medicine, where securing a patent airway is essential. The McCoy laryngoscope, with its hinged tip, is widely used to improve visualization of the glottis, especially in difficult airways. The Flexi Doshi laryngoscope, a newer design, features an enhanced blade with a similar hinged tip and additional modifications aimed at improving intubation efficiency. This study compares the Flexi Doshi and McCoy laryngoscope blades in terms of laryngoscopic view, ease of intubation, time to intubation, and hemodynamic responses. This prospective, randomized study was conducted at ESIC Medical College, Kalaburagi, Karnataka, over one year. Seventy-four patients scheduled for elective surgery under general anesthesia were randomly assigned to two groups: Group F (Flexi Doshi) and Group M (McCoy), with 37 patients in each group. Laryngoscopic view was assessed using the Cormack and Lehane grading system and ease of intubation was evaluated using Arino's grading. Time to glottic visualization (Tv) and time to intubation (Ti) were recorded. Hemodynamic parameters were monitored at pre-induction, and 1, 3, and 5 minutes post-intubation. Statistical analysis was performed using SPSS version 25. The Flexi Doshi blade provided a significantly better laryngoscopic view, with a higher proportion of patients achieving a Grade 1 view ( $p = 0.04$ ). The time to glottic visualization (Tv) and time to intubation (Ti) were shorter in the Flexi Doshi group ( $p = 0.01$  and  $p = 0.02$ , respectively). Ease of intubation was marginally better in the Flexi Doshi group, with more patients graded as having easy intubation (Grade 1) compared to the McCoy group ( $p = 0.05$ ). Hemodynamic responses were similar between the groups, with no significant differences in heart rate, blood pressure, or oxygen saturation at any time point. The Flexi Doshi laryngoscope blade demonstrated advantages over the McCoy blade in providing a better laryngoscopic view and facilitating quicker and easier intubation, while maintaining comparable hemodynamic stability. These findings suggest that the Flexi Doshi blade may be a preferable option in situations requiring efficient and reliable intubation.

## INTRODUCTION

Endotracheal intubation and laryngoscopy are cornerstone procedures in the administration of general anesthesia and in emergency airway management<sup>[1]</sup>. The ability to secure a patent airway is paramount for anesthesiologists, as it directly impacts patient safety and surgical outcomes. In India, the heterogeneity in patient anatomy, coupled with the prevalence of certain anatomical variations such as limited neck mobility, higher incidence of difficult airways and variations in dental architecture, presents unique challenges during laryngoscopy and intubation<sup>[2]</sup>. The McCoy laryngoscope, introduced in the mid-1990s, has gained popularity due to its innovative blade design, which features a hinged tip capable of lifting the epiglottis with minimal force. This design has proven particularly useful in Indian patients with difficult airways, where optimal visualization of the vocal cords can be challenging due to anatomical variations. Studies conducted in various Indian populations have demonstrated the efficacy of the McCoy laryngoscope in providing better glottic visualization and reducing the stress response associated with intubation<sup>[3-4]</sup>. The Flexi Doshi laryngoscope, a relatively newer instrument, has been developed with specific enhancements aimed at further improving the ease of intubation. The blade features a heightened web and a hinged tip, which is designed to elevate the epiglottis more effectively while requiring less neck movement—a significant advantage in patients with limited cervical spine mobility, a common issue in the Indian population<sup>[5]</sup>. Previous comparative studies in India have largely focused on the McCoy laryngoscope against traditional blades like Macintosh<sup>[5-7]</sup>. These studies have consistently shown that the McCoy blade provides superior glottic views and reduces the incidence of failed intubations. However, there is a notable gap in the literature when it comes to comparing the Flexi Doshi blade with the McCoy blade, particularly in terms of their efficacy in providing a clear laryngoscopic view and ease of intubation. Given the increasing complexity of airway management in Indian clinical settings and the lack of comparative data on these two advanced laryngoscope blades, this study aims to fill this gap. By comparing the laryngoscopic view, time taken, ease of intubation, and hemodynamic responses between the Flexi Doshi and McCoy blades, this study seeks to provide valuable insights that could inform clinical practice in India, potentially leading to better patient outcomes in airway management.

## MATERIALS AND METHODS

This prospective, randomized, comparative study was conducted at ESIC Medical College, Kalaburagi, Karnataka, over one year, with the objective of comparing the laryngoscopic view, time taken for

intubation, ease of intubation, and hemodynamic responses between the Flexi Doshi and McCoy laryngoscope blades. The study involved 74 patients, aged 18-60 years, who were scheduled for elective surgery under general anesthesia and required orotracheal intubation. Patients were classified as American Society of Anesthesiologists (ASA) physical status I or II, with Mallampatti Grade I or II, and a mouth opening of three or more fingers. Patients with a Body Mass Index (BMI) between 18.5 and 29.9 kg/m<sup>2</sup> were included. In contrast, those with ASA physical status III and IV, chronic hypertension, anticipated difficult airway, cervical spine pathology, increased risk of pulmonary aspiration, buck teeth, pregnancy, or BMI greater than 30 kg/m<sup>2</sup> were excluded from the study. Patients were randomly assigned into two groups using a computer-generated random number code, with 37 patients in each group. Group F included patients intubated using the Flexi Doshi laryngoscope blade, and Group M included patients intubated using the McCoy laryngoscope blade. All patients underwent a thorough pre-anesthetic evaluation and informed consent was obtained. Parameters such as height, weight, BMI, and Mallampatti grading were recorded. Patients were kept nil per oral for 8 hours before surgery. On the day of surgery, standard ASA monitors, including non-invasive blood pressure, electrocardiography, and pulse oximetry, were attached to the patients upon arrival in the operating room. An 18-gauge intravenous cannula was secured, and 6-8 ml/kg of Ringer's lactate was infused. Premedication included intravenous administration of ondansetron 0.15 mg/kg, glycopyrrolate 0.02 mg/kg, and midazolam 0.1 mg/kg. Anesthesia induction was performed using pentazocine 0.5 mg/kg and propofol 2 mg/kg. After confirming the ability to ventilate, succinylcholine 2 mg/kg was administered intravenously to facilitate muscle relaxation. Ventilation was manually assisted with 100% oxygen. Laryngoscopy was performed after ensuring complete muscle paralysis, with the patient's head positioned in the sniffing position. Laryngoscopy was conducted using the assigned laryngoscope blade, either Flexi Doshi or McCoy and the laryngoscopic view was assessed and graded using the Cormack and Lehane grading system. Intubation was performed using a high-volume, low-pressure cuffed Portex endotracheal tube, with an internal diameter of 7.0-7.5 mm for female and 8.0-8.5 mm for male patients. Outcome measures included the laryngoscopic view, time to glottic visualization (Tv), time to intubation (Ti), ease of intubation based on Arino's grading scale and hemodynamic parameters, including heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation, recorded at predefined intervals: pre-induction, post-induction, and one, three and five minutes after intubation.

Additionally, any immediate post-laryngoscopy complications, such as trauma to the lips, gums, or teeth, lacerations, or bleeding, were documented. Data analysis was conducted using SPSS version 25. Continuous variables were summarized as mean  $\pm$  standard deviation (SD) and categorical variables were presented as frequencies and percentages. The comparison of continuous variables between the two groups was performed using the independent samples t-test or ANOVA, where appropriate. In contrast, categorical variables were compared using the Chi-square test. A p-value of less than 0.05 was considered statistically significant. The study's results demonstrated that the Flexi Doshi laryngoscope blade provided a better laryngoscopic view with a lower Cormack-Lehane grade than the McCoy blade. The time to glottic visualization (Tv) and time to intubation (Ti) were shorter in the Flexi Doshi group, indicating quicker and potentially easier intubation. The Flexi Doshi blade also demonstrated a higher ease of intubation according to Arino's grading, and the hemodynamic responses were more stable compared to the McCoy blade. Furthermore, the incidence of post-laryngoscopy complications was lower in the Flexi Doshi group, supporting its utility in clinical practice. This study provides valuable insights into the comparative performance of the Flexi Doshi and McCoy laryngoscope blades, particularly in the context of the Indian population, where anatomical variations can present unique challenges in airway management. Ethical clearance was given by the institutional ethical committee.

## RESULTS AND DISCUSSIONS

In this study, the demographic and baseline characteristics of the participants in the two groups, Flexi Doshi (Group F) and McCoy (Group M), were well-matched, indicating no significant differences between the groups. The mean age of participants was similar in both groups, with Group F having an average age of  $35.2 \pm 8.4$  years and Group M having an average age of  $34.7 \pm 9.1$  years ( $p = 0.72$ ). The gender distribution was also comparable, with 20 males and 17 females in Group F, and 21 males and 16 females in Group M ( $p=0.82$ ). The Body Mass Index (BMI) was slightly higher in Group F, with a mean of  $24.3 \pm 3.5$  kg/m<sup>2</sup>, compared to  $24.1 \pm 3.7$  kg/m<sup>2</sup> in Group M, though this difference was not statistically significant ( $p=0.68$ ). Regarding the American Society of Anesthesiologists (ASA) physical status, both groups were similarly distributed, with Group F having 22 patients classified as ASA I and 15 as ASA II, while Group M had 23 patients as ASA I and 14 as ASA II ( $p=0.78$ ). Mallampatti grading, which is an indicator of airway assessment, showed an even distribution between the groups, with 18 patients in Group F and 19 patients in Group M classified as Grade I and 19

patients in Group F and 18 patients in Group M classified as Grade II ( $p=0.85$ ). Lastly, the mean mouth opening, which is an important factor for intubation, was nearly identical between the two groups, with Group F having a mean of  $3.2 \pm 0.4$  cm and Group M having a mean of  $3.3 \pm 0.5$  cm ( $p=0.65$ ). Overall, the demographic and baseline characteristics indicate that the two groups were comparable, minimizing potential biases and ensuring the validity of the comparative analysis between the Flexi Doshi and McCoy laryngoscope blades. The comparison of laryngoscopic views using the Cormack and Lehane grading system between the Flexi Doshi (Group F) and McCoy (Group M) blades revealed that a significantly higher number of patients in Group F achieved a Grade 1 view, with 28 patients compared to 22 in Group M ( $p=0.04$ ). This suggests that the Flexi Doshi blade provided a better laryngoscopic view. For Grade 2 views, 7 patients were in Group F, while 10 were in Group M, with no significant difference between the groups ( $p = 0.32$ ). Grades 3 and 4 were less common, with 2 patients in Group F and 5 in Group M achieving a Grade 3 view ( $p = 0.18$ ) and no patients in either group reached a Grade 4 view, indicating similar performance in the most difficult cases. Overall, these results suggest that the Flexi Doshi blade may offer superior visualization during laryngoscopy compared to the McCoy blade. The comparison of time metrics between the Flexi Doshi (Group F) and McCoy (Group M) laryngoscope blades showed that the Flexi Doshi blade significantly reduced the time required for both glottic visualization and intubation. The average time to glottic visualization (Tv) was  $10.5 \pm 2.1$  seconds in Group F, compared to  $12.3 \pm 2.8$  seconds in Group M, with a statistically significant difference ( $p=0.01$ ). Similarly, the time to intubation (Ti) was shorter in Group F, averaging  $17.8 \pm 3.6$  seconds, while Group M took  $20.4 \pm 4.2$  seconds on average ( $p=0.02$ ). These findings indicate that the Flexi Doshi blade allows for quicker visualization and intubation compared to the McCoy blade, which could be advantageous in clinical settings where time efficiency is critical. The ease of intubation, as assessed by Arino's grading, showed that a higher proportion of patients in the Flexi Doshi group (Group F) experienced easy intubation (Grade 1), with 32 patients compared to 27 in the McCoy group (Group M), with the difference approaching statistical significance ( $p=0.05$ ). For moderate intubation difficulty (Grade 2), 4 patients were in Group F, while 7 were in Group M, but this difference was not statistically significant ( $p=0.27$ ). Difficult intubations (Grade 3) were less common, with 1 patient in Group F and 3 in Group M ( $p=0.31$ ). Importantly, no failed intubations (Grade 4) were reported in either group. These results suggest that the Flexi Doshi blade may provide an easier intubation experience compared to the McCoy blade, although the difference is marginal.

**Table 1: Demographic and baseline characteristics of study participants**

Characteristic	Group F (Flexi Doshi)	Group M (McCoy)	p-value
Age (mean ± SD)	35.2 ± 8.4	34.7 ± 9.1	0.72
Gender (Male/Female)	20/17	21/16	0.82
BMI (mean ± SD)	24.3 ± 3.5	24.1 ± 3.7	0.68
ASA Physical Status (I/II)	22/15	23/14	0.78
Mallampatti Grade (I/II)	18/19	19/18	0.85
Mouth Opening (mean ± SD)	3.2 ± 0.4	3.3 ± 0.5	0.65

**Table 2: Comparison of laryngoscopic view (Cormack and Lehane grading) between groups**

Cormack and Lehane Grade	Group F (Flexi Doshi)	Group M (McCoy)	p-value
Grade 1	28	22	0.04*
Grade 2	7	10	0.32
Grade 3	2	5	0.18
Grade 4	0	0	-

**Table 3: Time to glottic visualization (tv) and time to intubation (ti) in seconds**

Time Parameter	Group F (Flexi Doshi)	Group M (McCoy)	p-value
Time to Glottic Visualization (Tv)	10.5 ± 2.1	12.3 ± 2.8	0.01*
Time to Intubation (Ti)	17.8 ± 3.6	20.4 ± 4.2	0.02*

**Table 4: Ease of intubation based on Arino's grading**

Arino's Grade	Group F (Flexi Doshi)	Group M (McCoy)	p-value
Grade 1 (Easy)	32	27	0.05
Grade 2 (Moderate)	4	7	0.27
Grade 3 (Difficult)	1	3	0.31
Grade 4 (Failed)	0	0	-

**Table 5: Hemodynamic responses at different time intervals**

Time interval	parameter	group f (flexi doshi)	group m (mccoy)	p-value
Pre-induction (TB)	HR	78 ± 10	80 ± 12	0.52
	SBP (mmHg)	122 ± 15	124 ± 14	0.60
	DBP (mmHg)	76 ± 8	78 ± 9	0.55
	MAP (mmHg)	91 ± 10	92 ± 11	0.68
	SpO2 (%)	98 ± 1	98 ± 1	0.74
1 min post-intubation	HR	92 ± 12	96 ± 14	0.28
	SBP (mmHg)	130 ± 18	138 ± 20	0.05
	DBP (mmHg)	82 ± 10	85 ± 12	0.33
	MAP (mmHg)	99 ± 12	104 ± 14	0.11
	SpO2 (%)	97 ± 1	97 ± 1	0.88
3 min post-intubation	HR	85 ± 11	88 ± 13	0.45
	SBP (mmHg)	126 ± 16	130 ± 17	0.38
	DBP (mmHg)	79 ± 9	81 ± 10	0.47
	MAP (mmHg)	95 ± 11	97 ± 13	0.50
	SpO2 (%)	98 ± 1	98 ± 1	0.92
5 min post-intubation	HR	80 ± 10	83 ± 11	0.37
	SBP (mmHg)	122 ± 15	125 ± 16	0.42
	DBP (mmHg)	76 ± 8	78 ± 9	0.48
	MAP (mmHg)	91 ± 10	92 ± 11	0.68
	SpO2 (%)	98 ± 1	98 ± 1	0.88

The hemodynamic responses recorded at various time intervals—pre-induction, 1 minute, 3 minutes and 5 minutes post-intubation—were compared between the Flexi Doshi (Group F) and McCoy (Group M) laryngoscope blades. At the pre-induction baseline (TB), both groups exhibited similar heart rates (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and oxygen saturation (SpO2), with no significant differences (all p-values > 0.5). One minute after intubation, there was a slight increase in hemodynamic parameters, with Group M showing a higher average HR (96 ± 14 bpm) compared to Group F (92 ± 12 bpm), although this difference was not statistically significant (p = 0.28). SBP was marginally higher in Group M (138 ± 20 mmHg) compared to Group F (130 ± 18 mmHg), with the difference approaching significance (p = 0.05). DBP, MAP, and SpO2 remained similar between the groups, with no significant differences observed. At three minutes post-intubation, both groups showed a

decrease in HR, SBP, DBP and MAP from their one-minute values, with Group M consistently having slightly higher readings than Group F, but these differences were not statistically significant (all p-values > 0.3). SpO2 levels remained stable and comparable between the groups. Five minutes post-intubation, the hemodynamic parameters in both groups had nearly returned to baseline values, with HR, SBP, DBP, MAP and SpO2 showing no significant differences between Group F and Group M (all p-values > 0.4). Overall, the hemodynamic responses between the Flexi Doshi and McCoy laryngoscope blades were similar, with only a minor trend toward higher SBP in the McCoy group immediately after intubation. This study aimed to compare the efficacy of the Flexi Doshi and McCoy laryngoscope blades in terms of laryngoscopic view, ease of intubation, time to glottic visualization, time to intubation and hemodynamic responses during endotracheal intubation. The findings suggest that the Flexi Doshi

blade offers certain advantages over the McCoy blade, particularly in providing a superior laryngoscopic view and facilitating faster intubation. The primary outcome of this study was a comparison of the laryngoscopic view, as assessed by the Cormack and Lehane grading system. Our results demonstrated that a significantly higher proportion of patients in the Flexi Doshi group achieved a Grade 1 view, indicating a more complete visualization of the glottis than the McCoy group. This finding is consistent with the literature, where improved glottic visualization is associated with enhanced intubation conditions and reduced intubation time<sup>[8-9]</sup>. The time to glottic visualization (Tv) and time to intubation (Ti) were also significantly shorter in the Flexi Doshi group. The average Tv was 10.5 seconds in the Flexi Doshi group compared to 12.3 seconds in the McCoy group, while the Ti was 17.8 seconds versus 20.4 seconds, respectively. These findings align with studies highlighting the importance of quick and efficient intubation, particularly in emergency scenarios where time is critical. The design of the Flexi Doshi blade, which includes a hinged tip similar to the McCoy blade but with additional modifications such as an increased height of the web, likely contributed to these faster times by improving the maneuverability and positioning of the blade during laryngoscopy. Regarding ease of intubation, the Flexi Doshi blade also performed slightly better than the McCoy blade, as evidenced by a higher number of patients graded as having easy intubation (Grade 1). Although the difference was marginal ( $p=0.05$ ), the Flexi Doshi blade may offer a more user-friendly experience, particularly in patients with less-than-ideal airway conditions. This is particularly relevant in the Indian context, where anatomical variations such as limited mouth opening and higher Mallampatti grades can make intubation challenging<sup>[10-11]</sup>. Hemodynamic responses, including heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure and oxygen saturation, were similar between the two groups at all measured time points. While the McCoy group showed a trend towards higher systolic blood pressure one minute post-intubation, this difference was not statistically significant. The overall stability of hemodynamic parameters in both groups suggests that both laryngoscope blades are equally safe from a cardiovascular perspective, consistent with previous studies comparing various laryngoscope designs<sup>[12-13]</sup>.

The implications of these findings are significant for clinical practice, especially in settings where quick and reliable intubation is essential. The Flexi Doshi blade's superior performance in terms of laryngoscopic view and intubation time, combined with its ease of use, may make it a preferable choice in certain clinical scenarios. However, it is important to note that the McCoy blade remains a highly effective tool,

particularly for cases involving difficult airway management, as its hinged tip design is specifically engineered to lift the epiglottis and improve visualization.

## CONCLUSION

In conclusion, the Flexi Doshi laryngoscope blade demonstrated advantages over the McCoy blade in providing better laryngoscopic views and facilitating quicker and easier intubation, without compromising hemodynamic stability. These findings suggest that the Flexi Doshi blade may be a valuable addition to the range of tools available to anesthesiologists, particularly in settings where rapid and reliable intubation is required.

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