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Original Article

# Evaluation of Glottic Visualization & Ease of Intubation at Induction of General Anesthesia: Comparison Between Macintosh & Mc-coy Blade Laryngoscopes

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## Abstract

**Objective:** To compare the frequency of better glottic visualization and ease of tracheal intubation with Macintosh and McCoy blades.

**Methods:** This randomized controlled trial was conducted in the Department of Anesthesia, Lahore from September 2017 to March 2018. A total of 60 patients booked for elective surgical procedures under general anesthesia of age ranges from 20-40 years, of both genders, were included. Patients with anticipated difficult intubation, diabetes mellitus, hypertension, pulmonary diseases, and ischemic heart diseases were excluded. Patients were randomly divided in two groups: Group 1 (Mc-Coy) and Group 2 (Macintosh) with 30 patients in each group. Laryngoscopy was performed using McCoy blade in Group 1 and with Macintosh blade in Group 2 and the best possible view of the glottis was sought. Two trained anesthesiologists were involved to grade the view of glottis visualization and ease of intubation.

**Results:** The mean age of patients in Group 1 and Group 2 was 29.80 ± 6.07 years and 31.93 ± 5.99 years respectively. Out of these 60 patients, 35 (58.33%) were male and 25 (41.67%) were females with male to female ratio of ratio of 1.4:1. Better glottic visualization was found in 60.0% of cases with Macintosh blade and in 83.33% of cases with Mc-Coy blade (p-value = 0.045) and ease of intubation was 73.33% and 93.33% with Macintosh and with McCoy blade respectively (p-value = 0.038).

**Conclusion:** This study concluded that frequency of better glottic visualization and ease of tracheal intubation with McCoy blades is higher as compared to Macintosh blade.

**Keywords:** Endotracheal tube placement, glottic visualization, McCoy blades.

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## Introduction

Endotracheal intubation is done for various purposes, most commonly among them is for securing and maintaining the airway and ventilation for the conduct of surgery under general anesthesia. Other indications include mechanical ventilation of critically ill patients, securing airway, resuscitation, and to achieve hyperventilation for lowering raised intracranial pressure[1]. Intubation is normally facilitated by sedating or anaesthetizing the patient first and then by the use of some intubation gadget including a conventional laryngoscope, flexible fiberoptic bronchoscope or video laryngoscope to name a few.[2]

Direct view of the larynx using laryngoscopes of various designs has been the corner stone of endotracheal intubation since the advent of artificially ventilating the patient during general anesthesia. Direct laryngoscopy brings the various structures of upper airway including the pharynx and the larynx in one line, thereby facilitating the process of intubation. However, cases of difficult intubations have always been there, prompting the anesthesiologists to use various sizes and designs of laryngoscope blades to aid in the process.[3,4]

The popularity of Macintosh laryngoscope in the world

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of anesthesia is beyond any doubt. Designed by Sir Robert Macintosh, Professor of Anesthetics at University of Oxford, it has revolutionized the conduct of intubation in anesthesia. In 1940s, when the use of straight Miller blade was common and many anesthetics were struggling with the intubations particularly due to lack of the discovery of muscle relaxants, Macintosh designed a curved blade laryngoscope and suggested to place its tip in the valecullae, thus lifting the epiglottis and improving the view for intubation. The ease of intubation with this device made it popular over a quick span of time. Macintosh laryngoscope is still regarded by most of the anesthetists as an easier to master device and a gold standard for intubation even though larynx cannot be viewed properly in 1-3% of the cases by its use.[5]

The McCoy blade of the laryngoscope is a modification in the design of Macintosh blade. The tip of the blade is made hinged which bends by pressing the lever at the handle of the laryngoscope. This further lifts the epiglottis making the device particularly useful for improving the glottic view.[6]

Studies comparing the use of various blades of laryngoscope for the ease of intubation have shown variable results. Kulkerni et al compared the ease of intubation using Miller, McCoy, Macintosh and Trueview laryngoscopes. The ease of intubation was not statistically difference between McCoy blade, Trueview, and Macintosh blade (grade 1 view=93% with McCoy and Trueview and 90% with Macintosh blade). However, statistically significant difference was seen between McCoy and Miller blade with grade 1 view seen in only 57% of patients in Miller group. Barak et al compared the Truview with Macintosh blade. They concluded that Truview provides better laryngoscopic view as compared to Macintosh blade (grade 1 view = 86% and 45% respectively, p value = 0.001)7,8. We, therefore, planned to compare the Macintosh and McCoy blades laryngoscope for glottic visualization and ease of tracheal intubation in our general population to get further evidence.

## Methods

This Randomized Controlled Trial was conducted in the Department of Anesthesia, …. from September 2017 to March 2018. After taking ethical approval from the hospital committee and research department, sample size of 60 patients was calculated. The patients were randomly divided into two groups: Group 1 (McCoy group) and Group 2 (Macintosh group), each comprising of 30 patients. Patients of both genders scheduled for elective procedures under general anesthesia, belonging to American Society of Anesthesiologist physical class 1 and 2 and ranging between 20 to 40 years of age were included in the study. Patients with anticipated difficult intubation on history and physical examination, having diabetes mellitus, hypertension, chronic obstructive airway disease, ischemic heart disease, undergoing head and neck surgery or Body mass index (BMI) more than 30 were excluded. Informed consent for participation in the study was taken from each patient. Randomization was performed using the lottery method technique. Patients in both groups were fasted for solids for at least 6 hours before surgery. Tablet Alprazolam 0.25 mg was given per oral at night before surgery. After application of all the monitoring equipment to the patients, anesthesia was induced with injection Propofol 2-3 mg/kg till the loss of verbal response and maintained with isoflurane in 70% air and 30% oxygen. Loading dose of injection Atracurium (0.4-0.5mg/kg) was injected intravenously to attain adequate muscle relaxation. Injection nalbuphine was given was for analgesia to each patient in a dose of 0.10 - 0.15mg/kg. Assisted ventilation was provided to each patient for four minutes to allow adequate muscle relaxation. Then, laryngoscopy was carried out using McCoy blade in patients belonging to Group 1 and Macintosh blade in patients belonging to Group 2. Two trained anesthesiologists were then asked to report the vocal cord visualization according to Cormark-Lehabe scoring system9 (Grade-I and 2a as better view, grade 2b to IV as difficult view). Ease of tracheal intubation was determined using Intubation Difficulty Scale (IDS)10. Score of 0 to 5 was taken as easy to intubate while a score of 6 or more was taken as difficult to intubate. The patients were then intubated using endotracheal tubes of appropriate sizes, cuffs of the tubes were inflated, laryngoscope blade removed, breathing circuits were attached and mechanical ventilation was ensued. Bilateral chest auscultation and capnography was used to ensure the proper placement of endotracheal tubes. All the data including the patients' demographics and findings at the laryngoscopy was recorded on especially designed proforma.

Data was analyzed using SPSS version 20. Frequency and percentage were calculated for qualitative variables

like gender, ASA score, glottic view and ease of tracheal intubation. Mean±SD were calculated for quantitative variables like age, weight, and BMI. Chi-square test was applied to compare glottic view and ease of tracheal intubation in both groups. p value of ≤ 0.05 taken as significant.

## Results

Patients in both groups were comparable in terms of age, gender distribution, ASA physical class status, weight, and BMI (table-1) with insignificant p values. In our study, we have found significantly better glottic visualization and ease of intubation with McCoy laryngoscope blade as compared to Macintosh laryngoscope blade (table-2).

**Table 1:** *Comparison of Physical Characteristics of Two Study Groups*

| Parameter | Group 1 (n=30) | | | GROUP 2 (n=30) | | |
|---|---|---|---|---|---|---|
| AGE in years (mean ± SD) | 29.80 ± 6.07 | | | 31.93± 5.99 | | |
| Gender | **Male** | n=17 | 56.66% | **Male** | n=18 | 60% |
| | **Female** | n=13 | 43.33% | **Female** | n=12 | 40% |
| ASA CLASS | **I** | n= 12 | 40% | **I** | n= 14 | 46.67 |
| | **II** | n=18 | 60% | **II** | n=16 | 53.33 |
| WEIGHT In kg years (mean ± SD) | 81.90 ± 9.47 | | | 79.13 ± 9.04 | | |
| BMI kg/m$^2$ (mean ± SD) | 30.73 ± 2.38 | | | 30.23 ± 2.33 | | |

**Table 2:** *Comparison of Glottic Visualization and Ease of Intubation in Two Study Groups*

| Parameter | | Group 1 (n=30) | | Group 2 (n=30) | | P value |
|---|---|---|---|---|---|---|
| | | No. | %age | No. | %age | |
| **Glottic visualization** | Better view | 25 | 83.33 | 18 | 60.0 | **0.045** |
| | Difficult view | 05 | 16.67 | 12 | 40.0 | |
| **Ease of tracheal intubation** | Yes | 28 | 93.33 | 22 | 73.33 | **0.038** |
| | No | 02 | 6.67 | 08 | 26.67 | |

## Discussion

The incidence of difficult tracheal intubation during the conduct of anesthesia has been estimated to be around 8%[11]. Conditions necessitating the restriction of the neck movements as in cases with the fracture of cervical spine or joint deformities where the joints are fused or fibrosed raises this incidence up to 20%.[12] Various methods and tests have been designed for the prediction of difficult airway. However, none of them have proven to be 100% accurate in the prediction.[13,14] This failure of prediction of a limited number of cases regarding the difficulty in intubation brings forward the scenarios of "unanticipated" difficult airways. Literature reveals that 1.5 to 8.5 % of the cases poses unanticipated difficulty in intubation.[15,16] Since the advent of Macintosh laryngoscope, its use has gained immense popularity over a very short span of time. It will not be an exaggeration to state that it has become a "gold standard" in the art of laryngoscopy. Cases in which laryngoscopy with Macintosh blade does not reveal the laryngeal inlet adequately, use of assisting gadgets like stylet or gum elastic bougie become handy.[17,18]

The McCoy blade of laryngoscope is essentially a modification in the design of Macintosh blade where the tip of the blade is made hinged to lift the epiglottis when flexed with a lever. This hinged design lessens the application of force required to lift the epiglottis particularly in cases of limited glottic view.[19,20]

We have conducted this study to compare the frequency of better glottic visualization and ease of tracheal intubation in Macintosh versus McCoy blades. We have found that the glottic visualization is better with the use of McCoy laryngoscope as compared to Macintosh laryngoscope (83.33% vs 60% respectively with p-value=0.045). Ease of intubation with McCoy laryngoscope is 93.33% as compared to 73.33% with Macintosh laryngoscope (p-value = 0.038). Garhwal AM and his associate found in their study that better glottic visualization was 15% with Macintosh and ease of intubation was 38.33%[21]. Study conducted by Kulkarni et al. showed better glottic visualization with McCoy blade as compared to Macintosh blade (77% and 63% respectively) and ease of intubation was 93% with McCoy while with Macintosh blade its 90%7. Uchida et al[22] conducted a study on view of glottis with Macintosh and McCoy blade keeping the necks of the patients in neutral positions. They concluded that the glottic view improves in grade when McCoy blade is used in place of Macintosh blade. The results of their study showed that 72% of the patients in the Macintosh group had grade 3 view on laryngoscopy. However, this view improved to grade 1 or grade 2 when McCoy blade was used in 83% of the patients.

The difficulty faced during endotracheal intubation prior to the invention of Macintosh blade was perhaps more due to the technique rather than the shape of the blade. The straight blades used previously employed a midline approach where the tongue was kept in the

center. This required use of far greater force to obtain the adequate view of laryngeal inlet causing the anesthetists to struggle during direct endotracheal intubation. Professor Macintosh with the invention of curved laryngoscope also emphasized on the technique of laryngoscopy by putting the tip of the laryngoscope blade in the vallecula and displacing the bulk of the tongue onto one side, thereby improving the view of laryngeal inlet.[23] The blade of Macintosh laryngoscope incorporates the bulk of muscle mass of the tongue under its curvature and by displacing the tongue to one side further improvement in the view is obtained with far lesser force being used. McCoy further modified the technique by incorporating the hinged tip to the blade of the laryngoscope. Flexing the tip with lever during laryngoscopy further lifts the epiglottis with far less force, improving the view of glottis and aiding in tracheal intubation. Literature shows that the number of attempts at intubation, difficulty in intubation and trauma to the upper airway is lesser when using McCoy blade for direct laryngoscopy in comparison with Macintosh blade.[24,25] Also the laryngoscopic view is seen to be improved by using McCoy blade in patients with rigid cervical collar on or when utilizing manual in-line stabilization techniques for patients with suspected cervical spine injury.[26,27]

## Conclusion

This study concluded that frequency of better glottic visualization and ease of tracheal intubation with McCoy blades is higher as compared to Macintosh blade. So, we recommend that use of McCoy blades should be encouraged for obtaining better view of glottis on direct laryngoscopy n and tracheal intubation. Use of Mc-Coy blade can be particularly handy in the scenario of limited glottic visualization.

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## Authors Contribution

**A.G:** Conceptualization of Project, Data CoIIection, Literature Search

**M. M:** Data CoIIection

**L.R:** Statistical Analysis

**A.G, L.R:** Drafting, Revision

**L.R, M:** Writing of Manuscript