

## ORIGINAL ARTICLE

# COMPARISON OF HAEMODYNAMIC RESPONSE TO LARYNGOSCOPY WITH MACINTOSH AND MCCOY BLADES IN PATIENTS UNDERGOING GENERAL ANAESTHESIA

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## ABSTRACT

**Background:** Non-pharmacological approaches for controlling laryngoscopy induced stress responses are less explored; resulting in under-diffusion of laryngoscopy blades with safe designs in the hospital system. The aim of this study was to evaluate comparative efficacy of McCoy blades and MacIntosh blades in reducing stress response to laryngoscopy.

**Materials and Methods:** Total Sixty adult patients with American Society of Anaesthesiologists's (ASA) grade I or II were included with random assignment to group A (MacIntosh, n=30) and group B (McCoy, n=30). Primary study endpoints were changes in mean arterial pressure and heart rate in peri-induction phase during laryngoscopy and secondary endpoint was occurrence of adverse event or any in both groups. For continuous variables presented in mean  $\pm$  standard deviation (SD), student's t-test and for categorical variables chi-square test was performed with  $p < 0.05$  as significance criteria.

**Results:** The maximum change observed in mean arterial pressure (MAP) in the MacIntosh group was 28.08% compared to 15.25% in the McCoy group ( $p = 0.0001$ ). The maximum rise in the heart rate (HR) compared to baseline seen was 25.67% in the MacIntosh group compared to 14.86% in the McCoy group ( $p = 0.0001$ ). No ST elevation, arrhythmia or any other side-effects were observed in any of the groups.

**Conclusion:** Given better clinical outcome with more attenuation of laryngoscopy induced stress response compared to conventional blades, McCoy blade could be advocated for robust diffusion and institutional use for ensuring patient safety especially in those with compromised cardiovascular dynamics.

**Keywords:** Laryngoscopy, MacIntosh laryngoscope blade, McCoy laryngoscope blade

## INTRODUCTION

Laryngoscopy and endotracheal intubation are associated with generation of noxious stimuli followed by altered haemodynamic response.<sup>1</sup> The increase in sympathetic and sympatho-adrenal activity leads to increase in catecholamine release resulting in haemodynamic changes which are a concern for anaesthesiologists' team, which is also evidenced causative factor for hypertension, tachycardia and arrhythmias.<sup>2,3,4,5,6</sup>

The forces exerted by the laryngoscope blade on the base of the tongue while lifting the epiglottis act as major stimulus for cardiovascular and airway responses.<sup>7</sup> These haemodynamic changes could prove to be detrimental especially in patients with ischemic heart disease, cerebrovascular disease and similar clinical manifestations with equal risk to even non-cardiac patients, which need to be prevented.<sup>8,9</sup>

Though previous evidences emphasize on pharmacological methods to attenuate abnormal haemodynamic responses, non-pharmacological options have shown promising results. For example, use of a laryngoscope blade with change in design has shown promising results by attenuating stress response because of minimized oropharyngeal stimulation.<sup>10, 11</sup> However, due to discrepancies in research designs unlike pharma trials, paucity of data focusing on non-pharmacological options has been observed.

There are two type of curved blades found in common practice of laryngoscopy; The MacIntosh blade and The McCoy blade. Out of the two commonly used laryngoscope blades, MacIntosh blade is commonly practised option for intubation purpose. At the same time, several studies have shown concern in view of raised haemodynamic response while use of MacIntosh laryngoscope blade<sup>1-5</sup> particularly in patients with hypertension and cardiac diseases. As a practical

solution, McCoy blade was introduced in anaesthesia practice before almost three decades with a change in the basic design of MacIntosh curved blade. It has a hinge on its tip operated by a lever attached to blade to lift the epiglottis. Due to unique design, it gives better glottic visualization using lesser lifting force than MacIntosh blade and lesser haemodynamic response to laryngoscopy.<sup>12</sup> Despite such proven safety, McCoy laryngoscope blade remains underutilized in routine except selected cases.

The aim of this study was to evaluate comparative efficacy of McCoy blades and MacIntosh blades in reducing stress response to laryngoscopy.

## METHODOLOGY

**Subject Selection and randomization:** After approval from institutional ethics committee, Sixty ASA grade I & II patients of either gender, aged 18 to 60 years, admitted in our hospital posted for surgery under general anaesthesia were considered in this prospective clinically controlled study. Patients with known allergies, spine deformities cardiovascular pathology or anticipated difficult airway were not included in this study. Patients with history of bronchial asthma, coagulopathy, & those on beta blockers or requiring nasal intubation were also excluded from this study. Only single attempt tracheal intubations were considered into the study. After informed consent, enrolled subjects were randomly assigned to have laryngoscopic intervention using either MacIntosh blade (Group A) or McCoy blade (Group B) with quasi-randomization approach.

**Clinical Procedure:** Enrolled subjects' baseline vitals were obtained with multipara monitor. Intravenous (I.V.) pre-medications with Injection (Inj.) Glycopyrolate (0.004mg/kg I.V.), Inj. Ondansetron (0.08mg/kg I.V.) and Inj. Midazolam 0.2mg/kg I.V. was given. Pre oxygenation with 100% oxygen (O<sub>2</sub>) for 3 minutes was done. They were induced with Inj. Thiopentone (5-7mg/kg I.V.) followed by Inj. Succinyl choline (2mg/kg I.V.) to facilitate endotracheal intubation. The laryngoscopy was performed with either of the blades (McCoy or MacIntosh) with their standard sizes followed by endotracheal intubation in a single effort with appropriate sized endotracheal tube. During whole surgical procedure, anaesthesia was maintained with the mixture of oxygen (O<sub>2</sub>) and nitrous oxide (N<sub>2</sub>O) 50% each with administration of Isoflurane 1-2%. The muscle relaxation was provided by using Inj. Atracurium I.V. Routine reversal was performed using simultaneous administration of Inj. Glycopyrolate 0.01mg/kg + Inj. Neostigmine 0.5mg/kg I.V. Patients were extubated when they fulfilled the criteria for extubation and shifted to post anaesthetic recovery unit.

**Analysis:** To understand the pattern of stress response attenuation, haemodynamic parameters were recorded at various time points (Table 1) including mean arterial blood pressure and heart rate. Primary objective was to compare mean difference in arterial blood pressure and heart rate from baseline measurements during laryngoscopy between both A and B groups. Secondary objective was to assess safety profile in both groups in form of number of patients with adverse events if any. Chi-square and student's t-test were performed with 95% Confidence Interval (C.I.) for categorical data and continuous variables respectively. p value <0.05 was considered as criteria for statistical significance.

## RESULTS

Out of total 60 enrolled patients matching with the inclusion criteria there was equal demographic distribution in terms of gender 60% were males (n=38), and rest were females (n=22). ASA grade I (n=29) and ASA grade II (n=31), Mean age group A (32.3±2.83) & group B (31± 1.41) [Table 2].

**Table 1: Reference codes for measurement time-points**

VITAL RECORDING INTERVALS	CODES
Pre Induction	PI
Pre laryngoscopy	PL
Immediately (0 min) after laryngoscopy	L0
1min post laryngoscopy	L1
3min post laryngoscopy	L3
5min post laryngoscopy	L5
10min post laryngoscopy	L10
15min post laryngoscopy	L15

**Heart Rate (HR) variations:** Heart rate was found to rise significantly for 3 min following laryngoscopy in both the groups. On intergroup comparison, McCoy group showed statistically significant lower values immediately at 0, 1, 3 and 5 min following laryngoscopy. The maximum rise in the HR compared to baseline seen was 25.67 % in the MacIntosh group compared to 14.86% in the McCoy group (p = 0.0001). These changes are shown in Figure 1.

**Mean Arterial Pressure (MAP) Variations:** The changes in mean arterial pressure showed similar changes like heart rate. On intergroup comparison, significant changes were seen immediately at 0, 1, 3 and 5 min after laryngoscopy. The maximum change observed in the MacIntosh group was 28.08% compared to 15.25% in the McCoy group (p = 0.0001). Figure 2].

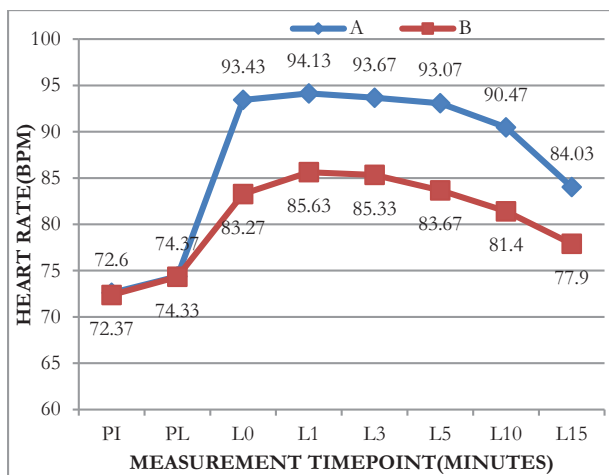
**Table 2: Demographic and Base line Characteristics for both groups (MacIntosh and McCoy laryngoscope blades)**

Variables	MacIntosh (Group A)(n=30)	McCoy (Group B)(n=30)	p Value
Gender			
Male	18(60.0)	20(66.6)	0.5920
Female	12(40.0)	10(33.3)	
ASA Grade			
ASA I	15(50.0)	16(53.3)	0.7961
ASA II	15(50.0)	14(46.6)	
Malampatti Score			
MPG I	13(43.3)	11(36.6)	0.8566
MPG II	13(43.3)	15(50.0)	
MPG III	4(13.3)	4(13.3)	
Mean Age(Yrs)	32.3±2.83	31± 1.41	0.0281
Baseline Heart Rate (BPM)	72.60±1.41	72.36±4.24	0.9585
Baseline Mean Arterial Pressure(MAP)	72.10±2.12	71.03±1.41	0.0256

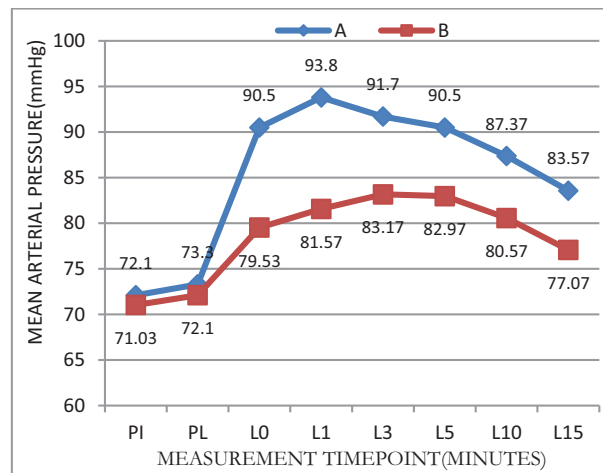
**Safety Outcomes:** No ECG changes, other complications or any side-effects were observed in any of the groups during the study.

**DISCUSSION & CONCLUSION**

The primary objective of the study was to measure the efficacy of McCoy laryngoscope blade in comparison to MacIntosh laryngoscope blade in attenuating stress response developed during laryngoscopy. Though there was gender influence in terms of more male patients than female patients (63% vs. 27%), there was equal distribution in terms of intervention assignment. The sample distribution even after quasi-randomization was found similar to that of a study done by *Mehtab A et al. (2013)*, which used computer generated randomization in study design.<sup>13</sup>



**Figure 1: Heart rate (bpm) variation trend of the studied groups**



**Figure 2: Mean arterial pressure variation trend (mm of Hg) of the studied groups**

As per common observation, MacIntosh blade is widely used. McCoy bladed laryngoscope was developed as an aid to difficult laryngoscopy.<sup>14</sup> Due to lever mechanism of McCoy Laryngoscope blade, exerted force to lift the epiglottis was lesser compared to that in case of MacIntosh conventionally used blade. This might be the reason for attenuation of pressor response. From our findings, McCoy showed better clinical outcome, which was consistent with findings of previously conducted studies showing attenuation of haemodynamic response while use of McCoy laryngoscope.<sup>10,14,15,16,17</sup>

*Mehtab A et al. (2013)* showed the maximum change in HR was 18.7% in the MacIntosh and 7.7% in the McCoy group, and in systolic arterial pressure was 22.9% in the MacIntosh and 10.3% in the McCoy group.<sup>13</sup> This difference between groups was statistically significant (p < 0.0001). The change lasted for a lesser duration in the McCoy group. No arrhythmias or ST changes were observed in either group. Similarly in our study, in McCoy study group, attenuation of haemodynamic changes (MAP and heart rate) was significantly less than the MacIntosh group. The maximum response in mean BP observed in the MacIntosh group was 28.08% compared to 15.25% in the McCoy group and response in HR was 25.67 % in the MacIntosh group compared to 14.86% in the McCoy group. p value= 0.0001 was recorded suggestive of lesser sympathetic response associated with McCoy laryngoscope blade as compared to MacIntosh laryngoscope blade. As there was no change in terms of pharmacological management in both groups, the outcome effect could be attributed to design factors only.

Use of quasi-randomized design was a significant source of bias. Comparable distribution in both groups could be assumed to be result of the same bias. Another limitation was that our study did not contain sensitivity analyses to understand confounding factors. Nevertheless, there was no any aberrant change

in outcome. Last but not the least, anaesthesiologist's awareness regarding laryngoscope blade type could be considered as a source of bias as per design point of view; however, the analysis of data was performed by another independent anaesthesiologist.

To conclude, it is evident that use of McCoy laryngoscope blade instead of commonly practised MacIntosh laryngoscope blade during laryngoscopy provides better clinical benefit in terms of lesser haemodynamic response and could be recommended for patients with compromised cardiovascular diseases to reduce dependency on pharmacological agents.

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