MRIMS Journal of Health Sciences 2017;6(1) pISSN: 2321-7006, eISSN: 2321-7294
http://www.mrimsjournal.com/

Original Article

A Prospective controlled comparative study of haemodynamic responses, intubating conditions to laryngoscopy and tracheal intubation by using Macintosh vs. Mc Coy blade laryngoscope

Sarada Devi V [1], Lakshmi Narasimham M [2*], Manjula VR [3], Saroj P [4], Surender P [5]

[1, 2 & 3]Assistant professor, [4]Associate Professor, [5] Professor and HOD, Department of Anesthesia, Malla Reddy Medical college for women, Hyderabad

***Corresponding Author:**

Dr. Lakshmi Narasimham M

Email: narasimham_dr@yahoo.com

Abstract:

Background: The invention of McCoy blade in the early 1990s is a modification of the Macintosh blade with a hinged tip. The McCoy blade reduces the amount of force applied during laryngoscopy and endotracheal intubation, thus the increased reflex haemodynamic changes in response to tracheal intubation becomes less significant.
Objective: To determine the advantages of McCoy blade laryngoscope in obtunding the pressor response, better glottic visualization and ease of intubation during laryngoscopy and endotracheal intubation as compared to Macintosh blade laryngoscope.
Methods: The present study was done on 60 adult patients of ASA I and II, between the age group of 20 to 50 years. We observed the haemodynamic changes, glottic view and ease of intubation by using either Macintosh or McCoy blade laryngoscope during general anesthesia at laryngoscopy and endotracheal intubation. The changes in HR, SBP, DBP, and MAP were recorded before induction, at laryngoscopy and intubation and at 1 min, 3 min and 5 min after tracheal intubation. Glottic view obtained on laryngoscope was compared as per Cormack and Lehene grading. Tracheal intubation grading was also compared between the groups. Complications during the procedure like arrhythmias, injury, and bleeding were noted.
Results: In our study, a significant haemodynamic changes were observed in both the groups following laryngoscopy and endotracheal intubation. The rise in HR, SBP, DBP and MAP were more significant with Macintosh blade laryngoscope, where as better visualization of the glottis, ease of intubation and less haemodynamic changes were noted with McCoy blade laryngoscope.
Conclusion: McCoy blade laryngoscope produces significantly less marked haemodynamic changes, better glottic view and ease of intubation as compared to Macintosh blade laryngoscope during laryngoscopy and tracheal intubation.
Key words: Macintosh blade, McCoy blade, endotracheal intubation, Haemodynamic response, glottic view

Introduction:

General anesthesia requires laryngoscopy and intubation which is an essential part in anesthesia practice. Stress response to laryngoscopy and tracheal intubation is manifested as tachycardia, hypertension and dysrrhythmias and it may have profound respiratory, neurological and cardiovascular effects. There is also a rise in the serum catecholamine levels. [1] Most of the patients tolerate these changes with out any significant consequences but patients with co morbid diseases may not withstand these responses. Forces exerted by the laryngoscope blades on the base of the tongue are assumed to be a major stimulus for Sympatho-adrenal response. This stress response is due to the stimulation of the supra-glottic region by the laryngoscope blade along with the tracheal tube placement and cuff inflation. [2] So during general anesthesia, these effects must be attenuated as much as possible and especially in high risk patients.

Several pharmacological agents (both intravenous and topical) have been using to attenuate these responses but they have some limitations and side effects. Various modified instruments and use of other intubating devices (e.g. LMA) [3, 4], have been tried to attenuate this response to laryngoscopy and endotracheal intubation.

The Macintosh Blade is being used in anesthesia practice since a long time successfully. [5] The invention of McCoy blade with a hinged tip in early 1990s is a modification of Macintosh blade. The insertion of the McCoy blade into the vellecula decreases the amount of force exerted during laryngoscopy and tracheal intubation by elevating the tip acting on the hypo- epiglotic ligament and lifting the epiglottis out of the view for better glottic visualization and decreases the overall movement. [6]

Material and Methods:

This prospective study was carried out at MRMCW Hyderabad between Feb 2015 to April 2016 in the dept of anesthesia in 60 ASA physical status I and II adult patients of either gender, age between20 to 50 years under general anesthesia posted for elective surgeries, after obtaining approval from institutional ethics committee and written informed consent from the patients.

Exclusion Criteria:

1. Pregnant patients

2. Patients with diabetes, HTN and CAD

3. Patients on beta blocker therapy

4. Patients with difficult airway

5. Patients with major liver, kidney and heart diseases

6. Patients with h/o allergy to any of the drugs received in this study.

7. Patients with morbid obesity.

The 60 patients recruited for this study were randomly allocated in to two groups of 30 each by sealed envelop method.

Group A/Study group: 30 patients studied for laryngoscopy and tracheal intubation with the McCoy blade. **Group B/Control group**: 30 Patients studied for laryngoscopy and tracheal intubation with the Macintosh blade.

Anesthesia protocol:

Pre anesthesia checkup was done one day prior to the surgery, detailed history of the patient was taking, thorough clinical examination was done, and necessary investigations were sent and reviewed if necessary. Airway assessment was graded by using Modified Mallampati score. [7] Patients were kept nil per oral for 8 hrs prior to the surgery and premedication was given to all patients on the day of surgery. Standard monitoring like ECG, pulse oximeter (spo_2), $Etco_2$ and non invasive blood pressure were connected. Anesthesia technique was similar for both the groups using propofol, fentanyl, vecuronium, nitrous oxide, oxygen and isoflorane.
A 10 cm pillow / head ring was kept under the head to facilitate flexion at the cervical and extension at the atlanto-occipital joint called the sniffing position. Inj glycopyrrolate 0.2 mg, ondansetron 4 mg, midazolam 0.03 mg/kg body weight and fentanyl 1 ug/kg body weight was given as premedication to all patients. All parameters were recorded before induction. General anesthesia was induced after preoxygenation with 100% oxygen for 3 min. with intravenous propofol 2 mg/kg and maintained with 60% N2O, 40% O2 and intravenous vecuronium bromide 0.1 mg/kg as neuromuscular blocking agent. After mask ventilation for 3 minutes, orotracheal intubation was done with McCoy and Macintosh blades in groups A and B respectively. Extent of exposure of the glottis was graded on laryngoscopy according to Corm ark and Lehane's score and ease of intubation also graded.

The glottis view obtained on laryngoscopy was graded and compared according to Cormark and Lehene grading [8]

Grade I: glottic view visible fully
Grade II: Only posterior commisure visible
Grade III: Visible only epiglottis
Grade IV: No glottic structure visible

The degree of difficulty with intubation was graded as

Grade I: Intubation easy
Grade II: Intubation requiring an increased anterior lifting force and assistants help to pull the right corner of the mouth to increase the space.
Grade III: Multiple attempts or use of stylet for intubation
Grade IV: Intubation failure with the assigned laryngoscope

The parameters like heart rate(HR), systolic blood pressure(SBP), diastolic blood pressure(DBP), mean arterial pressure(MAP) and SPO2 were recorded at pre induction, during laryngoscopy & intubation and at 1, 3 and 5 minutes after intubation
Complications during this study like arrhythmias and local injuries, bleeding, regurgitation, laryngospasm and de-saturation during laryngoscopy and intubation were noted.
The parameters were recorded and data was entered into Statistical Package for Social Sciences (SPSS 20.0). Unpaired t test was used for comparing between two groups and paired t test was used for intergroup comparison through graph pad software with quick-calcs for statistical analysis. According to statistical power analysis, to get an 80% power, 24 patients per treatment group were needed to get in detecting a 30% difference between treatment groups with a 5% type 1 error. The study was done on 30 patients in each group and P value less than 0.05 was taken as statistically significant.

Results:

Table 1: Demographic profile of patients

Demographic profile	Study group (mean±SD)	Control group (mean±SD)
Age (years)	40.7±10.36	38.76
Male:Female	10:20	13:17
Weight (kg)	65.6±7.32	64.7±7.3
ASA grade	I/II	I/II
MP grade	I/II	I/II

In demographic profile both the groups for age, weight, male: female ratio, ASA physical status, Mallampati grades were compared and were not significant statistically.

Table 2: Heart Rate Comparison

Time interval	Study group (mean±SD)	Control group (mean±SD)	P value
Pre-induction	82.70±7.04	82.20±10.22	0.5104
During laryngoscopy and intubation	95.83±7.58	104.30±11.18	0.0011
1 min	98.24±7.18	106±10.00	0.0003
3 min	93.27±6.11	102.33±8.87	0.0001
5 min	88.20±5.26	90.60±7.60	0.1602

Both the groups were compared for changes in heart rate. There was an increase in heart rate in both study and control group during laryngoscope and intubation, 1 and 3 min post intubation as compared to base line but more rises in group B (control). There was 27% rise in HR in-group B and 18% rise in group A which is significant statistically (P value 0.0001). The heart rate comparison after 5 min post intubation was not statistically significant when comparing two groups.

Table 3: Systolic Blood Pressure Comparison

Time interval	Study group (mean±SD)	Control group (mean±SD)	P value
Pre-induction	123.07±7.18	120.73±7.89	0.2177
During laryngoscopy and intubation	131.07±5.96	138.13±3.67	0.0001
1 min	131.93±4.88	138±3.67	0.0001
3 min	128.47±4.83	134.60±4.01	0.0001
5 min	122.00±4.27	124.00±5.80	0.1337

Both the groups were compared for changes in **systolic blood pressure**. There was significant rise in SBP compared to baseline, during laryngoscopy &intubation and at 1 & 3 min after intubation but there was more rise in group B. There was a 15% rise in group B and 7.5% in group A as compared to baseline which is statistically significant (P=0.0001). The SBP comparison after 5 min of intubation was statistically insignificant.

Table 4: Diastolic Blood Pressure Comparison

Time interval	Study group (mean±SD)	Control group (mean±SD)	P value
Pre-induction	71.40±6.06	73.20±4.94	0.2125
During laryngoscopy and intubation	75.60±5.74	82.40±4.71	0.0001
1 min	78.13±4.67	84.00±4.46	0.0001
3 min	75.60±4.12	81.60±4.25	0.0001
5 min	74.92±4.92	75.93±4.41	0.4105

Both the groups were compared for changes in **diastolic blood pressure (**DBP). There was a significant rise in **DBP** compared to baseline, during laryngoscopy & intubation and at 1 & 3 min after intubation but more rise in group B. There was 15 % rise in DBP compared to baseline in group B and 9.8% rise in-group A, which was statistically significant. (p=0.0001). After 5 minutes post intubation, the DBP comparison was statistically insignificant.

Table 5: Comparison of Mean Arterial Pressure

Time interval	Study group (mean±SD)	Control group (mean±SD)	P value
Pre-induction	88.63±4.92	89.00±5.32	0.7825
During laryngoscopy and intubation	94.03±4.69	100.53±4.16	0.0001
1 min	96.03±3.93	102.07±3.58	0.0001
3 min	93.27±3.67	99.20±3.71	0.0001
5 min	90.63±4.21	91.93±4.20	0.2359

Both the groups were compared for changes in **Mean arterial pressure (MAP).** Ther was a significant rise in MAP compared to baseline during laryngoscopy &intubation and at 1 & 3 min after intubation but more rise in group B. There was 14.6 % rise in group B and 9.03 % rise in group A. (p=0.0001). After 5 minutes of intubation there were statistically insignificant changes in MAP comparison.

Table 6: Comparison of Laryngoscopic View

Groups	Laryngoscopic view (%)		
	Grade I	Grade II	Grade III
Group A	16 (53%)	14 (47%)	00
Group B	06 (20%)	22 (73%)	02 (07%)

The glottic view obtained on laryngoscopy was comparable between the two groups. In group A , 53% had grade I and 47% had grade II whereas in group B 20% had grade I , 73% had grade II and 7% had grade III, which is statistically significant.(p value 0.009).

Table 7: Comparison of Ease of Intubation

Groups	Ease of intubation (%)	
	I	II
Group A	23 (77%)	07 (23%)
Group B	11 (37%)	07 (23%)

The ease of intubation or degree of difficulty in intubation was comparable between the two groups. In group A, 77% had grade I and 23% had grade II where as in group B 37% had grade I and 63% had grade II, which is statistically significant. (P value 0.0018).

Complications during laryngoscopy and intubation like local injury, bleeding, laryngospasm, regurgitation de-saturation and arrhythmias were not seen in either group in our study.

Discussion:

Laryngoscopy and endotracheal intubation during general anesthesia is the most critical event as it may provoke transient and marked sympathetic and sympathoadrenal response and may manifest as tachycardia, hypertension and various dysrrhythmias. The principal mechanism for hypertension and tachycardia is the sympathetic response which may be the result of increase in catecholamine activity.

Most of the patients tolerate these changes with out any significant consequences but patients with co morbid diseases may not withstand these responses. Forces exerted by the laryngoscope blades on the base of the tongue are assumed to be a major stimulus for Sympatho-adrenal response. This stress response is due to the stimulation of the supra-glottic region by the laryngoscope blade along with the tracheal tube placement and cuff inflation. So during general anesthesia, these effects must be attenuated as much as possible especially in high risk patients.

Several pharmacological agents have been used both intravenous and topical to attenuate these responses but they have some limitations and side effects. Various modalities like modified instruments and other intubating devices e.g. LMA, also have been tried to attenuate this response to laryngoscopy and endotracheal intubation.

Literature regarding the type of laryngoscope blade and its haemodynamic response to laryngoscopy and intubation are very few. The amount of forces exerted during laryngoscopy and intubation at the base of the tongue is the major mechanical stimulation of stretch receptors present in the respiratory tract. Different types of laryngoscope blades can help in decreasing this response[9]. The McCoy blade with a hinged tip is a modification of Macintosh blade was invented in early 1990 and aimed to attenuate the exaggerated haemodynamic response to laryngoscopy and tracheal intubation.

This study was undertaken to compare the use of McCoy blade laryngoscope with standard Macintosh blade laryngoscope to observe glottic exposure, ease of intubation and hemodynamic changes during laryngoscopy and tracheal intubation. Our study observed better glottic view, ease of intubation and lesser hemodynamic changes with McCoy blade laryngoscope as compared to Macintosh blade laryngoscope. The present study and results were compared with previous studies.

McCoy et al compared HR and BP responses between McCoy and Macintosh blades during laryngoscopy and also measured catecholamine concentrations during the procedure. [10] They observed significant rise in HR and BP in both the groups during laryngoscopy from the baseline but there was no difference in hemodynamic responses between the two groups. This may be because the study included only laryngoscopy but not intubation.

In our study less hemodynamic changes were observed with McCoy blade laryngoscope as compared to Macintosh blade laryngoscope. There was significant rise in HR, SBP, DBP, and MAP in both the groups but observed lesser haemodynamic response with McCoy group. In both the groups the parameters returned to baseline in 5 minutes. These observations were in conjunction with the study of Mukta Jitendra etal.[11]

The maximum rise in heart rate compared to baseline seen in our study was 27% in group B as compared to 18% in group A. Both the groups showed a significant rise in **Mean arterial pressure** compared to baseline during laryngoscopy &intubation, 1 minute, 3 minutes after intubation but more rise in group B. The maximum rise in MAP compared to baseline was 14.6 % in group B as compared to 9.03 % in group A. The parameters returned to baseline in 5 minutes in both the groups. These observations were in concurrence with the study done by Mukta Jitendra et al. [11]

The study done by Mehtab A Haidry observed that hemodynamic changes with the use of McCoy laryngoscope were lesser in magnitude as compared to Macintosh laryngoscope. The rise in the HR was 7.7% in McCoy group where as 18.7% in Macintosh group. There was a rise in MAP from the baseline of 13.6 % in McCoy group where as 25.7% in Macintosh group. Our study results were in concurrence with the above study. [12]

The glottic view obtained on laryngoscopy in the present study was 53% of grade I and 47% of grade II whereas in group B 20% of grade I, 73% of grade II and 7% of grade III. This was in conjunction with the study done by Zia Arshad et al. [13]

Similarly the results obtained in our study in respect to hemodynamic parameters and glottis view grades were comparable to the study results of Singhal et al. [14]

Conclusion:

Our study concludes that McCoy blade laryngoscope produces significantly lesser marked haemodynamic changes, better glottic view and ease of intubation as compared to Macintosh blade laryngoscope during laryngoscopy and tracheal intubation. So we can consider the use of McCoy blade laryngoscope along with other pharmacological methods to attenuate the pressor response during laryngoscopy and endotracheal intubation more so in high risk patients.

References:

1. Shribman AJ, Smith G, Achola KJ. Cardiovascular and catecholamine responses to laryngoscopy with and without endotracheal intubation. Br J Anaesth 1987;59:295-9.
2. McCoy EP, Mirakhur RK, Rafferty C. A comparison of the forces exerted during laryngoscopy Macintosh vs. McCoy blade. AnesthESIA 1996;51:912-5.
3. Braude N, Clements EAF, Hodges UM, Andrews BP. The pressor response and LMA insertion, a comparison with tracheal intubation. Anesthesia 1989;44:551-4.

4. Wood ML, Forrest ET, Haemodynamic response to insertion of the LMA, a comparison with laryngoscopy and tracheal intubation. Acta Anesthesiol Scand. 1994;38:510–3.
5. Jephcott A. The Macintosh laryngoscope. Anesthesia 1984;39:474- 9.
6. McCoy EP, Mirakhur RK. The levering laryngoscope Anesthesia 1993;48:516- 519.
7. Mallampati SR. Clinical sign to predict tracheal intubation (hypothesis) condition. Anesthesia Soc J 1983;30:316–7.
8. Cormack RS, Lehene J. Airway management. In: Clinical anesthesiology. Morgan GE, Mikhail MS, Murray MJ, editors. 3rd ed. McGraw Hill, New York; 1996; 82.
9. McCoy EP, Mirakhur RK, McCloskey BV. A comparison of the stress response to laryngoscopy. Anesthesia 1995;50(11):943-6.
10. Cook TM, Tuckey JP. A comparison between the Macintosh and the McCoy laryngoscope blades Anesthesia 1996;51(10):977-80.
11. Mukta J, Sharma S. Comparison of haemodynamic response to tracheal intubation with Macintosh vs. McCoy laryngoscope. JEMDS. 2015;4(50):8676–84.
12. Haidry MA, Khan FA. Comparison of hemodynamic response to tracheal intubation with Macintosh and McCoy laryngoscopes. J Anaesthesiol Clin Pharmacol. 2013;29:196-199.
13. Arshad Z, Abbas H. Comparison of Laryngoscopic view and haemodynamic changes with McCoy and Macintosh blade in predicted easy and difficult airway. Open J Anaesthesiol 2013;3:278-82.
14. Singhal S, Neha. Haemodynamic response to laryngoscopy and intubation, comparison of the McCoy and Macintosh laryngoscope. The Internet J Anesthesiol 2008;17(1).

Cite this article as: Sarada Devi V, Lakshmi Narasimham M, Manjula VR, Saroj P, Surender P. A Prospective controlled comparative study of haemodynamic responses, intubating conditions to laryngoscopy and tracheal intubation by using Macintosh vs. Mc Coy blade laryngoscope. MRIMS J Health Sciences 2018;6(1):1-5.

Source of Support: Nil. **Conflict of Interest:** None.