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A Comparative Study between Mac-Coy and Macintosh Blade for Glottis Exposure and Hemodynamic Changes

Anuka singh[1], Vaishali Waindeskar[2], Sheetal Songir[3], Shrinivas S R[4], Charan Raj SR[5]

Author Affiliation: [2]Professor, [4,5]Junior Residents, Department of Anaesthesia and Critical care, All India Institute of Medical Sciences, Bhopal, Madhya Pradesh 462020, India, [1]Consultant, Department of Anaesthesia and Critical care, Ruban Memorial Hospital Patna, Bihar 800013, India, [3]Associate Professor, Department of Anaesthesia and Critical care, Government Medical College, Vidhesha, Madhya Pradesh 464001, India.

Corresponding Author: Vaishali Waindeskar, Professor, Department of Anaesthesia and Critical care All India Institute of Medical Sciences, Bhopal, Madhya Pradesh 462020, India.

E-mail: dranandiap@gmail.com

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Abstract

The aim of laryngoscopy is to obtain good visualization of vocal cords to facilitate smooth endotracheal intubation. Many factors have shown to influence Laryngoscopic view of vocal cords. These include forward displacement of mandible, prominent or absent teeth, backward displacement of tongue. Difficult Mask Ventilation i.e., Bones. Laryngoscopy and endotracheal intubation trigger major stress response, in the form of increased catecholamines leading to tachycardia and hypertension, which may be catastrophic in patients with cardiovascular disease.[1,2]

Present study was done to evaluate the ease of intubation and there effect on hemodynamic parameters by using two different laryngoscopy blades.

Taking Mallampati grading, Cormack and Lehane grading into consideration the various parameters were studied.

The McCoy blade, which is a modification of the Macintosh blade with its levering tip significantly reduces the duration of laryngoscopy, improves the visualization of the larynx. less increase in hemodynamic parameters during laryngoscopy and intubation, early return of hemodynamic parameters towards baseline following intubation.

Keywords: Mac Coy; Macintosh blade; Laryngoscopy; Glottic exposure; Hemodynamic changes.

Glossary of words: C-Cormack, L-Lehane, ETT -endotracheal tube, HR-heart rate, BP-blood pressure.

Introduction

Laryngoscopy forms an important part of general anesthesia and endotracheal intubation. Laryngoscopes are used to view the larynx and adjacent structures, most commonly for inserting endotracheal tubes into the tracheobronchial tree. The aim of laryngoscopy is to obtain good visualization of vocal cords to facilitate smooth endotracheal intubation. Laryngoscopy and endotracheal intubation trigger major stress response, in the form of increased catecholamines leading to tachycardia and hypertension, which may be catastrophic in patients with cardiovascular disease.[1,2] In 1943, R. R. Macintosh developed the first curved laryngoscope blade. Macintosh also created a flange along the left side of the blade by folding outward the inferior portion of the blade lengthwise. The McCoy laryngoscope blade described in 1993 is the most widely accepted blade of this kind. Curved in shape, the McCoy blade was designed to be used just as the Macintosh with its distal tip placed within the valleculae under circumstances where the operator does not have a satisfactory view of the larynx.[3,4]

Pressor response to laryngoscopy and intubation is mediated via sympathetic nerves and the efferent pathway is also composed of sympathetic nerves.[5,6,7] Thus, the blades used for laryngoscopy should trigger minimal stress response and at the same time facilitate good Laryngoscopic view for smooth

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endotracheal intubation. For Direct laryngoscopy an optimal position is required for most adult patients which is approximately 35 degree flexion of lower cervical spine and 85degree extension at the atlanto-occipital joint, the so called "Sniffing Position" to align the oral, pharyngeal and laryngeal axes.[8,9] The lower cervical spine portion can be maintained in a flexed position by using a pillow under the head. Atlanto-occipital joint extension can be achieved by pressure on the top of the head and /or upward traction on the upper teeth or gums.

Many factors have shown to influence the Laryngoscopic view of vocal cords. These include forward displacement of mandible, prominent or absent teeth, backward displacement of tongue.

The McCoy blade, a modification of Macintosh blade has been a recent addition to this series of advancement.

In this present study used McCoy blade and Macintosh blade in anaesthetized patients in the age group of 18-50 yrs to compare: glottic exposure, hemodynamic changes and duration of laryngoscopy.

Material and Methods

After institutional committee approval and written informed consent, patients posted for various elective surgeries requiring general anesthesia were selected. 100 adult patients in the age group of 18-50 yrs. and ASA status I and II, Mallampatti grade I and II undergoing elective surgeries under general anesthesia. Patients with history of hypertension, Ischemic heart disease, cerebrovascular disease endocrinal disease like diabetes mellitus, midline swellings of neck, Obesity (BMI > 30) were excluded from the study.

In this study, the Laryngoscopic view and hemodynamic response obtained with Macintosh and McCoy laryngoscope blades were studied. A detailed history, complete physical examination and appropriate investigations were done for all patients.

The study population was divided into 2 groups with 50 patients in each group.

Group A: Glottic exposure, Hemodynamic response and duration with Macintosh blade (n =50)

Group B: Glottic exposure, Hemodynamic response and duration with McCoy blade (n =50)

One day prior to surgery airway assessment was done using Mallampati grading. On the morning of surgery patients were visited again in the pre-operative room. They were asked for the Nil per Oral status; after confirming, an intravenous line was secured.

Patients were shifted in the operation theatre, monitors were attached. Pulse oximetry, electro-cardiography and automated non invasive blood pressure measurement were the tools used. A pre-induction heart rate, systolic, diastolic blood pressure and saturation were recorded.

Pre-medication was done with Inj. Glycopyrrolate 0.004mg/kg I.V, Inj. Midazolam 0.02mg/kg and inj. fentanyl 2ug/kg respectively.

All the patients were pre oxygenated with 100% oxygen for 3 minutes before induction. Induction was achieved with Inj. Propofol 2mg/kg I.V; Muscle relaxation obtained with Inj. Succinylcholine 1.5mg/kg IV, and patients were put into "Sniffing position". Direct laryngoscope was done by an expert anesthesiologist in all the patients of both the groups.

Direct laryngoscopy was carried out in Group A using Macintosh blade No.3 and Group B with McCoy blade respectively. Intubation was done with disposable, high volume low pressure cuffed endotracheal tube, using 7.5mm Internal Diameter ETT for females and 8.5mm Internal Diameter ETT for males.

Cut off limit taken for laryngoscopy and intubation was 30 seconds. Cases which took more than 30 seconds time were excluded from the study.

The duration of laryngoscopy and laryngeal view obtained according to Cormack and Lehane grading were recorded. Heart rate, systolic and diastolic blood pressure were recorded following induction, immediately after laryngoscopy, after intubation and at 3, 5 min intervals. Patients were connected to Closed circuit and anaesthesia was maintained with oxygen (40%), N20 (60%), halothane and non- depolarizing muscle relaxant vecuronium bromide and IPPV. Intra-operative monitoring of the vitals like heart rate, systolic and diastolic blood pressure, saturation was done strictly. Adequacy of ventilation was monitored.

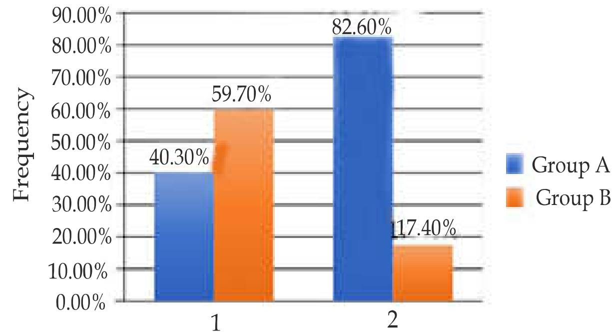
At the end of the surgery, reversal was done After adequate reversal, patients were extubated and shifted to the post-operative recovery room. Monitoring of the vitals was continued in the post-operative period.

Data analyses for demographic profile, ASA Grading, MP Grading, laryngeal visualization & duration of laryngoscopy is done using Chi-square Test. Unpaired “t’ test together with Chi-square Test are used for analyzing all the haemodynamic parameters P value < 0.05 was considered as statistically significant.

Result

Hundred patients of ASA grade I and II of either sex, aged between 18 - 45 yrs with Mallampati grading of I and II posted for elective surgery under general anesthesia were selected for the study. The study was undertaken to evaluate the laryngoscopic view and haemodynamic response with Macintosh and McCoy laryngoscopic blades.

Both groups were matched for age, sex, ASA grading, Mallampati grading, Cormack and Lehane grading, Duration of laryngoscopy, Heart Rate, Systolic Blood Pressure, Diastolic Blood Pressure, Mean Arterial Pressure.



Graph 1: Bar Graph Showing C & L Grading.

The visualization of the larynx was better in Group B (McCoy blade) as compared to that of Group A (Macintosh blade) which was found to be statistically significant between the two groups (P = <0.0001) (Graph 1).

There was no statistically significant variation noted in the Heart rate during the pre and post induction periods in both the groups. Following laryngoscopy and intubation an increase in Heart rate of 23.08% and 37.34% above baseline was observed in Macintosh group as compared to 7.36% and 11.74% in the McCoy group (P < 0.0001). Variation between the two groups was also found significant at 3 and 5 min post intubation where HR starts showing falling trends. Fall in HR is more in the McCoy group where HR was 6.62% and 2.94%

Table 1: Comparison of Heart Rates.

Heart rate (bpm)		Group A		Group B		T:Value	P: value	Mean Diff
		Mean ± SD	(%) Diff	Mean ± SD	(%) Diff			
Pre Induction		78.9 ±11.48	–	78.96 -±9.97	–	0.028	0.978	-0.06
Post Induction		76.46 ±10.29	-2.44	75.8 ±9.48	-3.16	0.333	0.739	0.66
Post scopy		101.98 ±9.93	23.08	86.32 ±9.22	7.36	8.168	<0.0001	15.66
Post intubation	1 Min	116.24 ±10.73	37.34	90.7 ±8.99	11.74	12.899	<0.0001	25.54
	3 Min	108.36 ±9.55	29.46	85.58	6.62	12.622	<0.0001	22.78
	5 Min	102.34	23.44	±8.46 81.9	2.94	11.862	<0.0001	20.44

Table 2: Comparison of Systolic Blood Pressure.

Systolic blood pressure (mmHg)		Group A		Group B		T:Value	P: value	Mean Diff
		Mean ± SD	(%) Diff	Mean ± SD	(%) Diff			
Pre Induction		117.98 ±7.68	–	120.84 ±11.78	–	1.437	0.154	-2.86
Post Induction		113.92 ±8.05	-4.06	116.7 ±11.12	-4.14	1.423	0.155	-2.78
Post scopy		140.16 ±6.41	22.98	127.82 ±10.44	6.98	7.585	<0.0001	13.14
Post intubation	1 Min	154.3 ±8.41	36.32	132.44 ±10.50	11.6	11.489	<0.0001	21.86
	3 Min	144.72 ±6.88	26.74	126.74 ±9.55	5.9	10.802	<0.0001	17.98
	5 Min	137.42 ±5.68	19.44	122.68 ±9.30	1.84	9.564	<0.0001	14.75

Table 3: Comparison of Diastolic Blood Pressure.

Diastolic blood pressure (mmHg)		Group A		Group B		T:Value	P: value	Mean Diff
		Mean ± SD	(%) Diff	Mean ± SD	(%) Diff			
Pre Induction		77.64 ±6.66	-	78.32 ±8.14	-	0.457	0.649	-0.68
Post Induction		74.28 ±6.41	-3.36	75.18 ±8.18	-3.14	0.612	0.542	-0.9
Post scopy		98.4 ±6.58	20.76	84.32 ±7.53	6	9.953	<0.0001	14.08
Post intubation	1 Min	111.02 ±8.28	33.38	87.94 ±7.49	9.62	14.615	<0.0001	23.08
	3 Min	104.04 ±6.80	26.4	83.02 ±6.85	4.7	15.403	<0.0001	21.02
	5 Min	98.1 ±6.02	20.46	79.96 ±6.64	1.64	14.304	<0.0001	18.14

above baseline values as compared to Macintosh group where HR values were 29.46% and 23.44% above baseline values at 3min and 5 min.(p =<0.0001) (Table 1).

There was no statistically significant variation noted in the Systolic blood pressure during the pre and post induction periods in both the groups. Following laryngoscopy and intubation increase in Systolic blood pressure of 22.98% and 36.32% above baseline was observed in Macintosh group as compared to 6.98% and 11.6% in the McCoy group. Fall in SBP is more in the McCoy group where 5.9% and 1.84% above baseline values as compared to Macintosh group where SBP values were 26 74% and 19.44% after 3 and 5 min post intubation (Table 2).

There was no statistically significant variation noted in the Diastolic blood pressure during the pre and post induction periods in both the groups. The rise in Diastolic blood pressure following laryngoscopy was more in the Macintosh group as compared to that of the McCoy group which was found to be statistically significant with a mean difference of 14.08 (t = 9.953, P < 0.0001). Rise in Diastolic blood pressure was also more in the Macintosh group at 1 min after intubation compared to McCoy group. (P = < 0.0001). Fall in DBP is more in the McCoy group as compared to Macintosh group 3 min AND 5min respectively after intubation (Table 3).

Discussion

Laryngoscopy forms an important part of general anaesthesia and endotracheal intubation. To aid and ease the process of intubation, laryngoscopic blades of different shapes have been designed and studied. The shape of a laryngoscope blade affects the exposure of the larynx. Laryngoscopy and endotracheal intubation trigger major stress response, in the form of increased catecholamines leading to tachycardia and hypertension, which may be catastrophic in patients with cardiovascular disease.

It has been observed that amount of forces exerted during laryngoscopy and intubation is the key determinant for mechanical stimulation of stretch receptors present in the respiratory tract. Thus, use of different types of laryngoscope blades can help in decreasing this response and at the same time facilitate good laryngoscopic view for smooth endotracheal intubation. The Macintosh blade has been the most popular blade for laryngoscopy visualization of vocal cords was popularized by Sir Robert Macintosh and Sir Evan Magill in early 1940's. The McCoy blade, a modification of the standard Macintosh blade was introduced in 1993 by EP McCoy and RK Mirakhur.

In this study conducted by us in our institution we have evaluated the duration of laryngoscopy, laryngoscopic view and hemodynamic response using conventional Macintosh blade and its modification McCoy blade.

A total number of 100 patients in the age group of 18—45 years were included in the study. The study population was divided into 2 groups with 50 patients in each group. Both the groups were comparable with respect to demographic profile, ASA grading, MP grading, size of laryngoscope blade and endotracheal tube.

The laryngeal view was compared using Cormack and Lehane grading. In grade 1 view 31 (40.3%) patients were from Group A and 46(59.7%) patients were from Group B. In grade 2 view 19(82.6%) patients were from Group A and 4(17.4%) patients were from Group B

This shows that the visualization of larynx was better with McCoy blade as compared to Macintosh blade which was found to be statistically significant, P < 0.0001, as shown in the study by ***Sakai T et. al*****.**

Sakai T et al compared the grade of laryngeal visualization with the McCoy, Macintosh and the Miller blade in adults, 117 patients for elective surgery under general anesthesia requiring tracheal intubation were investigated. They found that the grades of laryngeal visualization with McCoy blade were significantly better than those with Macintosh blades.[10]

Harioka et al, studied 219 patients and concluded that without external laryngeal pressure, the McCoy blade laryngoscope provided a better laryngoscopic view than that obtained by the Macintosh laryngoscope (p<0.001).[11]

Leon O et al in their study showed that McCoy blade significantly improved intubating conditions. The laryngoscopic view was compared in 100 patients with the McCoy blade The McCoy blade improves glottic visualization.[12].

The duration of laryngoscopy was <10 seconds in 27 patients of Group A and 38 patients in Group B. This shows that the duration of laryngoscopy was short with McCoy blade compared to Macintosh blade which was found to be statistically significant, (P=0.035) as shown in the study by *Beilin et. al*.[13]

Conclusion

The McCoy blade, which is a modification of the Macintosh blade with its levering tip significantly reduces the duration of laryngoscopy, improves the visualization of the larynx. less increase in hemodynamic parameters during laryngoscopy and intubation, early return of hemodynamic parameters towards baseline following intubation.

It can be utilized as an additional tool along with pharmacological interventions for obtunding stress response not only in difficult intubation scenario but also in normal routine cases.

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