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Comparision of the hemodynamic response to laryngoscopy and intubation using McCoy and Macintosh laryngoscopic blade

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Abstract
Background: The Macintosh blade is one of the most popular blades with a gently curved tongue which extends to the tip. The McCoy blade laryngoscope has a hinge on the tip to avoid the lifting force in the vallecula reducing the amount of force exerted in the vallecula causing less hemodynamic changes.
Aim: An attempt had been made to compare hemodynamic changes during laryngoscopy with Macintosh and McCoy laryngoscopes in adult patients undergoing elective surgeries.
Materials and Methods: Institutional Ethics Committee approval was taken before the commencement of the study. An informed and written consent was taken from every patient selected for the study. Sixty adults (18–60 years) of both sexes, American Society of Anesthesiologists Grade I and II, undergoing elective surgery under general anesthesia requiring endotracheal intubation were enrolled in this study. Patients were randomly divided into two groups. Group A – where McCoy laryngoscope blade was used for laryngoscopy and Group B – where Macintosh laryngoscope blade was used for laryngoscopy. After induction of anesthesia, laryngoscopy was performed, and trachea was intubated. The change in systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and heart rate (HR) was observed for 10 min post intubation. Statistical Analysis Used: All the data were compiled and using independent t test they were compared. Results: McCoy group showed statistically significant lower values of mean HR, SBP, DBP, and MAP till 5 min after intubation when compared to Macintosh group ($P < 0.05$). Conclusions: HR, SBP, DBP, and MAP all did rise in both the group following laryngoscopy and intubation but changes with McCoy laryngoscope were less and statistically significant when compared to Macintosh laryngoscopes.

Keywords: Macintosh laryngoscope blade, McCoy laryngoscopes blade, haemodynamic changes, laryngoscopy, intubation

Introduction
The induction of anaesthesia, laryngoscopy, endotracheal intubation and surgical stimulation often evoke transient cardiovascular response characterized by alterations in heart rate, systolic blood pressure, and cardiac rhythm. These complications are more likely to occur in patients with preexisting hypertension, coronary heart disease, cerebrovascular disease, intracranial pathology and hyperactive airways. In such cases, reflex cardiovascular responses needs to be suppressed, by means of trial of various laryngoscopy blade and systemic as well as topical agents.Macintosh blade is the most durable and most successful blade in the history of anaesthesia till the date. The McCoy blade is based on standard Macintosh blade invented in 1993 [1]. It has hinged tip that is operated by the lever mechanism on the back of handle so it causes less mechanical stimulation of respiratory tract so haemodynamic response should be less [2]. In our study, we have compared the hemodynamic response of McCoy laryngoscopic blade and Macintosh laryngoscopic blade for laryngoscopy and intubation.

Material and Methods
60 patients of ASA physical status I & II belonging to age groups of 18 – 60 years of both sexes, undergoing elective surgical procedure under general anaesthesia with endotracheal intubation were included in the study. It is a prospective randomized controlled study. The study was conducted after getting approval by our institution ethical committee and after obtaining written informed consent from the patient.

Exclusion criteria

1. Patients with difficult airway (Mallampatti Class III and IV, thyromental distance <6 cm, inter-incisor distance<3 cm, and cervical instability), require more than one attempt and external manipulation for intubation.
2. Hypertension
3. Obese (BMI>30)
4. Diabetes mellitus,
5. Ischemic heart disease,
6. laryngopharyngeal lesion
7. With contraindication to drugs that are used.

All patients were randomly allocated into 2 groups.

Group 1: McCoy laryngoscope was used

Group 2: Macintosh laryngoscope was used

Preanaesthetic checkup with detailed history and airway examination was performed in all patients on the day prior to surgery. On the day of surgery once the patient was on the operation table, pulse oxymeter, electrocardiography leads and automated non-invasive blood pressure monitor was attached. Baseline parameter were recorded. All the events on the trend graph of the multipara monitor were recorded. Intravenous line was secured with 20 gauge cannula, inj ranitidine 150mg, Inj. midazolam 2 mg and inj. glycopyrolate 0.2 mg were given 30 min prior to surgery. The patient was preoxygenated with 100% oxygen for 3 min. Then anaesthesia was induced with 2 mg/kg of propofol. After ventilation is confirmed with a face mask, injection succinylcholine 2 mg/kg was administered and the patient was ventilated with 100% oxygen for 1 minute, Then laryngoscopy and intubation were carried out in classical sniffing position by a single, experienced anesthesiologist & Endotracheal cuff was inflated with minimal leak. Anaesthesia was maintained with controlled ventilation with Nitrous oxide 60 % and oxygen 40 %. No surgical simulation was permitted for 7 minutes after intubation. HR, SBP, DBP, MAP were noted at different time points-baseline, immediately after intubation, and subsequently at1,2,5,7 minutes interval after intubation.

Statistical analysis: Means and standard deviations were calculated for quantitative data. Data analysis was done with the help of SPSS version-14. Two groups were analysed for statistical significance by using indepedent t test. P value <0.05 was considered as statistically significant.

Results

In our study we observed that McCoy with fentanyl produces a least rise in heart rate from base line. Group 1 has 9. 9% increase in heart rate from basal value. Group 2 has 14.3% increase in heart rate from basal value. Group 1has 10.9 % increase in Systolic BP from basal value. Group 2 has 14.8 % increase in Systolic BP from basal value Rise in diastolic BP after intubation was also less in group 1 than group2. Group 1 has 8.0% increase in Diastolic BP from basal value. Group 2 has 12.5% increase in Diastolic BP from basal value.

Table 1: Demographic variables

variables	Group1(n=30)	Group 2(n=30)	P value
Age(years)	35.97±9.4	35.9±7.3	0.999 Non Significant
QSex(M:F)	16:14	16:14	0.795 Non significant
Weight(kg)	54.1±3.8	54.3±4.8	0.858 Non Significant

Both groups were comparable in terms of demographic data

Table 2: HR, BP, and MAP immediate post intubation in group 1 and 2

Immediate Post intubation	Group 1(n=30)		Group 2(n=30)		P value
	Mean	SD	Mean	SD	
Heart Rate(minutes)	87.2	8.3	88.9	8.9	0.4473 Not Significant
Systolic BP(mmHg)	125	7.1	127.8	7.2	0.1348 Not Significant
Diastolic BP(mmHg)	82.5	6.8	79.1	5.4	0.0364 Significant
MAP(mmHg)	96.6	5.7	93.7	4.4	0.0316 Significant

Immediatly after intubation diastolic blood pressures and mean arterial pressure were significantly higher with Macintosh group compared to McCoy group

Table 3: HR, BP, and MAP at 1 minute in group 1 and 2

	Group 1(n=30)		Group2 (n=30)		P value
	Mean	SD	Mean	SD	
Heart Rate(minutes)	9o.7	1.9	130.6	3.4	0.006 Significant
Systolic BP(mmHg)	131.8	6.2	137	7.6	0.0053 Significant
Diastolic BP (mmHg)	85.6	6.5	86.8	5.6	0.4468 Not Significant
MAP(mmHg)	101.3	5.2	103.6	4.8	0.0803 Not Significant

At 1minute heart rate &systolic blood pressure were significantly higher with Macintosh group compared to McCoy group.

Table 4: HR, BP, and MAP at 2 Minute in group 1 and 2

	Group 1(n=30)		Group 2(n=30)		P value
	Mean	SD	Mean	SD	
Heart Rate(minutes)	90.5	7.7	92.3	5.8	0.311 Not Significant
Systolic BP(mmHg)	130.8	6.9	134.9	7.8	0.0353 Significant
Diastolic BP(mmHg)	84.6	6.6	85.3	6	0.6689 Not Significant
MAP(mmHg)	100.3	5.4	101.8	5.2	0.2776 Not Significant

At 2 minute systolic blood pressure was significantly higher with Macintosh group compared to McCoy group.

Table 5: HR, BP, and MAP at 5 minutes in group 1 and 2

	Group 1(n=30)		Group 2(n=30)		P value
	Mean	SD	Mean	SD	
Heart Rate(minutes)	86.6	7.8	85.4	0.5	0.4073 Not Significant
Systolic BP(mmHg)	126.9	7.3	128.9	7.3	0.293 Not Significant
Diastolic BP(mmHg)	81.1	6.9	79.3	6.7	0.3096 Not Significant
MAP(mmHg)	96.4	5.7	95.5	5.6	0.5397 Not Significant

Table 6: HR, BP, and MAP at 7 minutes in group 1 and 2

	Group 1(n=30)		Group 2(n=30)		P value
	Mean	SD	Mean	SD	
Heart Rate(minutes)	82.8	7.3	82.3	6.9	0.786 Not Significant
Systolic BP(mmHg)	122.9	7.7	127.7	7	0.0143 Significant
Diastolic BP(mmHg)	78.6	6.7	76.5	6.8	0.233 Not Significant
MAP(mmHg)	94.7	4.7	93.6	4.3	0.430 Not Significant

At 7 minute systolic blood pressure was significantly higher with Macintosh group compared to McCoy group.

Discussion

Laryngoscopy and intubation are known to cause transient but significant sympathetic response leading to increase in heart rate and blood pressure and cardiac dysrhythmias [3]. These transient changes can even result to potentially deleterious effect in susceptible patients, particularly those with systemic hypertension, coronary artery disease, and cerebrovascular disease [4]. The nociceptive signals generated during laryngoscopy and tracheal intubation are conducted to the brain via glossopharyngeal and vagus nerve [5]. In general these changes begin immediately after the laryngoscopy and last for 5 minutes [6]. Various anaesthetic techniques has been tried to obtund these deleterious hemodynamic responses like hypertension, tachycardia and arrhythmias in susceptible individuals. Use of McCoys blade instead of Macintosh blade for laryngoscopy is one such measure. Theoretically, use of McCoys blade should help since it avoids the lifting force on vallecula and epiglottis during visualization of larynx which might cause a lesser sympathetic response.

Moreover laryngoscopy with McCoy blade produces significantly a less rise in all hemodynamic parameters than with Macintosh blade In both groups laryngoscopy and intubation response peaks one minute after intubation McCoy EP *et al*. [7] demonstrated hemodynamic changes using Macintosh bladeMcCoy laryngoscope decreases the amount of forces exerted during laryngoscopy and endotracheal intubation so the exaggerated reflex haemodynamic response is significantly reduced. Laryngoscopy with McCoy blade required only 53% of the force (10.1 N) in order to obtain a clear view of vocal cord as compared to Macintosh blade (18.9 N). McCOY *et al*. [8] who concluded that the stress response to laryngoscopy is less marked with the use of the McCoy blade and is probably due to a reduction in the force necessary to obtain a clear view of the larynx. Rise in Plasma noradrenaline after laryngoscopy was not observed in laryngoscopy with McCoy blade

Nishiyama T, Higashizawa T, Bito H, Konishi A, Sakai T, [9] who concluded that Plasma epinephrine after laryngoscopy in the McCOY group were lower than other two groups and stress response was least in McCOY group and maximum in

Prabhat Tewari *et al*. [10] compare the hemodynamic changes with McCoy vs Macintosh laryngoscope in 180 ASA I and II neurosurgical patients undergoing elective surgery. They found that McCoy laryngoscope blade is less stressful and with fentanyl pretreatment the stress response is least than with Macintosh blade with fentanyl treatment.

S.K.Singhal and Neha (2008) [11] compared hemodynamic response to laryngoscopy and intubation using McCOY and Macintosh laryngoscope and they concluded that McCOY laryngoscopy produces siginificantly less marked hemodynamic response. They also concluded that this nonpharmacological intervention can be an adjuvant to attenuate the stress response during laryngoscopy and intubation along with other pharmacological agents. In our study the mean laryngoscopy and intubation time in both groups were below 13 seconds and it has been found that short duration direct laryngoscopy time less than 15 seconds is useful in minimizing the magnitude and duration of the circulatory changes associated with tracheal intubation [12] and all intubation were done in first attempt without cricoid pressure.

Conclusion

McCOY laryngoscope produces significantly less rise in hemodynamic parameters when compared with Macintosh blade. The combination of McCOY laryngoscope with fentanyl produces the least response than with Macintosh with fentanyl.

So this nonpharmacological intervention of McCOY blade can be utilized as a tool along with pharmacological drug fentanyl, for obtunding hemodynamic responses to laryngoscopy and intubation.

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