ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 11 | November - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

"COMPARATIVE STUDY OF HEMODYNAMIC STRESS RESPONSE TO LARYNGOSCOPY AND ENDOTRACHEAL INTUBATION _WITH THE MCCOY AND THE MACINTOSH LARYNGOSCOPE BLADES"

Anaesthesiology

Dr. Kaladi Likhitha* MBBS, (MD) *Corresponding Author

Dr. Pasupuleti Lavanya MBBS, MD

Dr. Mude Nage Ramesh Kumar MBBS, MD, Assistant Professor

ABSTRACT

Background And Objectives: To ease the process of endotracheal intubation, laryngoscopic blades of different shapes have be designed. This clinical study is undertaken to find out the comparative stress response and intubating conditions while using Macintosh and McCoy blades. **Methods:** 150 patients of ASA I of either sex, aged between 20 and 40yrs with MMP grade I/II posted for elective surgery under general anaesthesia were selected for the study after random allocation into group I (McCoy) and group II (MacIntosh). The laryngoscopic view was compared using the CL grade. HR, SBP, DBP, MAP and RPP preintubation and postintubation were compared to assess the stress response. **Results:** The rise in HR postintubation in the Macintosh group as compared to the McCoy group was statistically significant at 1,2, 3, 4, 5, 7 and 10 minutes (p value < 0.05). The rise in SBP in the Macintosh group as compared to the McCoy group was statistically significant at 1 minute postinubation (p < 0.001) and significant afterwards. The rise in DBP and MAP postintubation in the Macintosh group as compared to the McCoy was statistically significant at 1 minute (P=0.001) and 3 minutes (P<0.05) and significant afterwards. Visualization of larynx was better in group I as compared to group II (P = 0.009). **Conclusion:** The McCoy blade improves the intubating conditions, with significantly less haemodynamic stress response as compared to the Macintosh blade.

KEYWORDS

Intubating conditions, stress response, McCoy, Macintosh.

INTRODUCTION

Laryngoscopy and tracheal intubation are the most essential tools of an anaesthesiologist in the airway management. It was due to the pioneering effort of three anaesthesiologists - Alfred Kirstein (1863 - 1922), Chevalier Jackson (1865 - 1958) and Gustav Killian (1838-1912) that the first use of laryngoscopy came into existence. Robert A Macintosh and Robert A Miller also contributed significantly to the development of modern laryngoscopes. Laryngoscopes of varying sizes, shapes, handles, and blades have been produced since then to help with a variety of clinical situations.

Haemodynamic stress response to tracheal intubation and laryngoscopy has a profound influence on the circulatory parameters and the intracranial pressure[1]. It has been documented since 1951[2].

Stress response is regulated by two primary neuroendocrine system—the hypothalamus pituitary adrenocortical (HPA) and sympathetic adrenomedullary (SAM) systems. Salivary alpha-amylase (SAA) level can be used as an index of the SAM activity, and serum cortisol as an index of HPA activity.

Although this haemodynamic stress response to laryngoscopy is transient, usually of short duration and mild consequence in normal individuals, it can be hazardous to those with systemic hypertension, coronary artery diseases, cerebrovascular accidents, and the complications like increased HR, SBP, myocardial infarction, left ventricular failure, cardiac dysrhythmias, cerebral haemorrhage[1,3,4,5,6,7] can occur. There is also an increase in serum catecholamine levels[8,9,10,11]. Forces transmitted by laryngoscope blade on base of tongue to be a major stimulus[1,12]. Modification of instruments, use of other intubating devices (i.e, LMA)[13,14] and various pharamacological interventions (intravenous / topical)[15,16,17,18,19,20] have been tried to obtund this haemodynamic response to laryngoscopy and intubation.

Aim of the study:

To compare the haemodynamic stress response in laryngoscopy and endotracheal intubation with McCoy and Macintosh laryngoscope blades.

Objectives:

- To study haemodynamic changes with McCoy laryngoscope blade
- To study haemodynamic changes with Macintosh laryngoscope blade
- To investigate the laryngoscopy and intubation time duration with the McCoy blade
- To investigate the laryngoscopy and intubation time duration with the MacIntosh blade
- To investigate laryngoscopic view using Cormack and Lehane grading with McCoy blade
- To investigate laryngoscopic view using Cormack and Lehane grading with Macintosh blade

MATERIALS AND METHODS

Study Design: A prospective randomized comparative study

Study Subjects: This study comprised of 150 patients in 20-40 years age group, of both genders, posted for elective surgeries under general anesthesia requiring endotracheal intubation who are admitted in SVRRGGH Tirupati.

Inclusion criteria:

Patients giving written informed consent,ASA PS Grade I,MP Grade I & II.

Exclusion criteria:

Predicted difficult airway,History of difficult airway,Obese patients (BMI > 30 kg/m^2),Systemic hypertension,Diabetes Mellitus,More than one attempt of laryngoscopy,Pregnant and lactating ,Smoker and alcoholic patients,Respiratory hepatic and renal diseases,H/o cerebrovascular accidents (TIA/Stroke)

Study Period: 1year duration from the time of scientific and IEC approval

METHODOLOGY:

In this study, 150 patients will be randomly allocated into 75 patients each in two groups.

Pre-anaesthetic check-up will be done one day before the surgery and airway assessment will be done using Samsoon and Young's modification of the Mallampati classification. An informed consent will be taken from all patients during pre- anaesthetic examination. To eliminate observer's bias all intubations will be done by a single observer.All patients will be kept in fasting for a period of 8 hours preoperatively.

On the day of surgery patients will be shifted to the operation theatre

and connected to the ECG, non-invasive blood pressure, pulse oximeter and end-tidal carbon dioxide.Intravenous access will be obtained using 18G IV canula under local anaesthesia.A pillow (7 cm) will be placed under the occiput of the patient to obtain classical sniffing position.

Patients will be pre-oxygenated with 100% O2 for three minutes using Bain's circuit.Induction will be done with inj.fentanyl 2µg / kg, inj.midazolam 0.05mg / kg, inj.propofol 2.5mg / kg and inj.suxamethonium 1.5 mg / kg iv. Patients will be ventilated with 100% O_2.After one minute of suxamethonium administration, the HR, SBP, DBP and MAP, rate pressure product, SPO_2 will be noted as baseline value (B).

Laryngoscopy and intubation will be performed one minute after administration of succinylcholine. Patient will be intubated with an appropriate sized, cuffed PVC endotracheal tube and air entry will be checked for proper placement of endotracheal tube. The duration of laryngoscopy and intubation will be noted using a stopwatch.

In group 1, with McCoy laryngoscope, the laryngoscope blade will be gently introduced and tip of the blade will be placed in vallecula. By just pressing the lever of the laryngoscope, the epiglottis is lifted indirectly exposing the larynx.

In group 2, with Macintosh laryngoscope, the laryngoscope blade will be gently introduced and tip of the blade will be placed in vallecula.By lifting the laryngoscope upward and forward, the epiglottis is lifted indirectly exposing the larynx.

The time taken from when the point of the blade passed the incisors till the tip of the blade passed out of the incisors after inserting the endotracheal tube was the duration of laryngoscopy and intubation. The heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure, rate pressure product, SPO_2 will be measured at the end of insertion of laryngoscope and intubation(T). Then the laryngoscope will be removed and the patients will be ventilated for 5 minutes with100% O_2. Heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure, rate pressure product, SPO_2 will be recorded at 1, 2, 3, 4, 5, 7 and 10 minutes after intubation i.e. at T1, T2, T3, T4, T5, T7 and T10. Anaesthesia will be maintained with 50% N_2O, 50% O_2, 0.5% sevoflurane and neuromuscular blockade will be achieved with inj. Vecuronium 0.08-0.1 mg/kg iv followed by 0.04 mg/kg iv as maintenance dose.

The B, T, T1, T2, T3, T4, T5, T7 and T10 values of the heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure, rate pressure product, SPO2 will be compared among the two groups.

RESULTS:

The rise in HR postintubation in the Macintosh group as compared to the McCoy group was statistically significant at 1,2, 3, 4, 5, 7 and 10 minutes (p value < 0.05). The rise in SBP in the Macintosh group as compared to the McCoy group was statistically significant at 1 minute postinubation ($p < 0.001$) and significant afterwards. The rise in DBP and MAP postintubation in the Macintosh group as compared to the McCoy was statistically significant at 1 minute (P=0.001) and 3 minutes (P<0.05) and significant afterwards. Visualization of larynx was better in group I as compared to group II ($P = 0.009$).

DISCUSSION

Hemodynamic stress response to laryngoscopy and tracheal intubation have a profound influence on the circulatory parameters and intracranial pressure[1]. There is also an increase in the serum catecholamine levels. Forces transmitted by the laryngoscope blades on the base of the tongue is a major stimulus for the stress response.[1,12] Different laryngoscope blades can help to reduce stress response and at same time facilitate good laryngoscopic view for smooth endotracheal intubation.

In this prospective randomised study, we compared the intubating conditions and the stress response while using the Macintosh blade and the McCoy blade. Both groups of our study population (group I – McCoy blade and group II MacIntosh blade) were relatable with respect to the demographic profile, ASA grade and CL grade. The induction technique used was also same in both groups. In our study we measured the haemodynamic variables (HR, SBP, DBP, MAP and RPP) at 1, 2, 3, 4, 5, 7 and 10 minutes of laryngoscopy. The percentage increase in HR postintubation at 1, 2, 3, 4, 5, 7 and 10 minutes from the preintubation value in Macintosh group was 22.22%, 28.61%, 16.37%, 19.42%, 10.22%, 11.39%, 10.52% (P<0.001 at 1, 5, 10 minutes and P<0.002 at 2, 4, 7 minutes and P<0.003 at 3 minutes) whereas in McCoy group the percentage increase in HR postintubation was 18.85%, 12.01%, 14.83%, 8.17%, 9.39%, 1.81%, 0.63% (P<0.001 at 1, 5, 10 minutes and P<0.002 at 2, 4, 7 minutes and P<0.003 at 3 minutes). The percentage increase in the SBP postintubation at 1, 2, 3, 4, 5, 7 and 10 minutes from the preintubation value in Macintosh group was9.97%, -0.37%, -7.53%, -7.53%, -8.3%, -9.2% (P<0.001 at 1, 3, 4, 5, 7, 10 minutes and P<0.002 at 2 minutes) whereas in McCoy group the percentage increase in SBP was 4.63%, 4.63%, 0.25%, -0.61%, -5.92%, -6.74%, -7.6% at 1, 2, 3, 4, 5, 7 and 10 minutes respectively (P<0.001 at 1, 3, 4, 5, 7 and 10 minutes and P<0.002 at 2 minutes). The percentage increase in DBP at 1, 2, 3, 4, 5, 7 and 10 minutes from the preintubation value in Macintosh group was 22.79%, 21.37%, 3.33%, 1.91%, -5.10%, -6.80%, -6.58% (P<0.001 at 1, 5, 7, 10 minutes and P<0.002 at 2 minutes and P<0.006 at 3, 4 minutes) whereas in McCoy group the percentage increase in DBP postintubation was 10.20%, 8.72%, 0.49%, -0.98%, - 5.34%, -6.82%, -8.30% (P<0.001 at 1, 5, 7 and 10 minutes and P<0.002 at 2 minutes, P<0.006 at 3, 4 minutes). The percentage increase in MAP at 1, 2, 3, 4, 5, 7 and 10 minutes post intubation was 23.63%, 22.4%, 6.8%, 5.5%, -2.09%, -3.81%, -5.04% from the preintubation MAP (P<0.001 at 1, 5, 7 and 10 minutes and P<0.002 at 2 minutes and P<0.004 at 3, 4 minutes) whereas in McCoy group, the percentage increase in MAP postintubation was 7.09%, 5.88%, 5.21%, -1.44%, -5.34%, -7.34%, -8.5% (P<0.001 at 1, 5, 7 and 10 minutes and P<0.002 at 2 minutes and P<0.004 at 3 and 4 minutes).

The percentage increase in RPP at 1, 2, 3, 4, 5, 7 and 10 minutes post intubation was 41.42%, 41.96%, 21.45%, 18.80%, 5.22%, 2.64%, 0.94% from the preintubation MAP (P<0.001 at 2, 7 and 10 minutes and P<0.002 at 1, 3, 5 minutes and P<0.003 at 4 minutes) whereas in the McCoy group, the percentage increase in RPP postintubation was 24.95%, 22.62%, 15.34%, 13.09%, 2.90%, -0.38%, -2.46% (P<0.001 at 1, 7 and 10 minutes and P<0.002 at 1, 3, 5 minutes and P<0.003 at 4 minutes). The changes in haemodynamic variables were statistically significant in Macintosh group as compared to McCoy group. Thus, our study shows that the haemodynamic response to laryngoscopy and tracheal intubation is less with McCoy blade than with Macintosh blade.

In the study by McCoy et al[11], they measured heart rate, arterial blood pressure, plasma adrenaline and nor-adrenaline concentrations before and after laryngoscopy, (at 1 min, 3mins and 5 mins). They found a significant increase in heart rate (33%), blood pressure (27%) and plasma adrenaline and noradrenaline levels after laryngoscopy using Macintosh blade whereas McCoy blade didn't cause any significant change. The results of their study was similar to our study except that we did not measure the plasma adrenaline and noradrenaline concentrations.

Sarabjit Kaur et al[7] compared the intubating conditions and stress response to laryngoscopy with the Macintosh and McCoy laryngoscopes. They found highly significant increase in the HR and BP after laryngoscopy using Macintosh blade at 1, 3 and 5 minutes (P<0.001) as compared to preintubation period and only a slight rise with McCoy blade. In the McCoy group there was significant rise in HR at 1 minute post intubation (P<0.05) while the increase in SBP and DBP was highly significant at 1 and 3 minutes (P<0.001) and insignificant at 5 minutes when compared to preintubation period.

CONCLUSION

The following conclusion can be drawn from the current prospective randomized clinical comparison analysis. The McCoy blade, a modification of the Macintosh blade (with tip hinged):
Reduces the stress response to laryngoscopy,Improves visualization of larynx.

Is associated with less difficult airway maneuvers and complications as compared to Macintosh blade but there was statistically no significant difference between the groups.

REFERENCES

1. Miller RD, Eriksson LI, Fleischer LA, Wiener-Kronish JP, Young WL. Miller's Anaesthesia. 7th ed. Philadelphia: Elsevier Churchill Livingstone; 2010. p. 2424
2. King BD, Harris LC, Greifenstein FE, Elder JD, Dripps RD. Reflex circulatory

responses to direct laryngoscopy and tracheal intubation performed during general anesthesia. The Journal of the American Society of Anesthesiologists. 1951 Sep 1;12(5):556-66.
3. Wycoff CC. Endotracheal intubation: effects on blood pressure and pulse rate. InThe Journal of the American Society of Anesthesiologists 1960 Mar 1 (Vol. 21, No. 2, pp. 153-158). The American Society of Anesthesiologists.
4. Stoelting RK. Circulatory changes during direct laryngoscopy and tracheal intubation: influence of duration of laryngoscopy with or without prior lidocaine. The Journal of the American Society of Anesthesiologists. 1977 Oct 1; 47(4): 381-3.
5. Fleisher LA. Peroperative myocardial ischemia and infarction. Int Anaesthesiol Clin. 1994; 4:1-15.
6. Singhal and Neha: Haemodynamic response to laryngoscopy and intubation: Comparison of the McCoy and Macintosh laryngoscope. The Internet Journal of Anaesthesiology; 2008;17(1):12-18
7. Kaur S, Gupta A. Intubating conditions and stress response to laryngoscopy: Comparison between Macintosh and levering (McCoy's Type) laryngoscope. Journal of Anaesthesiology Clinical Pharmacology. 2009 Jul 1;25(3):333-6.
8. Russell WJ, Drew SE, Morris RG, Frewin DB. Changes in plasma catecholamine concentrations during endotracheal intubation. British Journal of Anaesthesia. 1981 Aug 1;53(8):837-9.
9. Derbyshire DR, Chmielewski A, Fell D, Vater M, Achola K, Smith G. Plasma catecholamine responses to tracheal intubation. BJA: British Journal of Anaesthesia. 1983 Sep 1;55(9):855-60.
10. Shribman AJ, Smith G, Achola KJ. Cardiovascular and catecholamine responses to laryngoscopy with and without tracheal intubation. British journal of anaesthesia. 1987 Mar 1;59(3):295-9.
11. McCoy EP, Mirakhur RK, McCloskey BV. A comparison of the stress response to laryngoscopy: The Macintosh versus the McCoy blade. Anaesthesia. 1995 Nov; 50(11):943-6.
12. McCoy EP, Mirakhur RK, Rafferty C, Bunting H, Austin BA. A comparison of the forces exerted during laryngoscopy: The Macintosh versus the McCoy blade. Anaesthesia. 1996 Oct;51(10):912-5.
13. Braude N, Clements EA, Hodges UM, Andrews BP. The pressor response and laryngeal mask insertion: a comparison with tracheal intubation. Anaesthesia. 1989 Jul;44(7):5514.
14. Wood ML, Forrest ET. The haemodynamic response to the insertion of the laryngeal mask airway: a comparison with laryngoscopy and tracheal intubation. Acta anaesthesiologica scandinavica. 1994 Jul;38(5):510-3.
15. King BD, Harris LC, Greifenstein FE, Elder JD, Dripps RD. Reflex circulatory responses to direct laryngoscopy and tracheal intubation performed during general anesthesia. The Journal of the American Society of Anesthesiologists. 1951 Sep 1;12(5):556-66.