Study on Haemodynamic Response to Laryngoscopy and Intubation using McCOY and Macintosh Laryngoscopes: A Comparative Approach

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

ABSTRACT

Introduction: Laryngoscopy and endotracheal intubation are known to cause increase in arterial blood pressure, heart rate and may be associated with various dysrhythmias. This study is done to compare the hemodynamic changes with McCOY laryngoscope and Macintosh laryngoscope in 120 patients who were divided into 2 groups.

Methods: A positive correlation has been demonstrated between force exerted at laryngoscopy and patient's height, weight, body mass index (BMI) and presence of maxillary incisors but it was seen that effect of these factors on force exerted with the McCOY blade is not as important as with Macintosh blade. So this study was done to compare the hemodynamic response to laryngoscopy and intubation using McCOY and Macintosh laryngoscope in stress attenuation.

Results: Maximum increase in heart rate from the baseline after laryngoscopy in group 2 and a least rise in heart rate from base line in group 1. Group 1 has 9% increase in heart rate from basal value. Group 2 has 22% increases in heart rate from basal value. Group 1 has 6% increase in
Systolic BP from basal value Group 2 has 27 % increase in Systolic BP from basal value. Rise in Plasma adrenaline after laryngoscopy was not observed in Laryngoscopy with McCOY blade.

Conclusion: McCOY laryngoscope produces significantly less in Hemodynamic parameters when compared with Macintosh blade. So this non-pharmacological intervention of McCOY blade can be utilized as a tool for obtunding hemodynamic responses to laryngoscopy and intubation.

Keywords: Myocardial ischemia; cardiac rhythm; laryngoscopy; McCOY; macintosh.

1. INTRODUCTION

The induction of anesthesia, laryngoscopy, endotracheal intubation and surgical stimulation is reported to evoke cardiovascular response characterized by alterations in systemic blood pressure, heart rate and cardiac rhythm [1]. Some clinical consequences in healthy patients are sympathoadrenergic responses. They generally cause failure of ventricular functioning, myocardial ischemia, haemorrhage in cerebrum. All these together cause sudden rise in arterial blood pressure and increase in heart rate. All these complications are reported to be noticed in pre-existing hypertensive patients. In such cases disturbances in cardiac rhythm and systemic arterial blood pressure needs to be suppressed. These complications are common in hypertensive patients. The present concept of a definitive sympathetic overactivity during laryngeal intubation clearly shows that a mere protection against vagal overactivity and the use of anticholinergic drugs alone may not be sufficient. Those techniques which require prior laryngoscopy to administer the local anesthetic solution are likely to be of limited value. Narcotics, vasodilators, Betablockers, Calcium channel blockers, lidocaine etc., modification of instruments and use of other intubating devices (e.g. LMA) have been tried to obtund this haemodynamic response to laryngoscopy and intubation [2,3]. These hemodynamic response during laryngoscopy and endotracheal intubation should be abolished to balance the myocardial O2 supply and demand which is very important in the safe conduct of anesthesia. Hence this study aims to compare the hemodynamic response to laryngoscopy and intubation using McCOY and Macintosh laryngoscopic blade [4].

2. MATERIALS AND METHODS

2.1 Study Design

120 patients of ASA physical status I undergoing elective surgical procedure under general anesthesia with endotracheal intubation was included in the study. Patients belonging to age groups of 18 - 60 years of both sexes were included. It is a prospective randomized controlled study.

Inclusion Criteria:

ASA I physical status-

Exclusion Criteria:

a) Patients with full stomach.
b) Patients posted for emergency surgery.
c) Patients with difficult airway (MPC 3 and 4 )
d) Hypertension, Diabetes mellitus, Ischemic heart disease.
e) Patients with contraindication to drugs that are used.
f) Patient’s refusal.

One of the anesthesiologists, who was blinded to the type of laryngoscope used gave all the drugs. The third anesthesiologist who was blinded to the haemodynamic parameters did the laryngoscopy and intubation. Patients of both sexes of ASA physical status I undergoing surgical procedure were randomly allocated into 2 groups (Group 1: McCOY laryngoscope, Group 2: Macintosh laryngoscope). One of the anesthesiologists, who was blinded to the type of laryngoscope used gave all the drugs. Another anesthesiologist took note of the heart rate and blood pressure at different point of times. The third anesthesiologist who was blinded to the haemodynamic parameters did the laryngoscopy and intubation. The McCOY laryngoscope was used with full lever on and it was never used as Macintosh laryngoscope. Once the vocal cords were visualized, the intubation was done. Both Laryngoscopic and intubation time was measured. The heart rate (HR), systolic blood pressure (SBP), and the diastolic blood pressure (DBP) were noted at different time points - baseline, after induction, immediately after intubation, and subsequently at one-minute interval after intubation. The information collected regarding all the selected
cases were recorded in a Master Chart. Data analysis was done with the help of computer using statistical software called PASW Statistic Version 21.0 by applying statistical tools like paired t test, chi square test, ANOVA. A ‘p’ value less than 0.05 is taken to denote significant relationship.

3. RESULTS

Heart rate, systolic blood pressure were recorded before induction, prelaryngoscopy, post intubation, and 1 min intervals for 7 min thereafter. Comparison of preoperative heart rate (HR), blood pressure (BP) and mean arterial pressure (MAP) at various time intervals in two groups were analyzed (Fig 1, 2 & 3).

Table 1. Time taken for laryngoscopy and intubation

| Time | Group 1 | Group 2 |
|------|---------|---------|
| Mean | 12.8    | 12.2    |
| S.D  | 3.42    | 4       |
| ‘p’  | 0.746   | 0.0032  |

Table 2. Comparison of preoperative heart rate, blood pressure and mean arterial pressure at various time intervals in two groups

| Basal Rate | Group 1 | Group 2 |
|------------|---------|---------|
|            | Mean    | S.D     | ‘p’     | Mean    | S.D     | ‘p’     |
| Heart Rate | 82.1    | 7.3     | 0.0231  | 80.1    | 6.7     | 0.6789  |
| Systolic BP| 121.6   | 8.7     | 0.0123  | 116.9   | 11.3    | 0.5321  |
| Diastolic BP| 80.1   | 6.7     | 0.0001  | 76.9    | 6.1     | 0.4456  |
| MAP        | 93.9    | 6.5     | 0.0096  | 90.2    | 6.8     | 0.3421  |

Fig 1. HR, BT & MAP at 1 min

Fig 2. HR, BT & MAP at 2 min

Fig 3. HR, BT & MAP at 5 min
Table 3. Changes in the heart rate at various time intervals

| Heart Rate         | Group 1     | Group 2     |
|--------------------|-------------|-------------|
|                    | Mean | S.D | 'p' | Mean | S.D | 'p' |
| Base Line          | 82.1 | 7.3 | 0.0320 | 80.1 | 6.7 | 0.4379 |
| Pre Laryngoscopy   | 83.6 | 7.9 | 0.0564 | 81.1 | 6.4 | 0.5643 |
| Post Intubation    | 87.3 | 8.7 | 0.0217 | 87    | 5.9 | 0.6632 |
| At 1 minute        | 91.9 | 7.8 | 0.0145 | 93.7 | 5.7 | 0.7854 |
| At 2 minute        | 90.5 | 7.7 | 0.0116 | 92.3 | 5.8 | 0.4891 |
| At 3 minute        | 89.3 | 7.8 | 0.0001 | 89.2 | 6.7 | 0.9865 |
| At 4 minute        | 87.9 | 7.7 | 0.0004 | 86.9 | 6.3 | 0.5478 |
| At 5 minute        | 86.6 | 7.8 | 0.0002 | 85.4 | 6.5 | 0.4219 |
| At 6 minute        | 84.8 | 7.6 | 0.0124 | 83.5 | 6.5 | 0.4897 |
| At 7 minute        | 82.8 | 7.3 | 0.0321 | 82.3 | 6.9 | 0.5211 |

4. DISCUSSION

Laryngoscopy and endotracheal intubation are reported to cause increase in arterial blood pressure, heart rate and may be associated with various dysrhythmias. Methods may be many but obtunding this reflex response during laryngoscopy and intubation remains a major concern for the anesthesiologists. Steinhan and Gaskin (1963) used intravenous lignocaine, James et al (1981) used lignocaine intratracheal spray, Masson and Eckangoff (1971) and Denlinger J.K (1974) and Stoelting (1978) used a combination of viscous lignocaine and topical lignocaine and in 1979 Leako used a bolus of sodium nitroprusside [3-10].

King et al (1951) used ether, Wychoff et al (1960) and J. Kenneth (1974) tried a combination of topical anaesthesia of larynx together with superior laryngeal nerve block to attenuate the stress response to endotracheal intubation. J.Curran et al (1980) tried droperidol, A.J Cole and C.Jordan (1980) and Richard et al (1981) studied the effect of fentanyl in attenuating the intubation stress response. Inhalational agents when used required deep levels and may delay recovery after short surgeries and can cause cardiovascular depression.

Adrenergic blockers are effective but may outlast the transient intubation response and may cause profound hypotension and bradycardia. Sudden withdrawal may result in rebound hypertension. Use of vasodilator like sodium nitroprusside results in reflex tachycardia. Thus use of different types of laryngoscope blades can help decreasing this response. So this study was done to compare the hemodynamic response to laryngoscopy and intubation using McCOY and Macintosh laryngoscope in stress attenuation. Laryngoscopy and intubation times were comparable in 2 groups in our study. Moreover laryngoscopy with McCOY blade produces significantly a less rise in all hemodynamic parameters than with Macintosh blade. In all groups laryngoscopy and intubation response peaks one minute after intubation. Group 1 has 6% increase in Systolic BP from basal value. Group 2 has 27% increase in Systolic BP from basal value. Rise in diastolic BP after intubation was also less in group 1 than the other group. Group 1 has 12% increase in Diastolic BP from basal value. Group 2 has 34% increases in Diastolic BP from basal value. McCOY laryngoscope produces significantly less effect in hemodynamic parameters when compared with Macintosh blade. Masui 1997 et al 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 Macintosh group.

So, this non-pharmacological intervention of McCOY blade can be utilized as a tool for obtunding hemodynamic responses to laryngoscopy and intubation.

5. CONCLUSION

McCOY laryngoscope produces significantly less or more Hemodynamic parameters when compared with Macintosh blade. So this non-pharmacological intervention of McCOY blade can be utilized as a tool for obtunding hemodynamic responses to laryngoscopy and intubation.

DISCLAIMER

The products used for this research are commonly and predominantly use products in
our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

**ETHICAL APPROVAL AND CONSENT**

The study was conducted after getting approval by our institution ethical committee and after obtaining written informed consent from the patient. The surgeon was also duly informed of the study.

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**COMPETING INTERESTS**

Author has declared that no competing interests exist.

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