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A COMPARATIVE CLINICAL STUDY OF HEMODYNAMIC RESPONSES TO INTUBATION WITH MACINTOSH AND MCCOY LARYNGOSCOPE BLADES IN PATIENTS UNDERGOING NEUROSURGICAL PROCEDURES.

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ABSTRACT The aim of this study was to compare the hemodynamic changes during laryngoscopy and intubation with Macintosh & McCoy laryngoscopic blades in patients undergoing neurosurgical procedures involving craniotomy. **Material and Methods:** 100 neurosurgical patients enrolled in this study were randomly allocated in 2 groups. Group 1 -McCoy blade **Group 2 –** Macintosh blade used. Hemodynamic parameters heart rate, mean systolic, mean diastolic and mean arterial blood pressure were measured at specified points of time and compared using appropriate biostatistical tests. **Results:** Rise in systolic, diastolic and mean arterial blood pressure is significantly less in McCoy group than Macintosh group until 10 minutes post laryngoscopy and intubation. **Conclusion:** Due to better hemodynamic parameters , McCoy blade should be preferred over Macintosh blade for laryngoscopy in neurosurgical patients.

KEYWORDS : Hemodynamic , Macintosh & McCoy laryngoscopic blades

INTRODUCTION:

Laryngoscopy is an important step in patients requiring anesthesia with endotracheal intubation. Laryngoscopy and intubation are known to cause elevation in heart rate and blood pressure.[1-2] This increase in heart rate & blood pressure can be tolerated in normotensive patients but is harmful in patient of hypertension[3], ischemic heart disease and also in patients undergoing neurosurgical procedures[4].

Cerebral blood flow depends on cerebral perfusion pressure, which is the difference between mean arterial pressure and intracranial pressure. Maintenance of stable hemodynamics perioperatively helps to preserve cerebral perfusion pressure and minimizes elevation in intracranial pressure. Usually neurosurgical patients have impair cerebral autoregulation . Acute alterations in hemodynamics may increase intracranial pressure especially when intracranial compliance is low[5].

Various studies [6, 8, 9] have shown that the major cause of sympathoadrenal response during laryngoscopy is due to stimulation of supraglottic region by the laryngoscopic blade. Various methods, both pharmacological[11,12] & non-pharmacological[7, 10] have been tried to abolish this stimulation. Pharmacological methods like vasodilators[13], beta blockers[14,15], combined alpha and beta blockers, calcium channel blockers[16], opioids[17,18] and local anesthetics[18] have been aimed at modulating the sympathetic response or blocking the response. On the contrary, the non-pharmacological methods are aimed to decrease or abolish the stimulus. Various modifications of laryngoscopes to reduce the difficulty of intubation and to enhance the visibility of vocal cords have been tried. McCoy's modification[7] is one of them.

In this study, we compare how two different laryngoscope blades (McCoy Vs Macintosh) shows the sympathoadrenal (stress) response to intubation.

METHOD AND MATERIALS

This Prospective randomized comparative clinical study was conducted after obtaining ethical clearance from the institute. Hundred patients were randomly allocated into one of the two groups according to the computer generated tables of random numbers. **Group 1 –** McCoy blade **Group 2 –** Macintosh blade

Hundred patients of either gender, in the age group of 18–50 years, belonging to American Society of Anesthesiologists (ASA) physical status I or II and scheduled for elective neurosurgical procedure involving craniotomy were included in the study.

Patients with difficult airway, preoperative signs of raised ICP and cerebral aneurysms, hypertension, vascular malformations and other cardiovascular diseases, diabetes mellitus, pheochromocytoma, thyroid diseases, any other endocrine or metabolic disorders, sensitive/ allergic to study drug and pregnant females were excluded from the study.

All patients underwent pre-anesthetic check-up, relevant investigations and voluntarily signing of written informed consent .

All patients were premedicated with Tab. Ranitidine 150 mg per oral at 10 pm on night before surgery & 6 am on the day of surgery.

All standard monitors were attached to patient before induction of anesthesia. Intravenous and arterial lines were placed under local anesthesia. Two minutes after placing the lines - heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were noted as the baseline values. Preoxygenation with 100% O2 for 3 minutes was followed by induction with Inj. Fentanyl 2 mcg/kg, Inj. Thiopentone 5 mg/kg and Inj. Vecuronium 0.1 mg/kg, then patients were mask ventilated with oxygen (33%), nitrous oxide (66%) and isoflurane (1%) for 3 minutes. Thereafter laryngoscopy was done and the view of the vocal cord was noted as per Cormack and Lehane grading[19].

The heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were noted at following time points – at baseline, after induction, immediately before laryngoscopy, during laryngoscopy, immediately after intubation and subsequently at one minute interval after intubation for first 4 minutes and at every 2 minutes interval for 10 minutes. No other stimulus was given during these ten minutes.

The data was analyzed statistically using chi-square test and student t test depending upon the nature of data.

RESULTS AND OBSERVATION

There was no statistical significant difference between the two groups with respect to age, gender,weight and height distribution [Table 1]**.**

Cormack and Lehane grading

Among the fifty patient's of McCoy group, forty had grade I, ten had grade II and none had grade III while among the fifty patients of Macintosh group, thirty four patients had grade I, fifteen patients had grade II and one patient had grade III. The results were compared using chi-square test. More patients in McCoy group had grade 1 score compared to Macintosh group, but it was statistically insignificant ($p = 0.288$).

Hemodynamic response to laryngoscopy: [Table -2]

Laryngoscopy resulted in significant rise in heart rate, systolic, diastolic and mean arterial pressure from the baseline values in both McCoy and Macintosh groups as shown in the above table. The peak increase was seen one minute after laryngoscopy and intubation, which gradually fall to baseline over ten minutes.

Mean Heart rate response to Laryngoscopy:

The mean heart rates at baseline were comparable between both the groups. (79.42 bpm in McCoy group vs. 81.2 bpm in Macintosh group, $p = 0.188$).

Immediately after laryngoscopy, heart rate rises in both the groups, but rise seen in Macintosh group was significantly higher than Mccoy group upto 4 minutes. The increase in heart rate from baseline was maximum one minute after laryngoscopy (from 79.42 to 98.99 beats per minute in McCoy group where as from 81.2 to 109.42 beats per minute in Macintosh group) .

The mean heart rates at 6 and 8 minutes after intubation were significantly higher from baseline in both the groups. Although the McCoy group had lower heart rates than Macintosh group at same times, the difference was statistically insignificant. The mean heart rates at 10 minutes after laryngoscopy and intubation were less than the baseline in McCoy group and near baseline level in Macintosh group ,the difference being insignificant (student t-test).

Blood Pressure response to Laryngoscopy and Intubation: (Table 3)

The mean systolic blood pressure at baseline were comparable between both the groups (129.64 mm Hg in McCoy group vs. 127.16 mm Hg in Macintosh group ,p = 0.45). It rises from the baseline in both the groups during and after laryngoscopy and intubation. The rise in mean systolic pressure was less in McCoy group than Macintosh group. There was statistically significant difference in the rise in mean systolic pressures between the two groups immediately after laryngoscopy and intubation till 4 minutes (p = 0.002).

The rise in mean systolic blood pressure was maximum one minute after laryngoscopy and intubation (from 120.64 to135.64 mm Hg in McCoy group where as from 117.16 to 150.22 mm Hg in Macintosh group).

The mean systolic blood pressures remained high till 8 minutes after laryngoscopy and intubation in both the groups, but there was insignificant difference between the two groups. The mean systolic pressures at 10 minutes after laryngoscopy and intubation were less than the basal in McCoy group but near basal level in Macintosh group (statistically insignificant, p = 0.797). The results were compared using student t-test.

Mean Arterial Blood Pressure response to Laryngoscopy and Intubation:[Figure 2]

The mean arterial blood pressures were comparable between both the groups at baseline levels which rises significantly during and after laryngoscopy and intubation in both the groups. The rise was less in McCoy group. There was statistically significant difference in the rise in mean arterial pressure of two groups during laryngoscopy till 6 minutes after intubation (p = <0.001).

The rise in mean arterial blood pressures from the baseline was maximum one minute after laryngoscopy and intubation (from 91.72 to 100.4 mm Hg in McCoy group where as 89.66 to 112.16 mm Hg in Macintosh group) and there after returned towards baseline over ten minutes.

The mean arterial pressures remained high until 8 minutes after laryngoscopy and intubation in both the groups but values of McCoy group were lower than Macintosh group (statistically insignificant p = 0.086). The mean arterial pressures at 10 minutes after laryngoscopy and intubation were less than the baseline in McCoy group and near baseline level in Macintosh group, which was also statistically insignificant. The results were compared using student t test.

DISCUSSION

The McCoy levering laryngoscope differs from a usual curved Macintosh blade in four respects [7]. It has a hinged tip, a lever at the proximal end, a spring-loaded drum and a connecting shaft. The hinged tip blade controlled by a lever on the handle of laryngoscope allows elevation of epiglottis while decreasing overall laryngoscopic movement. This unique design has shown two advantages over Macintosh laryngoscope. First the use of McCoy laryngoscope results in less force being [8, 9] applied during laryngoscopy and thus reduced stress response. Second difficult laryngoscopic visualization [20-21, 22-2] may be improved by lifting the epiglottis.

Sakai [23] *et al* compared the effectiveness in visualization of the vocal cord during orotracheal intubation with McCoy, Macintosh and Miller blades in 117 patients. The vocal cords of a patient were visualized three times with the three different types of blades. The result of our study was similar to Sakai study but was statistically insignificant which may be due to small sample size.

CARDIOVASCULAR CHANGES

McCoy [8] et al compared the stress response to laryngoscopy, using Macintosh and McCoy blade in twenty patients. They found a significant rise in both heart rate (33%) and mean arterial pressure (27%) after laryngoscopy in Macintosh group, which was similar to our study. The use of McCoy laryngoscope results in decrease in the heart rate and mean arterial blood pressure in their study which was opposite to our result ,where a significant rise in the heart rate (24.50% increase) and mean arterial pressure (7.96% increase) were observed. The reason for this could be due to different anesthesiologists with varying degrees of expertise done laryngoscopy in our study, as it was not standardized.

The peak rise in heart rate was seen one minute after laryngoscopy, which was similar to our study. The heart rates and the mean arterial pressures returned to basal levels at five minutes in their study but at ten minutes in our's.

Tewari [24] et al studied the opioid sparing effect during endotracheal intubation using McCoy laryngoscope in 160 patients undergoing neurosurgical procedures involving craniotomy. The comparison of hemodynamic changes with Macintosh blade and McCoy blade was done with or without fentanyl pretreatment.

Heart rate showed insignificant change at all points (p = 0.848) when McCoy laryngoscope was used with or without fentanyl pretreatment. This does not correlate with our study as there was significant rise in heart rates with McCoy group. Macintosh laryngoscope significantly increased heart rate in both placebo (maximum 103 from 73 beats per minute baseline) and in fentanyl pretreatment group (p <0.001) at all time points.This result is similar to our study.

Tewari et al found that systolic (p = 0.229) and diastolic blood pressure (p = 0.981) showed no significant rise with the use of McCoy alone or along with fentanyl which was contrary to our study result, however his result with Macintosh blade correlated with our study.

CONCLUSION

We can conclude from our study that laryngoscopy with McCoy blade in neurosurgical patients definitely have better hemodynamic parameters than Macintosh blade i.e. the sympathoadrenal response is less , rise in intracranial pressure is less thus minimal stress , so it should be routinely used in such patients.

Table 1: Demographic Profile In Both Groups

Gender Distribution				
Group		**McCoy**	**Macintosh**	**p value**
Number of patients		50	50	
Gender	Males	25	27	0.548
	Females	25	23	
Age distribution				
Age in years		38.48 ± 10.20	37.7 ± 9.48	0.694
Weight and height distribution				
Weight in kilograms		59.5 ± 7.52	59.74 ± 6.75	0.867
Height in centimeters		161.8 ± 8.82	163.1 ± 8.55	0.456

Table 2 : Hemodynamic changes from baseline in both groups

In McCoy Group			
Variables	**Baseline**	**During Laryngoscopy**	**1 minute after intubation**
Heart rate (bpm)	79.42	82.72 (<0.001)	98.88 (<0.001)
SBP (mm of Hg)	120.64	118.5 (0.002)	135.64 (<0.001)
DBP (mm of Hg)	77.4	75.64 (<0.001)	82.92 (<0.001)
MAP (mm of Hg)	91.72	89.92 (<0.001)	118.4 (<0.001)
In Macintosh Group			
Heart rate (bpm)	81.2	85.56 (<0.001)	109.42 (<0.001)
SBP (mm of Hg)	117.16	122.06 (<0.001)	150.22 (<0.001)
DBP (mm of Hg)	76	77.98 (<0.001)	93.12 (<0.001)
MAP (mm of Hg)	89.66	92.6 (<0.001)	112.16 (<0.001)

Table 3: Blood Pressure response to Laryngoscopy and Intubation

Mean Systolic Blood Pressure			
Group	**McCoy (Mean ± SD)**	**Macintosh (Mean ± SD)**	**p value**
Baseline	120.64 ± 8.29	117.16 ± 8.81	0.045

After induction of anesthesia	115.54 ± 8.10	110.62 ± 8.76	0.004
Just before laryngoscopy	112.18 ± 7.81	110.32 ± 7.94	0.243
During laryngoscopy	118.5 ± 7.22	122.6 ± 8.68	0.029
Immediately after intubation	123.54 ± 7.96	134.12 ± 9.25	<0.001
1 minute after intubation	135.64 ± 6.67	150.22 ± 10.50	<0.001
2 minute after intubation	132.2 ± 6.66	145.14 ± 9.63	<0.001
3 minute after intubation	128.82 ± 6.42	138.44 ± 10.26	<0.001
4 minute after intubation	128.22 ± 6.63	133.36 ± 8.97	0.002
6 minute after intubation	125.86 ± 6.54	127.24 ± 7.65	0.337
8 minute after intubation	123.46 ± 7.07	122.62 ± 7.94	0.579
10 minute after intubation	119.2 ± 7.80	118.78 ± 8.36	0.797
Mean Diastolic blood pressure			
Baseline	77.4 ± 5.21	76 ± 6.09	0.222
After induction of anesthesia	73.9 ± 6.00	71.6 ± 5.05	0.042
Just before laryngoscopy	72.48 ± 5.79	71.5 ± 5.75	0.400
During laryngoscopy	75.64 ± 5.18	77.98 ± 5.98	0.040
Immediately after intubation	78.16 ± 4.81	83.56 ± 5.26	<0.001
1 minute after intubation	82.92 ± 5.40	93.12 ± 5.68	<0.001
2 minute after intubation	79.94 ± 5.17	89.58 ± 4.91	<0.001
3 minute after intubation	78.32 ± 4.52	84.46 ± 3.82	<0.001
4 minute after intubation	77.62 ± 4.38	83.58 ± 4.00	<0.001
6 minute after intubation	76.86 ± 4.40	81.96 ± 4.20	<0.001
8 minute after intubation	76.16 ± 4.68	79.32 ± 4.48	0.001
10 minute after intubation	74.42 ± 4.66	76.94 ± 4.65	0.001

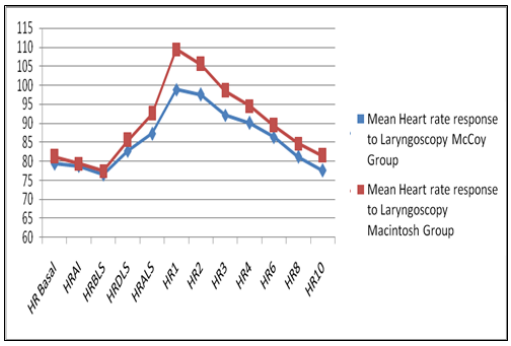

Figure 1-Mean heart rate response to laryngoscopy

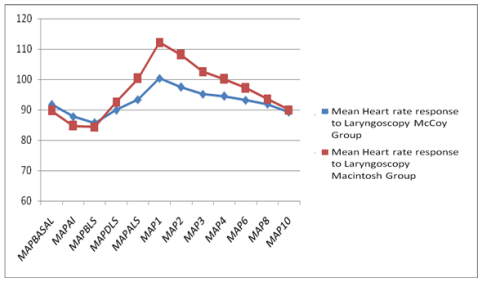

Figure 2 – Mean Arterial Blood Pressure response to Laryngo scopy and Intubation

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