IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 16, Issue 1 Ver. VIII (January. 2017), PP 76-80
www.iosrjournals.org

Stress Response to Laryngoscopy:Comparison between Macintoshand Mccoy's Type Laryngoscope Blades

[1]Jayshree Vaswani,[2]*Chirag Malik,[3]Yogesh Bhalerao, [4]Varsha Vyas, [5]Kirtika Chedda
[1,4]Professor,[2,5]Resident, [3]Lecturer
Department of Anaesthesiology, DY Patil School of Medicine, Nerul, Navi Mumbai, Maharastra, India

Abstract
Introduction:*Laryngoscopy and intubation is known to cause exaggerated hemodynamic response and increased intracranial pressure. Earlier studies have shown that the type of laryngoscope blade influences the degree of hemodynamic response to endotracheal intubation. The aim of the study was to to compare the stress response to laryngoscopy and endotracheal intubationwhile using Macintosh and McCoy type blades.*
Materials & Methods:*It is a prospective, comparative study including 60 patients undergoing various surgical procedures requiring general anaesthesia and endotracheal intubation between age group 20-50 years of both sexes with ASA grade 1 and 2 were chosen. The 60 cases were divided into two groups randomly (using table of random numbers): Group A: 30 Patients undergoing laryngoscopy with the Macintosh blade (size 3) and; Group B: 30 patients undergoing laryngoscopy with the McCoy blade (size 3). After induction and neuromuscular blockade pre-intubation pulse and mean arterial pressure (MAP) was recorded. Orotracheal intubation was attempted at this stage using laryngoscope blade assigned to respective group. Pulse and MAP was recorded while the blade was being inserted in vallecula. Similar pulse and blood pressure was taken at 2 minute and 5 minute after laryngoscopy. Ease of intubation was noted by knowing total time required for intubation, need for BURP maneuver and occurrence of any complication. Data was analyzed using SPSS software ver. 21.*
Results: *Time for Laryngoscopy was significantly less with McCoy blade as compared to Macintosh blades (16.2 sec vs 19.55 sec; p<0.01). BURP manuver was never required with Mccoy blade but with Macintosh blade it was required in 36.7% of patients (p<0.01). Both groups were comparable in terms of baseline hemodynamic parameters. Post-laryngoscopy and Intubation till 2 minutes, heart rate and mean arterial pressures were significantly higher with Macintosh group compared to Mccoy group.*
Conclusion: *McCoy's blade provides better visualization of larynx and intubating conditions with minimal haemodynamic response to laryngoscopy*
Keywords: *Hemodynamic Response, Laryngoscopy, McCoy's Blade, Macintosh Blade, Stress Response*

I. Introduction

Stress response to laryngoscopy and tracheal intubation have a profound influence on the circulatory parameters and the intracranial pressure.[1,2] It has been documented since 1951. This response manifests as tachycardia, hypertension, dysrrhythmias and it may have deleterious respiratory, neurological and cardiovascular effects.[3,4] There is also an increase in the serum catecholamines levels.

Forces transmitted by the laryngoscope blades on the base of the tongue are assumed to be a major stimulus.[1,2]Sympathoadrenal response arises from the stimulation of the supraglottic region by the laryngoscope blade along with the tracheal tube placement and cuff inflation.[2,5]. When planning the anaesthesia induction, these effects must be blunted as much as possible especially if the patient is in the high risk population, for example patients with coronary artery disease, asthma, elevated intracranial pressure and cerebral aneurysm.[1,2]

Various pharmacological interventions (both intravenous and topical), modification of instruments and use of other intubating devises (e.g LMA)[6,7], have been tried to obtund this haemodynamic response to laryngoscopy and intubation.[3]

The Macintosh blade is probably the most successful and durable blade in the history of anesthesia till date.[2,8] The McCoy blade invented in the early 1990s is a modification of the Macintosh blade (with tip hinged) . When the McCoy blade is inserted into the valeculla, elevation of the tip acts on the hyo-epiglottic ligament and lifts the epiglottis out of the view to expose more of the glottis while decreasing the overall movement. [2] The McCoy blade decreases the amount of forces exerted during laryngoscopy and endotracheal intubation. Thus the exaggerated reflex haemodynamic response becomes clinically insignificant.

Present study was thus conducted to compare the stress response to laryngoscopy while using Macintosh and McCoy type blades.

II. Material & Methods

Type of Study & Study Area

A Prospective Comparative study was conducted in the Department of Anaesthesia of a Tertiary Care Hospital and Medical college. The study was conducted in 60 patients of ASA grades I and II aged between 20 – 50 years undergoing various surgical procedures requiring general anaesthesia and endotracheal intubation. A written informed consent was obtained for this study from all subjects after obtaining approval of the ethical committee.

Inclusion Criteria

1. Patients undergoing various surgical procedures requiring general anaesthesia and endotracheal intubation
2. Age group of 20-50 years of ASA grades I and II

Exclusion Criteria

1. Patients with morbid obesity
2. Pregnant patients
3. Patients with Diabetes Mellitus
4. Patients with uncontrolled Hypertension
5. Patients with Coronary Artery Disease
6. Patients on Beta blocker therapy
7. Patients with major kidney, liver and heart diseases
8. Patients with allergy to any of the drugs used in the study.
9. Patients with anticipated difficult airway

Sample Size

After fulfilling the inclusion and exclusion criteria, a total of 60 cases requiring general anaesthesia and endotracheal intubation were selected and divided into two groups randomly (using table of random numbers):
Group A: 30 Patients undergoing laryngoscopy with the Macintosh blade (size 3)
Group B: 30 patients undergoing laryngoscopy with the McCoy blade (size 3)

III. Methodology

A day prior to the surgery, preoperative visit was made and a detailed history of the patient was taken. A thorough clinical examination was also conducted and necessary investigations were sent and reviewed. Airway assessment was done using Modified Mallampatti Score [9] on the day before the surgery. All patients was kept nil per oral (NPO) for 8 hrs prior to the surgery. They were premedicated with Tab Ranitidine 150mg at night on the day before surgery and also in the morning of the surgery and Tab Alprazolam 0.25mg in the night before surgery.

After the patient was brought to the operation theatre, the monitoring of pulse rate, blood pressure, ECG and SPO2 was started. After establishment of intravenous line, ringer lactate solution was given at 10 – 15 ml/kg. A 10 cm pillow was kept under the head to maintain flexion at the cervical and extension at the atlanto-occipital joint called the sniffing position. Patient were premedicated with glycopyrrolate 0.2 mg, odansetron 4 mg, midazolam 0.03 mg/kg and fentanyl 1 ug / kg bodyweight. Then patient was pre-oxygenated with mask for 3 minutes and pre-induction heart rate, noninvasive blood pressure, SPO2 and ECG monitoring was done. General anaesthesia was induced with intravenous propofol 2 mg/kg and maintained with 60% N2O, 40% O2 and isoflurane (1MAC), followed by intravenous vecuronium bromide 0.1 mg/kg as neuromuscular blocking agent. After mask ventilation for 3 minutes preintubation heart rate and noninvasive blood pressure was recorded and orotracheal intubation was tried with Macintosh and McCoy blades in groups A and B respectively. In group A, if the glottis was not visible, difficult airway maneuvers like backward, upward, rightward pressure and the use of stylets was tried. If there is still difficulty in exposing the glottis, the McCoy laryngoscope was tried to facilitate intubation. In group B, moderate to full levering action was applied to improve laryngeal view, if the glottis was still not visible then backward, upward, rightward pressure was applied to facilitate orotracheal intubation. Extent of exposure of the glottis was also noted on laryngoscopy according to Cormark and Lehane's score [10] in groups A and B.

Noninvasive blood pressure, pulse rate and SPO2 was recorded at pre-induction, pre-intubation, at the time of laryngoscopy/ Intubation and at 2 and 5 minutes post-intubation. Any arrhythmias and complications during intubation like local injuries, bleeding, regurgitation, laryngospasm and fall in SPO2 was noted.

IV. Data Analysis

Data was analyzed using SPSS 21.0 (SPSS Inc., Chicago, IL, USA) using appropriate statistical tests.

V. Results

Both the groups were comparable with respect to baseline parameters i.e. age, anthropometry and ASA grades (table **1).** Time for Laryngoscopy was significantly less with McCoy blade as compared to Macintosh blades (16.2 sec vs 19.55 sec; $p<0.01$). BURP manuver was never required with Mccoy blade but with Macintosh blade it was required in 36.7% of patients($p<0.01$) (Table 2). Both groups were comparable in terms of baseline hemodynamic parameters. Post-laryngoscopy and Intubation till 2 minutes, heart rate and mean arterial pressures were significantly higher with Macintosh group compared to Mccoy group (Table 3 and 4). No patient developed complication with Mccoy blade where as 10% patients developed complication with Macintosh blade such as mucosal injury, bleeding and laryngeal injection (Table 5).

VI. Discussion

Laryngoscopy and intubation are major stimuli which evoke a transient but significant sympathetic response leading to increase in heart rate and blood pressure. The nociceptive signals generated during laryngoscopy and tracheal are conducted to the brain via glossopharyngeal and vagus nerve.[11] In general these changes begin immediately after the laryngoscopy and last for 5 minutes.[12]Various anaesthetic techniques has been tried to blunt these deleterious hemodynamic responses like hypertension, tachycardia and arrhythmias in susceptible individuals.[13] 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.

In present study, it was observed that post-laryngoscopy and Intubation till 2 minutes, heart rate and mean arterial pressures were significantly higher in Macintosh group compared to Mccoy group.

In the year 1995, Mccoy EP et al. demonstrated hemodynamic changes using Macintosh blade.[14,15] There was significant increase in both heart rate (33%) and arterial blood pressure (27%) after laryngoscopy with Macintosh blade as compared to Mccoy blade. Mehtab et al. studied the hemodynamic response to laryngoscopy and tracheal intubation in 60 ASA 1 and 2 patients using either Macintosh or Mccoys laryngoscope.[16] The maximum change in heart rate was 18.7 % in Macintosh and 7.7% in Mccoy group. Systolic blood pressure increased in 22.9% in Macintosh group and 10.3% in Mccoys group. The difference was significant. ($p<0.01$). S K Singhal et al. [3] compared the haemodynamic response to laryngoscopy and intubation using the McCoy and Macintosh laryngoscopes. Following Laryngoscopy, there was a statistically significant rise in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure in both the groups. A further rise was seen in all variables following intubation, which persisted till one minute after intubation. But the changes were statististically highly significant with the Macintosh blade as compared to the McCoy blade.Sarabjit Kaur et al. [2]also studied the intubating conditions and stress response to Laryngoscopy between Macintosh and Levering (McCoy's type) laryngoscope. They observed a significant increase in the heart rate and blood pressure after laryngoscopy using Macintosh blade at 1, 3 and 5 minutes as compared to pre-induction period and only a slight rise with the McCoy blade.[2]Roman J et al observed that there was not any influence of laryngoscope design on hemodynamic response.[17] Takeshima et al. showed a greater effect on heart rate with Macintosh blade compared to straight blade. It was concluded that the pressure by the laryngoscope blades on the deep soft tissue adjacent to the epiglottis probably contributed to the ECG findings and hemodynamic response.

As with ease of intubation in present study, it was observed that laryngoscopy time was significantly higher with Macintosh group (mean value 19.5 sec.) than Mccoy group (16.2 sec).Out of total 30 patients, 17 (36.7%) required a BURPmanuver, stylet for intubation in Macintosh group whereas no aid in Mccoys group. Mccoy blade uses a levering action and flexes the tip like a hinge to elevate the epiglottis which is the main basis of reducing the force of intubation. In present study, there was 10% complication rate in Macintosh group while no complications were seen in Mccoys group. Atul et al. had also found that intubation was easier with Mccoys blade as compared to Macintosh blade.[18]Similar results were also observed by Uchida et al. [19]and Gotiwale et al. [20]

VII. Conclusion

We thus conclude that, McCoy's blade, which is a modification of the Macintosh blade with its levering tip significantly:

- Reduces need of BURP maneuver in laryngoscopy
- Improves the visualization of the larynx and ease of intubation.
- Less increase in hemodynamic parameters during laryngoscopy and intubation.

Thus, McCoy's blade provides better visualization of larynx and intubating conditions with minimal hemodynamic response to laryngoscopy

Acknowledgement

Authors acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript. The authors are also grateful to authors/ editors/ publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed.

Conflict Of Interest

None declared

References

[1]. Miller DR. Airway management of Anaesthesia. 6th Ed., Churhill Livingstone; 2005: 1636.
[2]. Sarabjit Kaur, Asha Gupta, Ranjana, Rita. Intubating conditions and stress response to laryngoscopy: Comparison between Macintosh and levering (McCoy's Type) Laryngoscope. Anaesth. ClinPharmacol 2009;25 (3): 333-336.
[3]. S Singhal and Neha: Haemodynamic response to laryngoscopy and intubation: Comparison of the McCoy and Macintosh laryngoscope. The Internert Journal of Anaesthesiology; 2008; 17(1):23-9.
[4]. King BD, Harris LC, Griefenstein FE, Elder JD, Dripps RD. Reflex circulatort responses to direct laryngoscopy with or without prior lidocaine. Anaesthesiology 1977, 47(4): 381-384.
[5]. Shirbman AJ, Smith G, Achola KJ. Cardiovascular and catecholamine response to laryngoscopy with and without tracheal intubation. Br J Anaesth 1987; 59: 295-299
[6]. Braude N, Clements EAF, Hodges UM, Andrews BP. The pressor response and laryngeal mask insertion - a comparison with tracheal intubation Anaesthesia, 1989;44: 551-554.
[7]. Wood ML, Forrest ET. Hemodynamic response to insertion of the laryngeal mask airway: a comparison with laryngoscopy and tracheal intubation. ActaAnaesthesiol Scand. 1994; 38: 510 – 513.
[8]. Jephcott A. The Macintosh Laryngoscope. Anaesthesia 1984; 39: 474-479.
[9]. Mallampati SR. Clinical sign to predict tracheal intubation (hypothesis) condition. Anaesthesia Soceity Journal 1983; 30: 316 -317.
[10]. Cormack RS and Lehane J. Airway management in clinical anaesthesiology. Morgan GE, Mikhail MS, Murray MJ, ed 3rd, McGraw Hill, New, McGraw Hill, New york 1996; 82.
[11]. Reid LC, Brace DE. Irritation of respiratory tract and its reflex effect on heart rate. SurgGynaec Obstet. 1940;70:157-62.
[12]. Adachi YU, Satomoto M, Higuchi H, Watanabe K. Fentanyl attenuates the hemodynamic response to endotracheal intubation more than the response to laryngoscopy. AnaesthAnalg. 2002;95(1):233-7.
[13]. Burstein CL, Lopinto FJ, Newman W. Electrocardiographic studies during endotracheal intubation effects during usual routine technics. Anesthesiology. 1950;11(2):224-37.
[14]. Mccoy EP, Mirakhur RK, Rafferty C, Bunting H, Austin BA. A comparison of the forces exerted during laryngoscopy the Macintosh versus mccoys blade. Anaesthesia. 1996;51(10):912-5.
[15]. Mccoy EP, Mirakhur RK, Mccloskey BV. A comparison of the stress response to laryngoscopy. Macintosh versus mccoys blade. Anaesthesia. 1995;50(11):943-6.
[16]. Haidry MA, Khan FA. Comparison of hemodynamic response to tracheal intubation with Macintosh and mccoys laryngoscopes. J AnaesthesiolClinPharmacol. 2013;29(2):196-9.
[17]. Roman J, Beltran HB, Garcia VP, Parramon F, Gracia R, Vilaplana J, et al. Hemodynamic response to intubation with Macintosh and mccoys blade. Rev EspAnestesiol Reanim.1996;43(5):177-9.
[18]. Kulkarni AP, Tirmanwar AS. Comparison of glottis visulation and ease of intubation with different laryngoscope blades. Indian J Anaesth. 2013;57(2):170-4.
[19]. Uchida T, Hikawa Y, Saito Y, Yasuda K. The mccoy levering laryngoscope in patients with limited neck extension. Can J Anaesth. 1997;44(6):74-6.
[20]. Gotiwale K et al. Stress response to laryngoscopy and ease of intubation: comparison between Macintosh and (levering) mccoys type laryngoscope. International Journal of Research in Medical Sciences. 2016 Aug;4(8):3141-3145.

Tables

Table 1. Distribution of subjects based on baseline characteristics

Variables	Group	Mean/ N	SD/ %	p- value
Age (yrs)	**A**	30.34	5.65	**0.15**
	B	32.21	5.91	
Weight (Kg)	**A**	62.13	11.1	**0.79**
	B	61.19	11.3	
Height (cm)	**A**	157.8	8.7	**0.31**
	B	159.7	9.1	
ASA Grade I/ II	**A**	21/9	70%/ 30%	**1.00**
	B	20/10	66.7%/ 33.3%	

Table 2.Comparison of laryngoscopy time and requirement of BURP Maneuver

Ease of Operability	Group	Mean/ N	SD/ %	p- value
Laryngoscopy Time	**A**	19.55	3.12	**<0.01**
	B	16.2	2.34	

BURP Maneuver	**A**	11	36.67%	**<0.01**
	B	0	0.00%	

Table 3. Comparison of Heart Rate changes between the groups

Heart Rate	Group	Mean	SD	p- value
Baseline	**A**	80.54	5.67	**0.76**
	B	81.45	6.54	
After Induction	**A**	69.16	5.90	**0.81**
	B	69.99	6.87	
After Intubation	**A**	78.23	6.21	**<0.01**
	B	73.45	6.09	
2 mins. after Intubation	**A**	75.41	6.11	**<0.01**
	B	72.98	6.23	
5 mins. after Intubation	**A**	73.11	6.32	**0.12**
	B	72.43	5.99	

Table 4. Comparison of Mean Arterial Pressure changes between the groups

MAP	Group	Mean	SD	p- value
Baseline	**A**	101.47	6.40	**0.79**
	B	100.20	10.80	
After Induction	**A**	95.67	7.15	**0.26**
	B	93.31	11.1	
After Intubation	**A**	114.8	8.7	**<0.01**
	B	98.23	9.1	
2 mins. after Intubation	**A**	105.34	7.9	**<0.01**
	B	96.75	9.1	
5 mins. after Intubation	**A**	97.67	7.8	**0.09**
	B	94.78	9.1	

Table 5. Comparison of Complication Rate between the groups

Complications	Group		Total	p- value
	Nylon	Silk		
No	3 (10%)	0 (0%)	3	**0.23**
Yes	27 (90%)	30 (100%)	57	
Total	30(100%)	30 (100%)	60	