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COMPARISON OF STRESS RESPONSE TO LARYNGOSCOPY USING DIFFERENT BLADES – THE MACINTOSH, MC COY AND DOSHI BLADE- A PROSPECTIVE RANDOMISED STUDY.

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ABSTRACT Laryngoscopy is the vital step aiding endotracheal intubation. Macintosh curved blade is most commonly used in the anaesthesia practice. McCoy blade with its hinge avoid the lifting force at the vallecula thereby attenuating the pressor response. Doshi blade with its high web and better glottic visualization are the alternative choices available for laryngoscopy. This prospective randomised study was planned to compare the magnitude of the hemodynamic stress response with the use of these three laryngoscope blades. A total of 150 eligible patients were divided randomly into three groups, Group1 (Macintosh n=50), Group2(McCoy n=50), Group 3(Doshi blade n = 50). Results showed McCoy Blade to be superior to both Macintosh and Doshi blade in terms of change in heart rate and rise in mean arterial pressure resulting as a stress response to intubation. The Cormack Lehane view was when compared between the groups, McCoy group had Grade 1 view in 94% of the subjects followed by Doshi blade group with 84% and Macintosh blade group with 80% respectively. To conclude McCoy blade when used for the laryngoscopy is superior to the remaining two blades, when the stress response and glottic visualization is compared.

KEYWORDS : Laryngoscopy, Endotracheal Intubation, Hemodynamic response, Glottis

Introduction:

Endotracheal intubation is an integral part of anaesthesia being carried out frequently in day to day anaesthesia practice. Endotracheal intubation adds tremendously to the safety of administration of general anaesthesia, but has its own deleterious effects, particularly on the cardiovascular system. [1] Tachycardia, hypertension, increase in intracranial tension, and dysrhythmias are well documented. A normal healthy patient may be able to deal with these response, but in a patient with a compromised cardiovascular system like hypertension or ischaemic heart disease, the response to laryngoscopy and intubation may prove potentially hazardous.

In order to abolish the pressor response, various techniques have been tried which included deepening the depth of anaesthesia, use of pharmacological agents like sublingual nitroglycerine, magnesium sulphate, lignocaine, esmolol, gabapentin, clonidine, dexmedetomidine.[2- 8] In view of undesirable side effects like sedation, cardiovascular effects, or respiratory depression with these drugs, this study was planned to change the instrumental technique of laryngoscopy by comparing Macintosh blade, Mc Coy blade and Doshi blade in an attempt to find the best laryngoscope blade for reduction of the stress response of direct laryngoscopy and intubation.

Materials and Methods:

This Prospective randomised comparative study was planned in our tertiary care centre after obtaining the ethical clearance from the institutional ethical committee. The study enrolled 150 patients of both sexes, age ranging between 20-50 years, ASA physical status class I and II, Mallampati class I and II who were scheduled to undergo various elective surgical procedures under general anaesthesia. Patients on antihypertensives, pregabalin, gabapentin, antianginal drugs and with Mallampati Class more than II and Cormack Lehane view of 2b and above were excluded from the study. Written informed consent was obtained from all the patients. Fasting instructions were explained to the patients and were given tab alprazolam 0.25mg and tab ranitidine 150 mg a night before surgery.

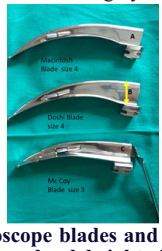

Figure 1: Three laryngoscope blades and yellow arrow in Doshi blade depicting the increased web height of the blade as compared to the Macintosh blade.

On the day of surgery, patients were randomly allocated into the three groups using computer generated random numbers tables. Group 1 (Laryngoscopy using Macintosh blade), Group 2 (Laryngoscope using Mc Coy Blade), Group 3(Laryngoscopy using modified Macintosh Doshi blade). [Figure1] On arrival in the operation theatre standard monitors [Non-invasive blood pressure (NIBP), SpO2, end tidal Co2(capnogram), ECG leads] were attached and baseline recordings were noted. Standard general anaesthesia technique was used with patients being preoxygenated with 100% oxygen for three minutes prior to induction which was done with the injection thiopentone 5mg/kg I.V(till the abolition of the eyelash reflex) which was followed by injection atracurium 0.5mg/kg I.V and the airway was secured with appropriate size endotracheal tube using direct laryngoscope with one of these three types of blades. Maintenance of anaesthesia was attained with oxygen, nitrous oxide with sevoflurane (1-2%). Recording of pulse rate and NIBP being done before induction, at the end of laryngoscopy, and then at 1 minute, 3minutes and 5 minutes interval after the laryngoscopy and intubation. At the end of the surgery the patient was reversed with injection Neostigmine 0.5mg/kg I.V and injection glycopyrrolate 10 µg/kg.

Anaesthesiologist attempting the laryngoscopy also mentioned about the Cormack Lehane view which is the view of the glottic opening with structures seen during the direct laryngoscopy. Modified Cormack Lehane view was divided into the following grades. Grade 1- full view of the glottis, Grade 2 a – partial view of the glottis. Grade 2 b- only arytenoid cartilages seen, Grade 3- only epiglottis seen, Grade 4- neither glottis nor epiglottis seen. [9]

Macintosh Blade: It is a curved laryngoscope blade with three basic parts which includes handle, light, blade. Blade has the three components – spatula, flange and tip. The spatula serves to compress and manipulate the tissue and lower jaw, the flange is the portion of the blade that projects from the edge of the spatula and serve s to guide instrumentation. The tip of the blade elevates the epiglottis. [Figure1A]

Mc Coy Blade: The levering laryngoscope blade differs from the standard Macintosh blade in four aspects, one it has a hinged tip, the proximal lever, the spring -loaded drum and the connecting shaft. [Figure 1C]

Doshi Blade: This blade is a modification of the Macintosh blade with the following modifications, the web height has been increased to 30 mm which is increased by 7mm which helps in opening the mouth wider keeping the upper lip stretched allowing a better retraction of tongue and allows better view of larynx. [Figure1B]

Statistical analysis included one-way ANOVA for comparing the mean

(SD) between the three groups and unpaired 't' test was applied for the continuous parametric data. The grades mentioned in the study were reflected as proportions (%). Statistical Package for Social Sciences, version 15. (SPSS, Inc, Chicago IL, USA) software was used for the analysis of the data. P value less than 0.05 was considered significant.

Results:
The study included 150 patients which completed the study and were divided equally into the three groups. Demographic characteristics were comparable within the groups. [Table1]

Table 1: Demographic characteristics

Parameter	Group1 n=50 (Macintosh)	Group2 n=50 (Mc Coy)	Group3n=50 (Doshi Blade)	P value
Age(year)	33.24±0.79	33.44±0.9	33.52±0.8	0.25
Weight (Kg)	63±2.5	63.86±2.6	63.34±2.7	0.26
Sex M/F	44/6	43/7	45/6	-

P value< 0.05 is considered significant.

In all the three groups heart rate before induction was comparable. At the end of laryngoscopy and intubation, the mean rise in heart rate was 19.2 in Group 1, 9.9 in Group 2 and 18.8 in Group 3. Mean (SD) heart rate in Group 1 and Group 3 are comparable (P> 0.98) whereas, the mean (SD) value of heart rate when compared between Group 1 and Group 2 as well as between Group 2 and Group 3 showed significant results with P value of < 0.05 respectively. At the end of one minute after intubation the increase in heart rate from pre-induction levels was 25.5, 12.2 and 22.3 in Group 1, 2 and 3 respectively and the comparison Of Mean (SD) value between the Group 1 and Group 2 as well as between Group 2 and Group 3 were significant (P <0.01). Similar significant results were replicated when the mean (SD) values were compared at 3 and 5 minutes after laryngoscopy. [Table 2]

Table 2: Comparison of heart rate (b.p.m) changes between the groups

Event	Group1 (n=50)	Group 2 (n=50)	Group3(n=50)
Preinduction	75±5.6	76.6±7.0	75.6±7.2
After Laryngoscopy	94.2±5.6	86.5.2±7.2	94.4±6.8
1min after laryngoscopy	100.5±7.2	88.6±6.8	97.9±7.6
3 min after laryngoscopy	90.4±5.4	82.2±7.1	91.1±7.2
5 min after Laryngoscopy	76.3±5.6	75.8±6.1	75.2±6.2

Comparison of mean arterial pressure (MAP) expressed as mm Hg between the groups before induction was comparable. (P value > 0.05). At the end of laryngoscopy and intubation, the MAP rose by 10.5mm Hg in Group 1, 2 mmHg in Group 2 and 11.7 mmHg in Group 3. Mean (SD) values when compared between the Group 1 and 2 as well as between Group 2 and 3 the results were significant (P value <0.01) whereas the results when compared between Group 1 and Group 3 were insignificant (P> 0.05). Similar significant results were obtained at 3 min and 5 min after laryngoscopy when Group 1 and Group 2 as well as Group 2 and Group 3 were compared. [Table 3]

Table 3: Comparison of Mean Arterial Pressure (mm Hg) changes between the groups.

Event	Group1 (n=50)	Group 2 (n=50)	Group3(n=50)
Preinduction	89.9±4.0	90.9±5.1	88.7±5.2
After Laryngoscopy	100.4±4.7	92.9.2±5.0	100.4±6.0
1min after laryngoscopy	115.0±5.9	99.7±6.0	112.9±5.6
3 min after laryngoscopy	98.4.4±3.4	94.5±5.6	98.1±4.2
5 min after Laryngoscopy	90.1±4.6	90.8±5.1	87.2±5.2

Cormack Lehane view when compared between the groups, the results were in favour of Group 2C(Mc oy) where majority operators achieved Grade 1 view (94%) as compared to Group 1 and Group 3 which could achieve Grade 1 view only in 80% and 84% during direct laryngoscopy respectively. [Table 4]

Table 4: Cormack Lehane view attained during laryngoscopy expressed in percentage (%).

Grades of view	Group1 (n=50)	Group 2 (n=50)	Group3(n=50)
Grade 1	80%	94%	84%
Grade 2A	14%	6%	12%
Grade 2B	6%	-	4%
Grade 3	-	-	-
Grade 4	-	-	-

Discussion
Routine use of laryngoscopy and endotracheal intubation in the anaesthesia practice has paved the way for safe administration of general anaesthesia. Adverse transient hemodynamic response to laryngoscopy followed by intubation can be deleterious especially in patients of coronary artery disease on antihypertensives and on antianginal drugs. [10] The magnitude of pressor response is more with the intubation as compared to the laryngoscopy alone. [11] Studies have shown that type of the laryngoscope blade can have an impact on the hemodynamic changes. [12]

Various methods and devices are available for intubation, however most commonly in use is the direct laryngoscope for the visualization of the glottic aperture. A standard curved Macintosh blade has been used in majority of the cases but, its modification, Mc Coy blade came into its existence in nineties which radically changed the laryngoscopy owing to its fulcrum positioned at a lower point within the pharynx and the reduced contact with the upper incisors with simplified elevation of the epiglottis produced a clearer view of the larynx.[13] Doshi blade is a curved Macintosh blade with the increased web height by 7mm which helps in retracting the tongue better and provides a clearer glottic view without much hyperextension of the neck especially in the edentulous or in patients with the missing incisors.[14] Study by Sanjeev OP et al has emphasised the role of Doshi blade in creating extra space in the mouth consequently resulting in the easy placement of the double lumen tube without any damage to the tracheal cuff.[15]

Haidry MA et al in their study observed that the hemodynamic variation in terms of change in the heart rate and systolic blood pressure was more in the Macintosh group as compared to Mc Coy group. [16] Our results are similar to the study done by the Sachidananda et al and Paul A, et al, who observed lesser hemodynamic responses during and after intubation with the Mc Coy blade when compared to the Macintosh blade where no intubation aids were utilized. [17,18]. Contrary to the above studies, Buhari FS et al in their study concluded that Mc Coy and Macintosh laryngoscope blade produce similar hemodynamic response to endotracheal intubation and laryngoscopy. [19]
Lesser response to Mc Coy laryngoscope use can translate into an advantage as lesser drugs will be required to blunt the stress response in wake of the direct laryngoscopy.

In our study use of Mc Coy blade led to the Grade 1, Cormack Lehane view in 94% of the subjects and this is attributed to the levering tip of the blade which aids in lifting of the epiglottis and improving the laryngeal inlet view and this is supported by the various studies. [20,21] Uchida et al showed that when laryngoscopy was performed in the neutral position Mc Coy blade improved the Cormack Lehane view. [22] Ashok kumar BK et al concluded that Doshi blade provides better glottic view which was in accordance with our results where Grade 1 view was attained in 84% of patients as compared to 80% with the Macintosh blade. [23]

The limitation of the study includes lack of depth of anaesthesia monitor and neuromuscular monitoring which could have measured the right plane of relaxation and depth of anaesthesia before attempting the intubation and this might have affected the results. Inclusion of only ASA grade I and II patients as well as Mallampati class I and II created a bias as any inclusion of the difficult airway and higher grades of ASA would have translated into a greater hemodynamic response. Complete blinding could not be achieved. In this context a larger randomized prospective study will help in establishing the hemodynamic response in patients of hypertension and difficult airways.

Conclusion:
In this randomised prospective study in a relatively healthy young

patients with the normal airways, we found that the stress response to laryngoscopy, intubation as well as the glottic visualisation was best with Mc Coy blade followed by the Doshi blade, when compared with the commonly used Macintosh blade.

References:

1. Cheney FW, Posner KL, Caplan RA. Adverse respiratory events infrequently leading to malpractice suits. A closed claims analysis. Anesthesiology 1991; 75:932-9.
2. Kumari I, Naithani U, Dadheech VK, Pradeep DS, Meena K, Verma D. Attenuation of pressor response following intubation: Efficacy of nitro-glycerine lingual spray. J anaesthesiol Clin Pharmacol 2016; 32:69-73.
3. Kim WY, Lee YS, Ok SJ, Chang MS, Kim JH, Park YC, et al. Lidocaine does not prevent bispectral index increases in response to endotracheal intubation. Anesth Analg 2006; 102:156-9.
4. Dahlgren N, Messeter K. Treatment of stress response to laryngoscopy and intubation with fentanyl. Anaesthesia 1981; 36:1022-6
5. Ogurlu UB, Erdal MC, Aydin ON. Effects of esmolol, lidocaine and fentanyl on haemodynamic responses to endotracheal intubation: A comparative study. Clin Drug Investig 2007; 27:269-77.
6. Kumari I, Pathania VS. A prospective randomised double-blind placebo-controlled trial of oral gabapentin in attenuation of haemodynamic responses during laryngoscopy &tracheal intubation. J Anaesth Clin Pharmacol 2009; 25:439-43.
7. Ashton WB, James MF, Janicki P, Uys PC. Attenuation of the pressor response to tracheal intubation by magnesium sulphate with and without alfentanil in hypertensive proteinuric patients undergoing caesarean section. Br J Anaesth 1991; 67:741-7.
8. Deepak Dwivedi, Kiran Sheshadri, Abhijit Karmarkar, Arijit Ray, Swayam Tara. Anaesthetic Considerations in Patients of Takayasu Arteritis and Blunting of Stress Response to Intubation by Dexmedetomidine Infusion "A Report of two Cases." Journal of Clinical and Diagnostic Research. 2017 Oct, Vol-11(10): UD01-UD03.
9. Koh LK, Kong CE, Ip -Yam PC. The modified Cormack -Lehane sore for the grading of direct laryngoscopy:evaluation in the Asian population. Anesth Intensive Care2002;30: 48-51.
10. Hassan HG, El-Sharkawy TY, Renck H, Mansour G, Fouda A. Haemodynamic and catecholine responses to laryngoscopy with Vs. without endotracheal intubation. Acta Anaesthesiol 1991; 35:442-7.
11. Shribman AJ, Smith G, Achola KJ. Cardiovascular and catecholamine responses to laryngoscopy with and without tracheal intubation. Br J Anaesth 1987; 59: 295-9.
12. Kaur S, Gupta A, Ranjana R. Intubating conditions and stress response to laryngoscopy: Comparison between Macintosh and levering (McCoy's Type) laryngoscope. J Anaesth Clin Pharmacol 2009; 25:333-6.
13. Mc Coy EP and Mirakhur RK. The levering Laryngoscope. Anaesthesia 1993; 48:516-519.
14. Tarun Doshi. Laryngoscope. In: Satish Deshpande, Principles of Anaesthesia. 1st ed. Hyderabad: Paras Medical Publisher 2007; 2:1642-51.
15. Sanjeev OP, Dubey PK, Shamshery C, Rastogi A. Mac Doshi laryngoscope blade makes tracheal cuff protection easier during double- lumen tube placement. Egypt J Cardiothorac Anesth.2017 ;8: 8-12.
16. Haidry MA, Khan FA. Comparison of hemodynamic response to tracheal intubation with Macintosh and McCoy laryngoscopes. J Anaesthesiol Clin Pharmacol 2013; 29:196-9.
17. Sachidananda R, Umesh G, Shaikh SI. A review of hemodynamic response to the use of different types of laryngoscopes. Anaesth Pain Intensive Care 2016; 20:201-8.
18. Paul A, Nathroy A. Comparison of hemodynamic changes during laryngoscopy with McCoy and Macintosh laryngoscopes. J Health Res Rev 2017; 4:35-9.
19. Buhari FS, Selvaraj V. Randomized controlled study comparing the hemodynamic response to laryngoscopy and endotracheal intubation with McCoy, Macintosh, and C-MAC laryngoscopes in adult patients. J Anaesthesiol Clin Pharmacol 2016; 32:505-9.
20. Arino JJ, Velasco JM, Gasco C, Lopez-Timoneda F. Straight blades improve visualization of the larynx while curved blades increase ease of intubation: A comparison of the Macintosh, Miller, McCoy, Belscope and Lee-Fiberview blades. Can J Anaesth 2003; 50:501-6.
21. Cheung RW, Irwin MG, Law BC, Chan CK. A clinical comparison of the Flexiblade and Macintosh laryngoscopes for laryngeal exposure in anesthetized adults. Anesth Analg 2006; 102:626-30
22. Uchida T, Hikawa Y, Saito Y, Yasuda K. The McCoy levering laryngoscope in patients with limited neck extension. Can J Anaesth 1997; 44:674-6.
23. Ashok Kumar BK, Viswanathan PN. Comparison of duration of laryngoscopy, laryngeal view and ease of intubation with different laryngoscopy blades. International Journal of Recent Trends in Science and Technology.2015; 16: 482-86.