Haemodynamic Response To Laryngoscopy And Intubation: Comparison Of McCoy And Macintosh Laryngoscope

S Singhal, Neha

Citation

S Singhal, Neha. *Haemodynamic Response To Laryngoscopy And Intubation: Comparison Of McCoy And Macintosh Laryngoscope*. The Internet Journal of Anesthesiology. 2007 Volume 17 Number 1.

Abstract

A prospective randomized study was done to compare hemodynamic response to laryngoscopy and intubation using McCoy and Macintosh laryngoscope. Hundred patients of either sex, belonging to ASA grade I or II, between age group of 20-50 years, requiring general anaesthesia with intubation were included in the study. A standard anaesthesia technique was used in all the patients. Both the groups (n=50) were matched demographically. Mallampati grading, laryngoscopy and intubation time and laryngeal visualization grades were comparable. Hemodynamic variables at baseline and following induction were also statistically comparable.

Following laryngoscopy there was statistically significant rise in HR, SBP, DBP and MAP in both the groups (31.32±6.96 bpm, 37.78±6.72mmHg, 36.18±7.95mmHg, 31.84±6.94mmHg in group A and 21.04±6.60 bpm, 18.16±4.75mmHg, 19.14±4.91mmHg, 18.48±5.97mmHg in group B respectively). A further rise was seen in all variables following intubation, which persisted till one minute after intubation. Increase in hemodynamic variables was statistically highly significant with Macintosh laryngoscope as compared to McCoy. It was concluded that McCoy laryngoscope produces significantly less marked hemodynamic response.

INTRODUCTION

Laryngoscopy and intubation is known to cause exaggerated haemodynamic response. This response manifests as tachycardia, hypertension and dysrrhythmias and it may have deleterious respiratory, neurological and cardiovascular effects. [1] Various pharmacological interventions (both intravenous and topical) [2,3,4,5,6,7,8] , modification of instruments [9] and use of other intubating devices (e.g. LMA) [10,11] have been tried to obtund this haemodynamic response to laryngoscopy and intubation. McCoy laryngoscope was introduced in 1993. It was postulated that it causes less mechanical stimulation of respiratory tract so haemodynamic response should be less. [12] However Roman et al in their prospective study did not find out any difference in haemodynamic response with McCoy and Macintosh laryngoscopes. [13] Nishiyama et.al. studied hemodynamic and stress response with Macintosh, Miller and McCoy laryngoscopes and observed that stress response with McCoy was minimal. [9] With no apparent consensus emerging from above studies this present study was undertaken in Indian population to evaluate and compare haemodynamic response to laryngoscopy and intubation using McCoy and Macintosh laryngoscope

METHODS

The present prospective and randomized study was carried out in the Department of anesthesia at PGIMS, Rohtak. A total of 100 patients of either sex between age group of 20-50 years belonging to ASA grade I and II were included in the study. All the patients were posted for elective surgery requiring general anesthesia with intubation. Patients with anticipated difficult intubation (MPG-III and IV) were excluded.

Pre anaesthesia check up was carried out a day before, included routine check up and airway examination. All patients, after written informed consent, were fasted overnight and premedicated with tablet alprazolam 0.25mg orally at bedtime and two hours prior to surgery. Before induction of anaesthesia, all the patients were randomly assigned to either of the following groups.

Group A (n=50)- conventional Macintosh laryngoscope (blade size 3or 4) was used.

Group B (n=50)- McCoy laryngoscope (blade size 3or 4) was used.

Standard anaesthesia technique was employed in both the groups using thiopentone 5mg/kg $^{-1}$ IV and succinyl choline 1.5mg/kg $^{-1}$ IV. All patients were manually ventilated using O_2 and N_2O (33% and 67%) with halothane 0.5% and intubated after 90 seconds

Laryngoscopy was done as per group protocol and size 7mmID cuffed endotracheal tube for female and 8mmID for male was used. Patients were not disturbed till the study period was over. Thereafter the anaesthesia was maintained as per surgical requirement of that particular patient. Patients having bucking, coughing on intubation or requiring more than one attempt or requiring optimal external laryngeal manipulation (OELM) were excluded from the study.

Following parameters were recorded during the study: -

- Size of laryngoscope blade
- Size of ETT
- Time taken for laryngoscopy
- Time taken for intubation
- Laryngoscopic view (Cormack and Lehane) 14

Hemodynamic parameters: - SBP, DBP, MAP, HR at following times (Baseline-TB, just before insertion of laryngoscope-T0, just after intubation-TE, 1-3 and 5 min after intubation-T1, T2, T3).

EKG lead II and SpO_2 was monitored continuously throughout the study period and any episode of arrhythmia or desaturation ($SpO_2 < 90\%$) were noted. At the end of operation residual neuromuscular blockade was reversed.

Data was compiled and analyzed using chi square test for demographic profile, ASA, MPG, laryngeal visualization grading, size of laryngoscope blade and ETT. Paired and unpaired "t' test was used for laryngoscopy time, intubation time and haemodynamic parameters. p value < 0.05 was considered as statistically significant

RESULTS

Both groups were matched for age, weight, height and sex (Table I). ASA, MP grading distribution, size of laryngoscope blade and ETT used, laryngoscopy and intubation time were also comparable in both the groups (Table II)

Basal hemodynamic parameters were comparable in both the groups (Table III). Following induction and just before laryngoscopy at T0 also all haemodynamic variables HR, SBP, DPB and MAP were statistically comparable.(Table IV).

Following laryngoscopy there was significant rise in all the variables in both the groups, however this rise was significantly more in-group A as compared to group B (Table IV). The rise in HR, SBP, DBP and MAP in group A was of the order of 31.32±6.96 bpm, 37.78±6.72mmHg, 36.18±7.95mmHg and 31.84±6.94mmHg respectively as compared to group B where it was 21.04±6.60 bpm, 18.16±4.75mmHg, 19.14±4.91mmHg and 18.48±5.97mmHg respectively. After intubation there was further increase in heart rate, SBP, DBP and MAP in both the groups, which was also significant. In between groups this rise was significantly more in-group A. This increase was persistent significantly till one minute (T1) after intubation. There were no episodes of desaturation or dysrrhythmias in any of patients in either group.

Figure 1

Table 1: Demographic profile of the patients

Parameters	Group A (n=50)	Group B (n=50)	P value
Age in years (Mean± SD)	33.04±8.56	35.74±7.33	>0.05
Weight in kg (Mean± SD)	59.08±7.67	62.10±8.45	>0.05
Height in cms (Mean± SD)	166.72±8.89	167.12±8.17	>0.05
Sex (n) (M/F)	24/26	22/28	>0.05

Figure 2

Table 2: Patient assessment and intubation parameters

Parameters	Group A (n=50)	Group B (n=50)	P value
ASA grade (n)(I / II)	49 / 1	50 / 0	>0.05
MP grade (n)(I / II)	45 / 5	41 / 9	>0.05
Size of laryngoscope Blade (n) (3 / 4)	26 / 24	22 / 28	>0.05
Size of ETT (n)(7mm / 8mm)	26 / 24	22 / 28	>0.05
Time taken for laryngoscopy in sec. (Mean± SD)	8.56±1.64	8.50±2.14	>0.05
Time taken for intubation in sec (Mean± SD)	12.90±3.41	12.12±4	>0.05
Laryngeal visualization grade (n) (I / II)	41 / 9	43 / 7	>0.05

Figure 3

Table 3: Basal haemodynamic parameters

Parameters	Group A (n=50)	Group B (n=50)	P value
Heart rate (beats/mt) (Mean± SD)	85.40±2.48	86.24±3.08	>0.05
SBP (mmHg)(Mean ±SD)	124.12±16.12	124.1±8.91	>0.05
DBP (mmHg)(Mean ±SD)	79.82±5.83	77.92±6.34	>0.05
MAP (mmHg)(Mean ±SD)	92.12±7.91	90.28±4.0	>0.05

Figure 4

Table 4: Comparison of changes in haemodynamic parameters at various intervals in two groups from baseline

Time intervals→ Parameters	Group	T0	TL	TE	T1	T3	T5
HR –beats/mt (Mean ±SD)	A	-1.38±5.86	+31.32±6.96**	+37.74±6.41**	+20.78±5.98**	+1.0±6.12	-0.72±6.02
	B	-0.26±6.31	+21.04±6.60**	+24.78±7.26**	+13.26±6.46**	+0.32±5.58	+2.0±4.47
	P value	> 0.05	< 0.001	< 0.001	< 0.001	> 0.05	> 0.05
SBP- mmHg (Mean ±SD)	A	-0.3±16.93	+37.78±6.71**	+43.76±7.33**	+21.72±8.97**	+2.06±7.58	+0.66±6.77
	B	-0.06±5.11	+18.16±4.75**	+21.14±4.52**	+7.64±4.84**	+0.5±5.04	-1.50±4.48
	P value	> 0.05	< 0.001	< 0.001	< 0.001	> 0.05	> 0.05
DBP- mmHg (Mean ±SD)	A	+1.30±7.42	+36.18±7.95**	+41.70±8.06**	+23.76±6.90**	+1.48±5.48	+0.78±5.86
	B	+148±5.38	+19.14±4.91**	+24.16±5.20**	+15.72±5.33**	+1.12±4.39	+0.52±3.40
	P value	> 0.05	< 0.001	< 0.001	< 0.001	> 0.05	> 0.05
MAP-mmHg (Mean ±SD)	A	+1.68±6.13	+31.84±6.94**	+37.68±7.55**	+19.62±8.20**	+2.32±8.69	+0.38±7.10
	B	+0.88±3.82	+18.48±5.97**	+23.74±6.53**	+10.06±5.50**	-1.36±4.93	-2.58±4.38
	P value	> 0.05	< 0.001	< 0.001	< 0.001	> 0.05	> 0.05

(-) Indicates fall, (+) indicates increase, **(p value < 0.001) with in group.

DISCUSSION

Laryngoscopy and endotracheal intubation are known to cause increase in arterial blood pressure, heart rate and may be associated with various dysrrhythmias. [1] Since beginning there has been controversy regarding nervous pathway involved in this reflex response Reid and Brace attributed both afferent and efferent pathways to vagus nerve. [15] King et.al observed that mechanism is non-specific, afferent being vagus but efferent pathway is less clear. [1] Methods may be many but obtunding this reflex response during laryngoscopy and intubation remains a major concern for the anesthesiologists. Deep anaesthesia, topical anaesthesia, opioids, calcium channel blockers, beta blockers, laryngeal mask airway (LMA) have been tried with varying success. [3,4,5,6,7,8,10,11]

It has been observed that amount of forces exerted during laryngoscopy and intubation is the key determinant for mechanical stimulation of stretch receptors present in the respiratory tract. Thus use of different types of laryngoscope blades can help decreasing this response. [16] McCoy was introduced in 1993; it decreases the amount of forces exerted during laryngoscopy and endotracheal intubation so the exaggerated reflex haemodynamic response is clinically insignificant. [12]

In this prospective randomized study demographic profile (table I), ASA, MP grading and size of laryngoscope blade and endotracheal tube used were comparable in two groups (table II). Induction technique and dosages of thiopentone were same in both groups.

It is known that McCoy blade improves the laryngeal visualization grade in patients with anticipated difficult intubation. [12] This bias was not there in our study as all patient belonged to MP grade I or II and also laryngeal visualization grades were comparable in both groups (tableII). The hypertensive response is proportional to duration of conventional laryngoscopy and intubation, beginning at 15 seconds and peaking at 45 seconds. [2] Laryngoscopy and intubation times were comparable in both the groups in our study.

Hemodynamic response was similar in our study as observed by McCoy et.al. Major cause of sympatho-adrenal response is believed to arise from stimulation of supraglotic region by the laryngoscope blade while endotracheal intubation and cuff inflation contributing little additional stimulation. [17] We also observed that maximum rise was after laryngoscopy (TL) which increased a little further after intubation (TE) (Table IV). It is established that forces exerted by the laryngoscope blade on the base of tongue are assumed to be the major stimuli, which result in exaggerated response to laryngoscopy. [18] McCoy blade was designed in such a way to decrease the forces exerted on the base of tongue so that the pressure response to laryngoscopy and intubation is minimized. [19]

Thus we draw a conclusion from this study that McCoy laryngoscope produces significantly less rise in haemodynamic parameters as compared to Macintosh laryngoscope during laryngoscopy and intubation. It can be utilized as an additional tool along with pharmacological interventions for obtunding this reflex response.

CORRESPONDENCE TO

Dr. S K Singhal H N 14 / 8 FM Medical Campus Rohtak – 124 001 (Haryana) India Email ; ssinghal12@gmail.com, ssinghal12@yahoo.co.in Ph ; +91-94163 91115

References

1. King BD, Harris LC, Greifenstein FE, Elder JD, Dripps RD. Reflex circulatory sponses to direct laryngoscopy and tracheal intubation performed during general anesthesia. Anesthesiology 1951; 12:556-66.
2. Stoelting RK. Circulatory changes during direct laryngosocpy and tracheal intubation - influence of duration of laryngoscopy with or without prior lidocaine.

Anesthesiology 1977; 47(4): 381-4.
3. Hamill JF, Bedford RF, Weaver DC, Colohan AR. Lidocaine before endotracheal intubation: Intravenous or laryngotracheal? Anesthesiology 1981; 55: 578-81.
4. Kautto UM, Heinonen J. Attenuation of circulatory response to laryngoscopy and tracheal intubation: A comparison of two methods of topical anaesthesia. Acta Anaesthesiol Scand 1982; 26: 599-602.
5. Vucevic M, Purdy GM, Ellis FR. Esmolol hydrochloride for management of the cardiovascular stress responses to laryngoscopy and tracheal intubation. Br J Anaesth1992; 68: 529-30.
6. Yaku H, Mikawa K, Maekawa N, Obara H. Effects of verapamil on the cardiovascular responses to tracheal intubation. Br J Anaesth 1992; 68: 85-9.
7. Wig J, Sharma M, Baichoo N, Agarwal A. Nicardipine and verapamil attenuate the pressor response to laryngoscopy and intubation. Can J Anaesth 1994; 41: 1185-8.
8. Casati A, Fanelli G, Albertin A, Deni F, Daneili G, Grifoni F, Torri G. Small doses of remifentanil or sufentanil for blunting cardiovascular changes induced by tracheal intubation: A double blind comparison. Eur J Anaesthesiol 2001; 18: 108-12.
9. Nishiyama T, Higashizawa T, Bito H, Konishi A, Sakai T. Which larygnosocpe is the most stressful in laryngoscopy - Macintosh, Miller or McCoy? Masui 1997; 46: 1519-24.
10. Braude N, Clements EAF, Hodges UM, Andrews BP. The pressor response and laryngeal mask insertion - a comparison with tracheal intubation Anaesthesia, 1989; 44: 551-4.
11. Wood ML, Forrest ET. The haemodynamic response to the insertion of the laryngeal mask airway: a comparison with laryngoscopy and tracheal intubation. Acta Anaesthesiol Scand. 1994; 38: 510-3.
12. McCoy EP, Mirakhur RK The levering laryngoscope. Anaesthesia. 1993; 48: 516-9.
13. Roman J, Beltran de Heredia B, Garcia-Velasco P, Parramon F, Garcia R, Vilaplana J, Villalonga A. Hemodynamic response to intubation with Macintosh and McCoy blades. Rev Esp Anestesiol Reanim, 1996; 43: 177-9.
14. Tuckey JP, Cook TM, Render CA. An evaluation of the levering laryngoscope. Anaesthesia; 1996; 51: 71-3.
15. Reid LC, Brace DE. Irritation of respiratory tract and its reflex effect upon heart. Surg, Gynec & Obst 1940; 70: 157-62.
16. Forbes AM, Dally FG. Acute hypertension during induction of anaesthesia and endotracheal intubation in normotensive man. Br J Anaesth 1970; 42: 618-24.
17. Shribman AJ, Smith G, Achola KJ. Cardiovascular and catecholamine response to laryngoscopy with and without tracheal intubation. Br. J Anesth 1987; 59: 295-9.
18. McCoy EP, Mirakhur RK, McCloskev BV. A comparison of the stress response to laryngoscopy - the Macintosh versus the McCoy blade. Anaesthesia 1995; 50: 943-6.
19. 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, 51: 912-5.

Author Information

S.K. Singhal, MD
Professor, Deptt. Of Anaesthesia, Pt. BD Sharma, Post Graduate Institute Of Medical Sciences

Neha, MD
Senior Resident, Deptt. Of Anaesthesia, Pt. BD Sharma, Post Graduate Institute Of Medical Sciences