Section: Anaesthesia

Original Research Article

COMPARISON OF HEMODYNAMIC CHANGES TO LARYNGOSCOPY & ENDOTRACHEAL INTUBATION WITH MACINTOSH LARYNGOSCOPY & VIDEOLARYNGOSCOPE IN ELDERLY PATIENTS – A PROSPECTIVE OBSERVATIONAL STUDY

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Abstract

Background: The laryngoscopy and endotracheal intubation often evoke cardiovascular response due to force applied during laryngoscopy and duration of laryngoscopy which may be decreased by using video laryngoscope**.** In this study we compared hemodynamics changes during Laryngoscopy with McGrath MAC video laryngoscope and conventional direct laryngoscope. The aim is to compare the effects of hemodynamic changes between McGrath MAC video laryngoscope and conventional direct laryngoscope. **Materials and Methods:** After ethical committee approval and informed written consent elderly (60-80yrs) patient posted for elective surgeries done under general anaesthesia were included. divided into two groups (38 in each group) Group V: Mc GRATH MAC video laryngoscope Group C: Conventional Macintosh direct laryngoscope. During laryngoscopy after induction of general anaesthesia hemodynamics and ease of intubation was compared between Mc GRATH MAC video laryngoscope and Macintosh direct laryngoscope. **Result:** One attempt success rate is 92% and 97.4% in group C and group V respectively. Both the groups were similar with respect to time taken for the number of attempts, use of external laryngeal manipulation and use of alternate airway gadgets. Heart rate was significantly low in Group V at 1, 5 and 10 mins. Other hemodynamics are similar between the groups. Conclusion: MAC grath laryngoscopy has better hemodynamic stability when compare to macintosh.

INTRODUCTION

The endotracheal intubation induction along with laryngoscopy, anaesthesia and surgical stimulation often evoke cardiovascular response which is characterized by certain alterations in the SBP (systolic blood pressure), heart rate and cardiac rhythm. The response following the laryngoscopy and intubation may peak at 1 to 2 minutes and can return to baseline within 5 to 10 minutes.[1,2]

In patients with preexisting hypertension, complications are more likely to occur such as in patients with coronary heart disease, cerebrovascular disease, intracranial pathology and hyperactive airways. In those cases, circulatory reflex responses have an increase in heart rate, systolic blood pressure, mean arterial pressure and disturbances in cardiac rhythm; these needs to be suppressed. There are certain techniques which may require prior to laryngoscopy to administer the local anesthetic solution - more likely to be of limited value.[3] The most common strategies adapted are beta blockers, vasodilators, calcium channel blockers, narcotics, sympatholytics, lidocaine, etc. Other modification of instruments and use of other intubating devices (e.g. LMA) have been tried to exterminate this haemodynamic response to laryngoscopy and intubation. In the year 1993, the McCoy laryngoscope was introduced.[4]

Video techniques are used in different endoscopic methods providing a better anatomical view, delineating anomalies and facilitating team cooperation. This advantage is absent in conventional laryngoscopy, making the cooperation of the assistant more difficult.[5] Although it is shown in several studies that video laryngoscopy provides a better view of the upper airways, thus facilitating the orotracheal intubation compared to the conventional laryngoscope method, its hemodynamic effects remain inconclusive. The aim of this study was to compare the hemodynamic effects of McGrath MAC video laryngoscope and conventional direct laryngoscope.

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Aim

To establish the first-choice equipment in operation theatres which attenuates undesirable hemodynamic responses during laryngoscopy and tracheal intubation?

Primary Objective

To study the heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure changes during tracheal intubation between the Macintosh laryngoscopy and McGrath Mac videolaryngoscopy.

Secondary Objective

To assess the ease of intubation, time to intubation, Cormack-Lehane gradings, procedure related side effects and complications including changeover to alternate airway gadgets.

MATERIALS AND METHODS

After getting informed written consent and institutional ethical committee clearance, A prospective observational study conducted on elderly patients 60-80yrs of age with American Society of Anaesthesiologist grading of I-III. Participant was selected using Computer generated Random number sequence and allocated into two groups using Opaque sealed Envelope.

Group V: McGRATH MAC video laryngoscope

Group C: Conventional Macintosh direct laryngoscope

Patients not willing to participate in the study and patient with difficult airway were excluded from the study.

Sample Size

The sample size was calculated assuming the expected mean and standard deviation of the MAP in the McGRATH MAC video laryngoscope as, σ_1(80.3,12.6) and in the Macintosh direct laryngoscope as, σ_0(88.3,11.8), as per the pervious study by Colak F et al.[6]

The required sample size was calculated using the following formula as proposed by Kirkwood BR et al.[7] Sample size calculated 36 in each group To account for a non-participation rate/ loss to follow up rate of a about 5%, another 2 subjects will be added to the sample size.Hence the final required sample size would be 76 (38 subjects in each group).

Method of Data Collection

Heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressures were recorded immediately after laryngoscopy, then 1, 3, 5 and ten minutes after intubation of trachea.

Intravenous access will be established prior and the patients will be given fluids prior to the proposed time as per institution protocol. Baseline vitals will be recorded in preparation room on the day of surgery. Essential equipment for difficult airway and intubation including Fiberoptic Bronchoscope will be made available.

With continuous monitoring of vitals, induction of anesthesia will be done by administering Glycopyrrolate 10 mcg/kg, Fentanyl 2 mcg/kg and Propofol 2 mg/kg intravenously. After checking ventilation, Cisatracurium 0.3 mg/kg will be used as a muscle relaxant. After four minutes, laryngoscopy and intubation will be performed either by direct laryngoscopy (group C) using Macintosh blade size 3 or 4 or by video laryngoscopy using McGrath Mac video laryngoscope (group V) by senior consultant with minimum 5 years' experience in using both gadgets.

Ease of intubation was graded as follows:[8]

- Grade 1: Intubation easy
- Grade 2: Intubation requiring an increased anterior lifting force and assistance to pull the right corner of the mouth upwards to increase space
- Grade 3: Intubation requiring multiple attempts and a curved stylet
- Grade 4: Failure to intubate with the assigned laryngoscope.

Maintenance of anesthesia will be achieved by delivering oxygen at 0.5 L/min, N_2O at 0.5 L/min, Desflurane at MAC 1 and Cisatracurium 1-2 mg when required. At the end of the surgery, reversal of neuromuscular blockade and awake tracheal extubation will be done. Then, the patient will be shifted to Post Anesthesia Care Unit. Hemodynamics, intubation time, number of attempts, Use of external laryngeal Manipulation and alternate devices were monitored.

Statistical analysis:

Data was spread in Microsoft excel and analysed using SPSS 20.0 version software. Descriptive statistics was reported as frequencies and percentage for categorical variables. Chi-square test was applied. A two-sided p value was taken as statistically significant.

RESULTS

Both the groups were comparable with respect to demography. [Table1]

The common presentation of intubation time [Table 2] in our study for both the groups were about 50 seconds which is about 78% and 60.5% in group C and group V respectively. Both the groups were similar with respect to time taken for intubation (p=0.09).

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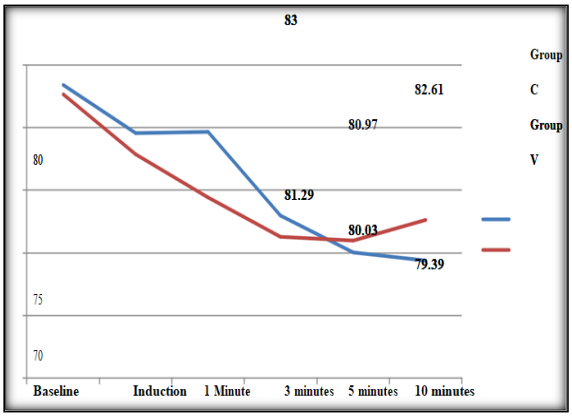

Figure 1: Comparison of mean arterial pressure

The common presentation of number of attempts in our study for both the groups were about one attempt which is about 92% and 97.4% in group C and group V respectively. Both the groups were similar with respect to time taken for the number of attempts (p=0.53). The common presentation of BURP in our study for both the groups was about 18% and 7.9% in group C and group V respectively. Both the groups were similar with respect to external laryngeal manipulation (p=0.53). The common presentation of the presence of alternate airway gadgets in our study for both the groups was about 8% and 2.6% in group C and group V respectively. Both the groups were similar in characteristics (p=0.52).

The common presentation of ease of intubation [Table 3] grading in our study was grade 1 for both the groups was about 73.6% and 84.2% in group C and group V respectively. Both the groups were similar with respect to ease of intubation grading (p=0.53).

The common presentation of hoarseness [Table 4] in our study for both the groups was about 21% and 10.5% in group C and group V respectively. Both the groups were similar with respect to presence of hoarseness (p=0.30).

The mean HR (Heart Rate) in Group C and Group V [Table 5]. There was significant difference between the two groups at all intervals except at baseline, arrival and at 10 minutes.

The table above shows the mean arterial blood pressure [Figure 1] in Group C and Group V.

There was no significant difference between the two groups statistically.

Table 1: Distribution of study participants

	Group C (n=38)	Group V (n=38)	p-value
Age (Mean±SD)	64.63±5.44	64.39±5.14	0.73
Males(%)	17(44.7%)	24(63.2%)	0.18
Females(%)	21(55.2%)	14(36.8)	
ASA			0.70
1	9(23.7%)	6(15.8%)	
2	11(28.95%)	12(31.6%)	
3	18(47.37%)	20(52.6%)	
Carmack Lehane Grading			
1	22	31	0.06
2	2	0	
2A	7	6	
2B	6	0	
3A	1	1	

Table 2: Intubation characteristics

Intubation time	Group C(n=38)	Group V(n=38)	Pvalue
<50	3(7.8%)	3(7.8%)	
50-100	30(78.9%)	23(60.5%)	
100-150	3(7.9%)	11(28.9%)	
>150	2(5.3%)	1(2.6%)	0.09
Attempts			
1	35(92.1	37(97.4%)	0.53
2	2(5.3%)	1(2.6%)	
3	1(2.6%)	0	
External laryngeal Manipultion			
BURP	7(18.42%)	3(7.9%)	0.20
Absent	31(81.57%)	35(92.1%)	
Alternate airway gadgets			
Present	3(7.8%)	1(2.6%)	0.52
Absent	35(92.1%)	37(97.4%)	

Table 3: Distribution of study participants according to the ease of intubation grading

Ease	Group C (n=38)		Group V (n=38)	
	No	Percentage	No	Percentage
1	28	73.6	32	84.2
2	7	18.4	5	13.2
3	2	5.2	1	2.6
4	1	2.6	0	0

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p-value	0.64

Table 4: Comparison of hoarseness of voice (N=76)

Hoarseness	Group C (n=38)		Group V (n=38)	
	No	Percentage	No	Percentage
Present	8	21.1	4	10.5
Absent	30	78.9	34	89.5
p-value	0.30			

Table 5: Comparison of mean HR

	Group	Mean ± SD	t-value	P-value
Baseline	Group C	76.37±15.18	0.86	0.39
	Group V	73.39±14.87		
Induction	Group C	73.13±8.70	1.81	0.07
	Group V	69.58±8.33		
1 minute	Group C	79.16±16.19	3.01	0.004
	Group V	69.53±11.26		
3 minutes	Group C	76.89±10.55	3.28	0.002
	Group V	69.08±10.18		
5 minutes	Group C	73.97±9.31	1.92	0.05
	Group V	69.71±10.01		
10 minutes	Group C	70.66±9.27	-0.16	0.87
	Group V	71.03±10.60		

DISCUSSION

Endotracheal intubation and laryngoscopy are directed to cause an increase in mean arterial blood pressure and heart rate. They are well associated with various dysrrythmias. There always has been a controversy associated with reflex response involved in the nervous pathway. The both efferent and afferent pathways are attributed to Reid and Brace. King et al,[9] in his study observed that the mechanisms were non-specific and the vagus being afferent and efferent pathways are not clear. Elisa et al had observed a left ventricular dysfunction after the introduction of endotracheal intubation. The reflex of sympathetic response may diminish or modify centrally, peripherally and locally which could accomplish in using all these approaches with varying success. There are various methods but obtaining the response to the reflex at the time of laryngoscopy and endotracheal intubation will project as a major concern among anesthesiologists. Laryngeal mask airway, beta blockers, CCB (calcium channel blockers), opioids, topical anesthesia have got different success rate. In a study done by King et al,[9] they have used the topical anaesthesia combination in larynx with superior laryngeal nerve block to decrease the stress response to endotracheal intubation. Usage of vasodilators like sodium nitroprusside can result in reflex tachycardia, blood pressure fluctuations, cerebral vasodilatation which in turn leads to intracranial pressure and pulmonary venous admixture. It is observed that the mechanical stimulation of stretch receptors in the respiratory tract is determined by the amount of forces that are exerted during laryngoscopy and endotracheal intubation. Thus the usage of different types of laryngoscope blades can in turn help in decreasing the response. In a study done by Wilson et al,[13] have found significant increase in systolic blood pressure after the laryngoscopy and endotracheal intubation between the two studied groups were 51.3% and 22.8% respectively. In our study the mean diastolic blood pressure (DBP) in Group C and Group V showed significant difference between the two groups at induction and at 1 minute. In some previous studies,[14] they showed that the hemodynamic stress response to a blind guided intubation with laryngeal mask airway was less than laryngoscopy. Similar findings were demonstrated in our study showing the mean systolic blood pressure (SBP) in Group C and Group V had significant difference between the two groups at 5 minutes and at 10 minutes. Kihara et al,[14] in her study evaluates the hemodynamic response for 120 patients without any risk factors and found there was significant increase in systolic and diastolic blood pressure, but there was an increase in heart rate 1 min after insertion of laryngeal mask airway. McCoy came in 1993; which may decrease the amount of force exerted during ET (endotracheal intubation) and laryngoscopy so that the hemodynamic response is completely reduced. The force required with McCoy for laryngoscopy requires about fifty three percent of the force to obtain a clear view of vocal cord as compared to Mcintosh blade,[15] Castilo et al,[12] in his study found significantly lower systolic arterial pressure and heart rate when they assessed the cardio circulatory repercussions of laryngoscopy performed with McCoY and Macintosh laryngoscope in fifty-eight patients. Besides the hypothesis in our study it was better to be evaluated on the subject with cardiopulmonary disease that more than on the patients without such conditions prone to the risk of being affected by the hemodynamic changes of this method of intubation. The McGRATH MAC videolaryngoscope is a new intubation device. It has a blade and handle like a Macintosh laryngoscope and a small camera and light source at the tip of the blade. Compatibility of

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the oral and pharyngeal axes is required to see the glottis with a Macintosh laryngoscope; however, this manipulation is not required with the McGRATH MAC videolaryngoscope. The hemodynamic response has been intensively addressed in the anesthesia literature. It has been shown that the force applied during laryngoscopy; the duration of laryngoscopy, and the number of attempts can all increase sympathetic response during laryngoscopy. Videolaryngoscopes do not need to align oral, pharyngeal, and laryngeal airway axes and allow the airway anatomy and vocal cords to be seen more clearly by reducing the lifting force to expose the glottis. It has also been hypothesized that during laryngoscopy, less mechanical stimulation will occur in the pharyngeal structures, which leads to a reduction in hemodynamic response. However, conflicting results of hemodynamic results of hemodynamic response have been reported in the literature. In our study, the overall duration of laryngoscopy and the number of attempts between the two groups were comparable. So, the statistically significant difference in hemodynamics can be attributed to the less significant force & manipulation by the McGRATH MAC videolaryngoscope.

CONCLUSION

We conclude that Intubation in elderly patients with McGRATH MAC videolaryngoscopy produces less hemodynamic changes compared to Macintosh Laryngoscope.

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