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HEMODYNAMIC RESPONSE TO TRACHEAL INTUBATION AND POSTOPERATIVE COMPLICATIONS USING LIGHTWAND OR MACINTOSH LARYNGOSCOPES IN NORMOTENSIVE ADULTS: A COMPARATIVE PROSPECTIVE STUDY

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ABSTRACT

Background: Laryngoscopy and tracheal intubation are often associated with hemodynamic changes like hypertension, tachycardia and an increase in plasma catecholamine concentrations. The present study was done to compare the hemodynamic response during tracheal intubation, guided by either Lightwand or Direct laryngoscopy and to observe postoperative complications.

MATERIAL AND METHODS: The present study is a randomized prospective comparative study. 80 adult consented patients of ASA I or II aged 22-55 years of either sex scheduled for elective surgeries under general anesthesia divided into two groups (n=40);Group 1 & Group 2. Patients were intubated using either Lightwand or Macintosh laryngoscopes. The number of attempts, intubation time and hemodynamic parameters of heart rate and blood pressure were recorded, at baseline, after induction, just after tracheal intubation and then at1,3,5,10,15 min after tracheal intubation. Variation in blood pressure and heart rate,postoperative sore throat,dysphagia, and hoarseness were evaluated.

RESULT& CONCLUSION: There was no significant difference in terms of changes in blood pressure and heart rate during laryngoscopy and after tracheal intubation between 2 groups. Post intubation hoarseness,sore throat and dysphasia were also comparable between the groups.

KEYWORDS : Lightwand, Macintosh Laryngoscopes, Tracheal Intubation, Hemodynamic Response.

INTRODUCTION:

Tracheal intubation uses a direct laryngoscope to expose the vocal cords and insert a tracheal tube under vision. However, if the vocal cords are not easily exposed, additional force must be applied during tracheal intubation, which can lead to adverse cardiovascular events like increases in blood pressure and heart rate due to hemodynamic stress [1-3]. Damage to surrounding tissue may result in hoarseness,sore throat and dysphagia after extubation.Difficult tracheal intubation may cause serious damage to the soft tissue of the upper airway, prompting a rise in blood pressure and complications such as stroke [5].Transillumination using a light wand is an alternative type of laryngoscope used for tracheal intubation.It has a malleable intubation stylet with a small light bulb in the distal extremity,as this end enters the trachea through the vocal cord, transillumination of the soft tissues of the anterior neck to guide the placement of the endotracheal tube into the trachea. The lightwand is gentle, safe and effective intubating technique and is unaffected by the presence of blood and secretions in the upper airway [6]. Since the use of the lightwand for intubation does not involve direct observation of the vocal cord, it is less invasive than traditional direct laryngoscope intubation.[4] The incidence of dental trauma and mucosal injuries,hemodynamic responses are lesser as compared to the direct laryngoscopy as epiglottis is not lifted to visualize the glottis [4,7,8].

Present study was aimed to compare the hemodynamic response during tracheal intubation performed by direct laryngoscopy or lightwand in normotensive adult.Any complications such as hoarseness,sore throat,dysphagia and mucosal bleeding in postoperative period were also recorded and compared.

MATERIAL AND METHODS :

After approval from the Institutional Ethics Committee and informed written consent from patients, the present study was carried out in the Department of Anaesthesiology,Gandhi Medical College & associated hospitals (Hamidia and Sultania), Bhopal over a period of 6 months. It was Randomized,comparative and Prospective study.80 normotensive patients of ASA class I and II, aged between 22-55 years, of either sex(M & F), scheduled for elective surgeries under general anesthesia were randomly (by computer generated system) divided into 2 groups (n=40);

Group 1: Patients were intubated with LIGHTWAND
Group 2: Patients were intubated with direct laryngoscopy using MACINTOSH blade.

All intubations were performed by a single experienced anaesthesiologist. INCLUSION CRITERIA: age 22-55yrs,ASA class I/II,normotensive adults.EXCLUSION CRITERIA:Any patient with history of systemic hypertension and cardiopulmonary disease,hepatic, renal or endocrine disorder, foreign body in airways, polyps,tumors,retropharyngeal abscess,laryngeal trauma, perioperative sore throat & hoarseness, difficult airway or Mallampatti Grade III/IV,body mass index >30,history of previous difficult tracheal intubation or patient who required more than 30 seconds or more than one attempt for intubation were excluded.

After arrival in operation room, routine standard monitoring,such as Electrocardiography,noninvasive arterial blood pressure and pulse oximetry (SpO_2) were applied before induction of anesthesia.Infusion of RL was started at rate of 6-8 ml/kg via intravenous line. The anesthetic induction technique was standardized. All patients were premedicated with i/v glycopyrrolate (0.004 mg/kg), midazolam (0.05 mg/kg) and fentanyl (2 µg/kg). Preoxygenation done with 100% oxygen for 3-5 mins. Anesthesia was induced with i/v propofol (2-2.5 mg/kg) followed by i/v succinylcholine (1mg/kg) to facilitate tracheal intubation. The patients were ventilated for 1 min with oxygen, trachea was intubated orally using either the lightwand or by direct laryngoscopy with Macintosh blade, according to study group. Anesthesia was maintained with nitrous oxide 60% in oxygen, isoflurane and atracurium or fentanyl as and when required. The arterial blood pressure and heart rate were recorded at baseline, immediately after induction, just after tracheal intubation and then at 1,3,5,10,15 min after tracheal intubation. The number of attempts and intubation time were noted. Intubation time was from the moment the device was inserted into the patient's mouth by the anesthesiologist until insufflation of the balloon and correct tracheal intubation was confirmed by observing the capnography curve on the monitor after the onset of controlled mechanical ventilation. If tracheal intubation failed or taking more time, the patient was excluded from the study and the case was managed according to difficult airway algorithms and ASA guidelines. In the lightwand group, the tracheal tube was pre-loaded at a 90° angle. Postoperatively,presence or absence of hoarseness, dysphagia,sore throat and any other complications like mucosal injury/bleeding,soft tissues damage etc were recorded in the recovery room in all patients. Grade of sorethroat, hoarseness, and dysphagia were evaluated using 4-point verbal rating scales as follows [9] :

Hoarseness: 0-absent, 1-slight, 2-severe, 3-cannot speak because of hoarseness;

Sore throat: 0-absent, 1-minimal, 2-moderate, 3-severe sore throat;

Dysphagia: 0-absent, 1-slight, 2-severe, 3-cannot swallow because of dysphagia;

Mucosal Bleeding: Yes /No.

STATISTICALANALYSIS :

Patient's characteristics and study parameters were analysed using SPSS software (version 15.0,SPSS, New York, USA).Variables are expressed as means±SD, percent and number(proportion). The differences between the study groups data was performed using the Student's t-test for parametric data and Chi-square test for nonparametric data.The level of significance was a P value < 0.05.

OBSERVATION :

TABLE -1: DEMOGRAPHIC DATA

PARAMETER	GROUP 1	GROUP 2	P VALUE
AGE	41.4 ± 12.2	39.9 ± 10.9	0.78
Weight(kg)	59.8 ± 9.7	60.5 ± 7.6	0.98
Height(cm)	159.8 ± 7.9	160.3 ± 6.8	0.66
SEX (M/F)	18/20	22/16	0.75
ASA (I/II)	24/14	25/13	0.8
Mallampatti grade (I/II)	26/12	27/11	0.69
Intubation time (sec)	19.98 ± 8.67	15.48 ± 5.75	0.062

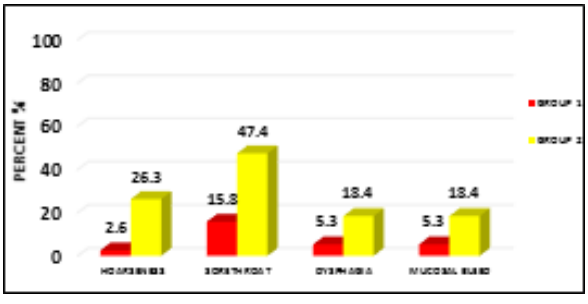
TABLE 2: Change in Hemodynamic Variables

PARAMETER	GROUP 1		GROUP 2		P VALUE	
	HR	MAP	HR	MAP	HR	MAP
Baseline	83.21 ± 15.98	92.56 ±8.97	87.67 ± 16.89	94.67 ±8.84	0.075	0.42
Immediately after induction	79.89 ± 15.78	75.65 ±13.23	82.89 ± 15.58	76.67 ± 12.89	0.079	0.21
Just after tracheal intubation	85.67 ± 16.67	93.67 ±11.67	90.79 ± 18.87	96.67 ±12.55	0.021*	0.32
1 min.	84.78 ± 17.67	91.67 ±16.78	89.98 ± 17.78	95.89 ±16.03	0.038*	0.36
3 min.	83.78 ±17.56	85.98 ±13.67	87.45 ± 16.89	90.67 ±15.45	0.432	0.41
5 min.	83.12 ± 15.64	83.56 ±12.67	87.12 ± 17.34	88.67 ± 15.65	0.309	0.24
10 min.	82.65 ± 16.12	84.67 ± 12.56	86.06 ± 16.54	92.56 ± 12.45	0.352	0.15
15 min.	82.01 ± 15.56	85.56 ± 11.45	86.98 ± 15.78	91.23 ±13.33	0.411	0.34

TABLE 3: Postoperative complications

PARAMETER	GROUP 1	GROUP 2	P VALUE
Hoarseness 0/1/2/3	37/1/0/0 (2.6%)	28/6/4/0 (26.3%)	0.016
Sore throat 0/1/2/3	32/6/0/0 (15.8%)	20/15/3 (47.4%)	0.008
Dysphagia 0/1/2/3	36/2/0/0 (5.3%)	31/5/2/0 (18.4%)	0.02
Mucosal Bleeding	5.3% (2/38)	18.4% (7/38)	0.04

GRAPH 1: BAR DIAGRAM SHOWING COMPARISION OF POSTOPERSTIVE COMPLICATION



RESULTS:

The demographic parameters age,weight,height,sex, mallampatti grade and ASA physical status of 76 patients were showed no significant difference. There was 2 patients of each group had study protocol deviation; hence, 76 patients were included for data analysis. The mean time taken for intubation in patients of group 1 was 19.98 ± 8.67sec and in group 2 was 15.48 ± 5.75sec. The difference in mean time taken for successful intubation was statistically insignificant P=0.062). (Table 1) Heart rate after induction of anaesthesia decreases below baseline value but did not differ between groups. Increase in heart rate just after tracheal intubation and after 1 min showed statistically significant difference between groups (P<0.05). In both groups, heart rate just after tracheal intubation was significantly greater, compared to baseline values and become non-significant after 3 min of intubation. Mean arterial pressure (MAP) after anaesthesia induction decreased in both the groups and increased during tracheal intubation which was statistically insignificant difference between groups (P>0.05). The maximum increase in MAP after tracheal intubation showed no significant difference between groups (Table 2). In the postoperative period, significantly higher incidence of hoarseness(26.3%), sore throat(47.4%), dysphagia(18.4%) and mucosal bleeding(18.4%) were developed in patients of group 2 (Table 3) as compare to group 1.

DISCUSSION:

Orotracheal intubation using a laryngoscope uses a blade to raise the glottis upward, causing hemodynamic changes [1-3]. Therefore, to attenuate hemodynamic changes caused by tracheal intubation, careful manipulation of the laryngoscope to decrease supraglottis stimulation is important. Still, sore throat, hoarseness and dysphagia may result from glottis stimulation, and using a lightwand rather than a rigid laryngoscope decreased the incidence of these post-operative symptoms [8].

Sore throat is a common symptom and it can be due to ischemia-reperfusion injury, local inflammatory reaction, or abrasion. However, some of the studies on this matter have observed a difference in morbidity between both techniques, suggesting a lower incidence of complications associated with the lightewand. Moreover, hemodynamic changes represent an important factor observed during intubation [4-6]. As for sore throat, however, some studies reported higher incidence of sore throat in the group of patients intubated with the lighted stylet [7]. Those clinical data contradict the results of the present study, as we found lower incidence in patients intubated with the lightewand. In another review article, the causes of post-intubation hoarseness were investigated. The authors reported that injury of laryngeal structures was the main factor responsible for the symptom. Some studies whose results coincide with ours have not demonstrated differences in hemodynamic changes between lighted stylet intubation and with direct laryngoscopy[7]. Another showed that lighted stylet attenuates hemodynamic changes after intubation when compared with the laryngoscope[5]. In a study comparing the hemodynamic changes between both intubation techniques in patients with coronary heart disease, blood pressure and heart rate were lower in patients undergoing lighted stylet intubation, but this difference was not significant[10]. The components of laryngoscopy and intubation contribute increased sympathetic response especially the force exerted during laryngoscopy, the duration of laryngoscopy and the number of attempts for intubation [10,11].

Hirabayashi et al. compared the hemodynamic responses during Trachlight technique and direct laryngoscopy for intubation and found no significant difference in the invasive blood pressure between the groups. They observed that jaw lift maneuvers caused similar response of direct laryngoscopy. The results of our study are similar to their observations of no significant differences in MAP between the groups [7]. Previously there were some studies, some shows no difference in hemodynamic changes during tracheal intubation whereas some studies show marked changes in hemodynamic variables.[13-14]

We found intubation time is higher with lightwand compare to direct laryngoscopy but that is statistically insignificant and there was no significant difference in hemodynamic values of two groups only difference is in heart rate which was higher just after tracheal intubation and after 1 min when intubation was performed using macintosh laryngoscope. In normotensive patients, compared to the use of the Macintosh laryngoscope, an lightwand caused less hemodynamic changes [12] and minimal occurrence of complications such as hoarseness, sore throat and dysphagia. This is because

manipulation of the lightwand causes less glottal stimulation than the Macintosh. There have been reports that injection of fentanyl before intubation decreases hemodynamic changes [2,15].

Nishikawa et al. [14] found that in normotensive patients, intubation with the lightwand took longer than the laryngoscope, but hemodynamic changes after tracheal intubation were less profound. This study revealed different results than previous studies, which suggested that hemodynamic changes after intubation were not affected by different devices. This may be due the lightwand technique does not require a large mouth opening or lifting of the epiglottis [15].

There are some limitations to our study. First, the study choosen the patients with normal blood pressures and airways. Therefore, there may have been differences in intubation time among two groups if patients were difficult to intubate. Also, as shown in Koyama's study [16], normotensive patients and hypertensive patients show variable hemodynamic change. Furthermore, we considered patients in whose intubation time took more than one minute as failures and excluded them from the study. We did not consider the hemodynamic changes in patients requiring either multiple attempts or prolonged intubation time.

CONCLUSION:

From our study, we have concluded that the hemodynamic behavior is almost similar in both groups, but more stable with lightwand group. Patients intubated with laryngoscope with macintosh blade had a higher incidence of postoperative complications as compare to lightwand.

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Conflicts of interest: No.

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