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Research article

HAEMODYNAMIC RESPONSE TO NASOTRACHEAL INTUBATION UNDER GENERAL ANAESTHESIA: COMPARISON BETWEEN FIBEROPTIC BRONCHOSCOPY AND DIRECT LARYNGOSCOPY

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ABSTRACT

Study Objective: To compare haemodynamic response in nasotracheal intubation under general anaesthesia between FOB and DLS as one accomplished with a FOB is thought to attenuate the circulatory responses to intubation as stimulation of the oropharyngeal structures may be avoided. **Design:** Randomized, prospective study. **Patients:** 50 ASA grade I and II patients of both sexes in the age group of 18 - 60 years scheduled for an elective surgery under general anesthesia. **Interventions:** Patients were randomly allocated to nasotracheal intubation facilitated with either the FOB [Group I] or the DLS [Group II]. A uniform protocol of anesthesia was used. **Measurements:** Heart Rate [HR], Systolic Blood Pressure [SBP], Diastolic Blood Pressure [DBP] & Mean Arterial Pressure [MAP] in the two groups were compared at their baseline, post-induction values, at the time of insertion of the scope, immediately after intubation & at 3, 5 and 10 minutes after intubation. **Results:** Haemodynamic response in the form tachycardia, increase in SBP, DBP & MAP occurred in nasotracheal intubations with both the fiberoptic bronchoscope and with direct laryngoscope. Tachycardia of similar magnitude was noted in both the groups following insertion of scope and after intubation whereas SBP, DBP & MAP were significantly high in Group II [$p<0.01$] at the time of intubation & SBP immediately after intubation was significantly high in Group I[$p<0.05$] **Conclusions:** Fiberoptic bronchoscopy provides no advantage over conventional laryngoscopy, in terms of decreasing the hemodynamic response to nasotracheal intubation under general anaesthesia.

Keywords: Nasotracheal intubation, General Anaesthesia, Hemodynamic Responses, Fibreoptic Bronchoscope, Macintosh Direct Laryngoscope, Difficult Intubation.

INTRODUCTION

Alfred Kirstein [1863–1922] first described direct visualization of the vocal cords on 23 April 1895 and fiberoptic assisted tracheal intubation was introduced into anaesthetic

practice by Murphy in 1967 and Taylor & Towey in 1972[1-3]. The popularity of fiberoptic intubation has increased since the introduction of delicate flexible fiberoptic laryngoscopes. However, it remains a skill possessed by a minority of anaesthetists in this country, the principal obstacles to dissemination of competence being the relatively fragile nature of a costly instrument and the difficulties of training. Fiberoptic nasotracheal intubation can avoid the mechanical stimulus to oropharyngolaryngeal structures thereby it is likely to attenuate haemodynamic response.[4]

MATERIALS AND METHOD

After the Institutional Ethics Committee approval, the study was conducted in Rajindra Hospital Patiala in 50 patients of either sex, aged 18 to 60 yrs of ASA grade I and II scheduled to undergone elective surgery under general anaesthesia requiring intubation. A written informed consent was obtained from each patient. The patients were divided in two groups randomly of 25 patients each.

Exclusion criteria: Patient's refusing; those with anticipated difficult airway, obesity, cardiovascular and endocrine diseases, bleeding disorders, history of nasal surgery or trauma, nasal polyp or on drugs known to produce changes in heart rate and blood pressure like beta blockers, digitalis, calcium channel blockers, oral contraceptives were excluded from study.

After a proper pre-anaesthetic checkup and assessing fasting status patients were pre-medicated with inj Glycopyrolate [0.2mg] I.M, inj Midazolam [2mg] + Promethazine [25mg] IM 30 min before the elective surgery. Fifteen minutes before shifting the patient to the OT table, 0.1% Oxymetazoline nasal drops where instilled in both the nasal passages. All patients received tab. Alprazolam 0.25 mg before sleep and 6 am on the day of surgery. After the patient is brought to operation table baseline measurements of heart rate, blood pressure and Spo_2 were taken. Fentanyl in a dose of 1.5µg/kg was administered intravenously 5 minutes before induction. Patients were pre oxygenated with 100% O_2 for 3 minutes.

General anaesthesia was induced with an intravenous injection of Propofol, 2mg/kg and intubation was facilitated with the use of Rocuronium 0.9 mg/kg intravenously. Then patient were ventilated with 100 % oxygen. Intubation was commenced exactly after 90 seconds of giving inj. Rocuronium.

In group I, nasotracheal intubation was carried out with the aid of fiberoptic bronchoscope and in group II with the aid of laryngoscope. A 7.00 mm internal diameter, cuffed endotracheal tube [ETT] was used for female patients and 7.5 mm internal diameter cuffed ETT for male patients.

In group I the ETT lubricated with lignocaine jelly was threaded over the fiberoptic bronchoscope. The fiberoptic bronchoscope was then introduced in the more patent nasal passage and once in nasopharynx, glottis identified and scope then advanced 5 to 7 cm beyond the laryngeal inlet till carina is visible. The ETT was then advanced into the trachea over the scope and fiberoptic bronchoscope removed gently through the endotracheal tube looking for position of ETT.

Similarly in group II, ETT was introduced through the more patent nasal passage. Direct laryngoscopy was performed to visualize the glottis and the endotracheal tube advanced into trachea with the help of Magill's forceps. In both the groups, after introduction of ETT, anaesthesia was maintained with O_2:N_2O:40:60 along with 1% isoflurane. The following parameters were observed: heart rate [HR], systolic blood pressure [SBP], diastolic blood pressure [DBP] and mean arterial blood pressure [MAP]. These parameters were recorded at following time intervals: baseline value, after induction, at the time of insertion of laryngoscope/fiberoptic bronchoscope, immediately after intubation and thereafter at 3, 5 and 10 minutes. ECG and SPO_2 were monitored continuously as per the intervals

mentioned above. The study was terminated at the end of 10 minutes after intubation. However vitals were monitored throughout the surgery. Time of intubation from cessation of mask ventilation to connection of breathing circuit to ETT was noted. And postextubation epistaxis if any noted.

Statistical analysis: Data was analyzed with Graph Pad Prism 6.01 statistical softwares. The male/female distribution & epistaxis between the two groups were compared using fishers exact stastical test. Demographic data, blood pressure, heart rate, time of intubation & Spo_2 were compared between the two groups using unpaired Students t-test.

RESULT

Table.1: Comparison demography, time of intubation, epistaxis & Spo_2

Variables	Group I	Group II	P value
Age [yrs]	36.84 ± 22.28	37.04 ± 21.06	0.9483
Sex [M:F]	9:16	3:22	0.0955
Weight [Kg]	60.2 ± 9.66	59.08 ±13.9	0.5112
Time req for intub.	69.52±37.18	18.2 ± 7.12	<0.0001*
Epistaxis	3[12%]	1[4%]	0.6092
Spo_2	98.72±6.1	99.96±0.4	0.048*

Table.2: Comparison of haemodynamics FOB vs DLS Group.

		Group I	Group II	P value
HR (bpm)	Baseline	83.16±14.7	82.72±16.83	0.84
	Aft. Induct.	77.76±13.7	76.12±13.88	0.40
	At Insertion	88.96±15.85	88.56±21.99	0.88
	Imm. Aft intub.	86.08±15	85.8±20.39	0.91
	3min	83.04±14.58	82.28±13.4	0.70
	5 min	81±14.44	80.52±12.65	0.80
	10 min	79.84±14	79.4±12.62	0.81
SBP (mmHg)	Baseline	122.48±14.24	122.04±14.67	0.83
	Aft. Induct.	108.6±12.87	107.92±19.06	0.76
	At Insertion	127.96±15.05	140±28.67	0.0005*
	Imm. Aft intub.	141.4±16.4	133.16±31.23	0.02*
	3min	121.36±14.54	116.64±21.3	0.07
	5 min	118.8±13.61	114.12±22.8	0.08
	10 min	116.52±13.81	114.36±22.71	0.42
DBP (mmHg)	Baseline	79±13.65	79.6±18.77	0.79
	Aft. Induct.	67.96±11.41	68.16±19.61	0.93
	At Insertion	82.56±14.46	91.96±26.28	0.002*
	Imm. Aft intub.	91.24±16	87.24±24.25	0.17
	3min	78.64±14	75.24±21.8	0.19
	5 min	76.72±13	74.44±19.73	0.33
	10 min	76.6±13.53	75.4±24.8	0.67
MAP(mmHg)	Baseline	93.5±13.5	93.75±15.68	0.90
	Aft. Induct.	81.5±11.5	81.4±16.93	0.96
	At Insertion	97.7±14.28	107.97±24.56	0.0007*
	Imm. Aft intub.	107.96±15.72	102.55±24.69	0.07
	3min	92.88±13.81	89.04±20.53	0.12
	5 min	90.75±12.85	87.67±18.1	0.17
	10 min	89.91±13.3	88.39±22.8	0.56

*Significant (P<0.05), values=Mean±SD

Mean age, weight & M:F were statistically insignificant and so both groups were comparable demographically. Epistaxis was seen in both groups and was statistically insignificant. It depends on proper preparation of patients. Spo2 was continuously monitored during intubation using either technique and it was found that patients maintained 100% saturation during induction, at the time of insertion of FOB/DLS, at 3min, 5min and 10 min in both Groups. In Group I, 4 patients and in group II, 1 patient had lower reading immediately after intubation. Difference was statistically analysed and found to be significant [$p<0.05$]. Mean time for intubation in Group I using FOB was high comparing that with DLS Group II. Difference in intubation time was found to be statistically significant [$p<0.0001$]. There was significant fall of all parameters after induction comparing with baseline [$p<0.0001$] in both groups. Comparing both groups there was no significant difference. At the time of insertion of FOB/DLS there was significant rise of HR, SBP, DBP & MAP.

There was no statistically significant difference of HR between two groups whereas SBP, DBP & MAP were significantly high in Group II [$p<0.01$]. HR remained high even after intubation and returned to baseline value at 3min in both groups. SBP, DBP & MAP further increased after intubation and returned to baseline value at 3min in FOB group while HR, SBP, DBP & MAP remained high after intubation but didn't increase and returned to baseline value at 3min in DLS group. Similarly maximum mean HR was noted at the time of insertion of FOB while maximum mean SBP, DBP & MAP were seen immediately after intubation using FOB in Group I. whereas maximum readings of all parameters were noted at the time of insertion of DLS in Group II. Comparing both groups SBP immediately after intubation was significantly high in Group I [$p<0.05$]. In both groups HR, SBP, DBP and MAP were at baseline level at 3min and there was no statistically significant difference between two groups. In both groups HR, SBP, DBP and MAP was below baseline at 5min and 10min.

DISCUSSION

Flexible fiberoptic intubation of the trachea is now the method of choice when direct laryngoscopy is expected to be difficult. The cardiovascular response to tracheal intubation, although transient, may be harmful to some patients, mainly those with myocardial or cerebrovascular disease. So we have conducted a study to find out whether FOB has some beneficial effect attenuating this hemodynamic effect of intubation. Spo_2 immediately after intubation was low in group I and is due to longer intubation time required for FOB. Difference in intubation time was found to be statistically significant [$p<0.0001$]. Our findings were consistent with most of the studies conducted.[5-11] This difference is because FOB is more technical, requires hand eye coordination and one has to reach till carina using FOB and then guide ETT over it and then withdraw FOB looking for tube position whereas in DLS we have direct vision of vocal cords, and also in FOB the field of view is restricted.[5] At the time of insertion of FOB/DLS there was significant rise of HR, SBP, DBP & MAP. This increase is due to stress response to laryngoscopy/bronchoscopy.[9] There was no statistically significant difference of HR between two groups whereas SBP, DBP & MAP were significantly high in Group II [$p<0.01$]. This finding is not in acceptance with study by Michal Barak, et al. which shows no significant differences this may be due to different route of intubation as they had used oral route for intubating.[9] Our results are consistent with study conducted by J. E. Smith, et al. These differences may arise because of the combined effects of differences in airway stimulation and differences in the duration of laryngoscopy between the two techniques. The fibrescope may produce less mechanical pressure on the tissues of the anterior

pharynx, which may therefore induce less reflex sympathetic activity.[6] SBP, DBP & MAP further increased after intubation and returned to baseline value at 3min in FOB group while HR, SBP, DBP & MAP remained high after intubation but didn't increase and returned to baseline value at 3min in DLS group. Comparing both groups SBP immediately after intubation was significantly high in Group I [$p<0.05$]. This findings are consistent with study conducted by J. E. Smith which shows that the increase in systolic pressure was sustained for a longer period in the fiberoptic group and concluded that the cardiovascular responses associated with fiberoptic intubation under general anaesthesia appear to be more severe.[5] This findings are also consistent with study conducted by J. E. Smith, et al. which shows that highest mean systolic pressure in the fiberoptic group was delayed until the second minute.[6] This findings are also consistent with most other studies.[12,13] This may be due to following reasons:

1. It has been shown that the longer the intubation time the more likely is it to develop hypercapnia, which can result in hypertention and tachycardia.[4] Longer time may tend to produce more sympathetic activity[6]
2. FOB necessitates the lifting of the jaw upward to make a clear passage for the FOB and for the tracheal tube to enter the glottis. Lifting of the jaw upwards itself is sufficient to cause a cardiovascular response similar to those observed in the laryngoscopic intubation.[4,13]
3. The advancement of the tracheal tube over the FOB is often impeded when the Murphy's tip catches on the downward sagging epiglottis, arytenoid cartilage, vocal cords and anterior tracheal wall. On such occasions, the successful intubation often requires some specific maneuvers e.g. rotating the tracheal tube, further lifting jaw upward and adjusting the patient's head-neck position.[4,13]
4. During the fiberoptic intubation, the insertion cord of the FOB must be placed into the trachea for guidance followed by advancing the tracheal tube over the insertion cord into the trachea and then the FOB is removed. This can cause repeated friction and irritation to the trachea.[4]
5. The traction on the tongue which is necessary to clear the airway which itself is a potent stimulus as the Macintosh blade.[5]
6. Tracheal tube insertion itself is most invasive stimuli.[14]
7. Longer intubation time may also cause weaning of anaesthetic effect of inhaled anaesthetic agent, hypoxia & hypercarbia in FOB group and minimal or negligible interruption of inhaled anaesthetic agent in DLS group this drawback was eliminated by using a mask adapter by Makoto Imai, et al. and found that FOB resulted in milder hemodynamic changes compared to conventional laryngoscopy, as they were able to maintain anaesthesia during intubation.[15]

Even though there was significant high haemodynamic response to laryngoscopy compared to bronchoscopy at the time of intubation which may be due to sudden severe stress response to DLS compared to FOB during intubation and also in DLS oropharyngeal structures alongwith nasopharyngeal ones are stimulated, there is no advantage of FOB in attenuating haemodynamic response as there was significant high SBP after intubation and SBP, DBP and MAP remained high for longer time. This has been shown by most of the studies.[4-9, 12,13, 16-19]

CONCLUSION

Fiberoptic bronchoscopy provides no advantage over conventional laryngoscopy, in terms of decreasing the hemodynamic response to nasotracheal intubation under general anaesthesia.

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