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Haemodynamic Response To Fiberoptic Nasotracheal Intubation Under General Anaesthesia

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Abstract

Introduction: 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 hemodynamic effect of intubation using FOB. *Aim and Objectives:* To observe haemodynamic response to nasotracheal intubation under general anaesthesia using fiberoptic bronchoscopy with respect to :Haemodynamic changes during intubation,at the time of & after intubation; Time required for intubation; Saturation; Post extubation epistaxis. *Methodology:* 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 were sleeted for nasotracheal intubation with FOB. A uniform protocol of anesthesia was used. Measurements: Heart Rate [HR], Systolic Blood Pressure [SBP], Diastolic Blood Pressure [DBP] & Mean Arterial Pressure [MAP] were noted 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. *Result:* Haemodynamic response in the form tachycardia, increase in SBP, DBP & MAP occurred in nasotracheal intubations with the fiberoptic bronchoscope. SpO_2 was continuously monitored and patients maintained 100% saturation during induction, at the time of insertion of FOB, at 3min, 5min and 10 min. 8 patients had lower reading immediately after intubation with mean Spo2 of 98.72%. Mean time for intubation using FOB was 69.52 sec. *Conclusion:* Fiberoptic bronchoscope under general anesthesia causes significant increases in blood pressure and heart rate

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

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Introduction

Fiberoptic assisted tracheal intubation was introduced into anaesthetic practice by Murphy in 1967 and Taylor & Towey in 1972.[1,2] Improved techniques have evolved as experience and expertise with fibrescopes have increased, and fiberoptic endoscopy has come to occupy an important place in the management of the difficult intubation. Flexible fiberoptic intubation of the trachea is now

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the method of choice when direct laryngoscopy is expected to be difficult.

Nasotracheal intubation can evoke the nasocardiac reflex, which depresses the tachycardic response.[3] The fiberoptic bronchoscope and tracheal tube passing through the nasal cavity tend to be more aligned with the laryngeal and tracheal axes than when introduced through the mouth because there is no sharp turn between choanae and the laryngeal aperture. Therefore, it is possible that FNI results in less friction and stimuli to the epiglottis, glottis and trachea than FOI.

Fiberoptic intubation under general anesthesia does have some advantages. The patient is not conscious of discomfort and the passage of time, so that neither patient nor operator is embarrassed by incompetence. The incidence of coughing is reduced. Nevertheless there are major disadvantages to using general anesthesia. The patient is no longer able to maintain his own airway, and therefore desaturation can occur. The soft palate, tongue and epiglottis tend to fall against the posterior pharyngeal wall and can be difficult to dislodge so that even if the airway is clear enough for spontaneous or controlled ventilation to occur it may be difficult for the operator to obtain a view of the laryngeal inlet.

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 hemodynamic effect of intubation using FOB.

Aims and objective

To observe haemodynamic response to nasotracheal intubation under general anaesthesia using fiberoptic bronchoscopy in 50 ASA grade I and II patients for elective surgery under general anesthesia requiring endotracheal intubation with respect to

- Haemodynamic changes during intubation.
- Haemodynamic changes at the time of & after intubation.
- Time required for intubation.
- Saturation.
- Post extubation epistaxis.

Materials and Methods

The study was conducted at Rajindra hospital Patiala in 50 patients, aged 18 to 60 yrs of ASA grade I and II scheduled to undergo elective surgery under general anaesthesia requiring intubation.

Inclusion criteria

- ASA I and II
- Age 18 to 60 yrs
- BMI of 30 or less

No diagnosed chronic medical disease

Exclusion criteria

- Patient's refusal
- Patients with an anticipated difficult airway
- Obesity
- Cardiovascular and Endocrine disease
- On drugs known to produce changes in heart rate and blood pressure like beta blockers, digitalis, calcium channel blockers, oral contraceptives.
- Bleeding disorders
- History of nasal surgery or trauma
- Nasal polyp

A written informed consent was obtained from each patient after explaining the technique prior to inclusion in this study in their own vernacular language.

Thorough preanaesthetic checkup was done in every patient and minimum 6 hrs NBM was advised

All patients received inj glycopyrolate (0.2mg) I.V, inj midazolam (2mg) IV + promethazine (25mg) IM 30 min before the elective surgery. Fifteen minutes before shifting the patient to the OT table, in both the nasal passages 0.1% oxymetazoline nasal drops where instilled. All patients received tab. alprazolam 0.25 mg 1 HS and 6 am on the day of surgery.

Method

The study was conducted in 50 patients of either gender aged 18 to 60 years belonging to ASA I and II scheduled for elective 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 1.5 µg/kg were administered intravenously 5 minutes before induction. Patients were preoxygenated with 100% O_2 for 3 minutes. General anesthesia 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. If any difficulty was encountered in performing facemask ventilation after anaesthesia induction, the patient was withdrawn from the study. During the intubation, the patient's head was placed in the sniffing position and a clear airway manouvre was maintained by trained assistants who extended the atlanto-occipital joint and displaced the mandible anteriorly by application of firm pressure behind the ascending rami. Nasotracheal intubation was carried out with the aid of fiberoptic bronchoscope. 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. 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. After introduction of ETT, anesthesia was maintained with O_2:N_2O:40:60 along with 0.8 - 1.5% 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 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. Data was collected, tabulated and analyzed using SPSS software.

Results

The mean age was 36.84 yrs and male to female ratio was 18:32 with mean weight being 60.8 Kg.

SpO_2 was continuously monitored during intubation and it was found that patients maintained 100% saturation during induction, at the time of insertion of FOB, at 3min, 5min and 10 min. 8 patients had lower reading immediately after intubation with mean SpO_2 of 98.72%.

Mean time for intubation using FOB was 69.52 sec.

Epistaxis was seen in 5 of 50 patients i.e.10%

Haemodynamic parameters are tabulated in Table 1 and depicted in Graph 1.

Discussion

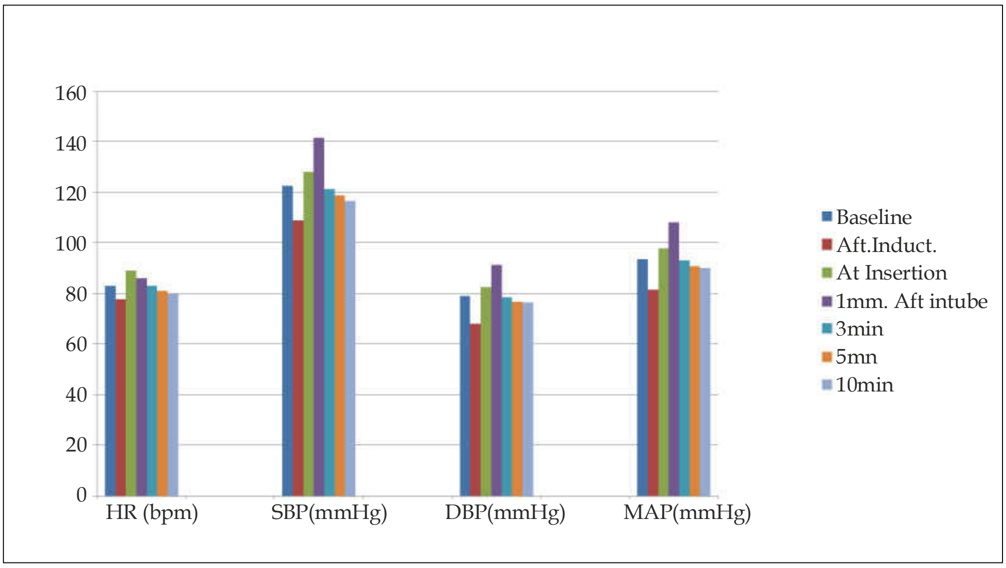
This study has clearly showed that under general anesthesia FNI causes significant increases in blood pressure and heart rate.

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. Time require for FNI was comparable with most of the studies mentioned in Table 2.

There was significant fall of all parameters after induction comparing with baseline (p < 0.0001). This is due to the effect of anaesthetic agents used for induction. This finding is consistent with

Table 1. Haemodynamic changes during FOB intubation

Parameter	Baseline	Aft. Induct.	At Insertion	Imm. Aft intub.	3min	5min	10min
HR (bpm)	83.16 ± 14.7	77.76 ± 13.7	88.96 ± 15.85	86.08 ± 15	83.04 ± 14.58	81 ± 14.44	79.84 ± 14
p value		< 0.0001	< 0.0001	< 0.0001	0.3765	< 0.0001	< 0.0001
SBP(mmHg)	122.48 ± 14.24	108.6 ± 12.87	127.96 ± 15.05	141.4 ± 16.4	121.36 ± 14.54	118.8 ± 13.61	116.52 ± 13.81
p value		< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
DBP(mmHg)	79 ± 13.65	67.96 ± 11.41	82.56 ± 14.46	91.24 ± 16	78.64 ± 14	76.72 ± 13	76.6 ± 13.53
P value		< 0.0001	< 0.0001	< 0.0001	0.0012	< 0.0001	< 0.0001
MAP(mmHg)	93.5 ± 13.5	81.5 ± 11.5	97.7 ± 14.28	107.96 ± 15.72	92.88 ± 13.81	90.75 ± 12.85	89.91 ± 13.3
p value		< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001



Graph 1: Haemodynamic changes during FOB intubation

most of the studies conducted.[4-7,11-23] The addition of fentanyl usually decreases the postintubation hypertension but can increase the propofol-induced preintubation hypotension.[12]

At the time of insertion of FOB there was significant rise of HR, SBP, DBP & MAP. This increase is due to stress response to bronchoscopy.[7]

The fiberoptic nasotracheal intubation can avoid the mechanical stimulus to oropharyngolaryngeal structures thereby it is likely to attenuate haemodynamic response.[18] During orotracheal intubation, the fiberoptic intubation time is approximately three times greater than that required using conventional laryngoscopy; thus, any benefit from reduced pharyngeal stimulation was outweighed by the effects of prolonged intubation. During nasotracheal intubation, the fiberoptic intubation time is only 25% greater than that required using the conventional technique. Study conducted by J.E. Smith, et al.[5] showed that arterial pressure was lower in patients intubated using the fiberoptic laryngoscope as compared to direct laryngoscope, 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.[5] Similar findings were note in other studies like Ali, Liaquat, et al.[24]

Table 2: Time to intubation in various studies

Study conducted by	Time required in sec FNI
J.E. Smith[4]	26.9
J.E. Smith, et al.[5]	37
H.G. Schaefer, et al.[6]	77.2
Michal Barak, et al.[7]	55
Finfer SR, et al.[8]	59.8
Aghdaii N, et al.[9]	39.4
Yushi U. Adachi, et al.[10]	102

HR remained high even after intubation and returned to baseline value at 3min. SBP, DBP & MAP further increased after intubation and returned to baseline value at 3min. Similarly maximum mean HR was noted at the time of insertion of FOB while maximum mean SBP, DBP & MAP were seen immediately after intubation. This finding is because nasotracheal intubation can evoke the nasocardiac reflex, which depresses the tachycardic response to nasotracheal intubation.[3]

These findings are consistent with study conducted by J.E. Smith which shows that the increase in systolic pressure was sustained for a longer period and concluded that the cardiovascular responses associated with fiberoptic intubation under general anaesthesia appear to be severe.[4]

This findings are also consistent with study conducted by J.E. Smith, et al. which shows that highest mean systolic pressure was delayed until the second minute.[5] These findings are also consistent with most other studies.[17,22]

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 hypertension and tachycardia.[18] Longer time may tend to produce more sympathetic activity.[5]
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.[18,22]
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.[18,22]
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.[18]
5. The traction on the tongue which is necessary to clear the airway which itself is a potent stimulus as the Macintosh blade.[4]
6. Tracheal tube insertion itself is most invasive stimuli.[25]
7. Longer intubation time may also cause weaning of anaesthetic effect of inhaled anaesthetic agent, hypoxia & hypercarbia in patients intubated using FOB. 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.[13]

HR, SBP, DBP and MAP were below baseline at 5min and 10min. This is due to effect of anaesthetic agents used for maintainance of anaesthesia. This finding is consistent with most other studies.[6,11,17,18,22] Epistaxis was seen in 10% of patients and was comparable with other stuies.[26]

Conclusion

Fiberoptic bronchoscope under general anesthesia causes significant increases in blood pressure and heart rate.

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