

A Randomized Control Trial Study to Evaluate the Efficacy of High Flow Nasal Cannula during Fibre Optic Intubation under General Anesthesia

Abhishek Tiwari¹

ABSTRACT

Introduction: To evaluate the efficacy of high flow nasal cannula during fibre optic intubation under general anesthesia in a randomized control trial.

Material and methods: This was a randomized controlled trial. Patients of Group A received conventional fibreoptic intubation after muscle relaxation and patients of Group B received with high flow nasal cannula during fibreoptic intubation after muscle relaxation. After taking 18G intravenous access in preoperative room and pre medicating patients with inj midazolam 0.05 mg/kg iv, Xylometazoline 0.01% nasal drop was instilled in each nostril. After ventilating patient for 3 min in Group A, fibreoptic oral intubation was done. In Group B patients, all the above steps was followed along with institution of HFNC with flow rate @ 60 l/min after ventilating for 3 minutes and thereafter fibreoptic oral intubation was done.

Results: The mean age of patients of Group A and Group B was 41.16±9.44 and 41.44±10.68 years respectively. Forty four percent patients of Group A and 48% of Group B were males. More than half of patients of Group A and 44% of Group B had ASA grade I. The mean BMI of Group A and Group B was 27.42±2.51 and 28.70±2.65 kg/m². There was no significant (p>0.05) difference in basic profile of patients between the groups. Inter-incisor gap and hyomental distance were insignificantly (p>0.05) lower in Group A than Group B. However, thyromental distance and time of intubation were insignificantly (p>0.05) higher among patients of Group A compared to Group B. There was no significant (p>0.05) difference in hemodynamic parameters between the groups at all the time periods.

Conclusion: The study found that both the groups were similar in terms of all the parameters studied. The study concluded that high flow nasal cannula prevents desaturation and makes passing of ET tube over fibroscope easy, so, it must be used.

Keywords: Fibre optic, Hyomental distance, Thyromental distance

reserve. Current preoxygenation guidelines suggest that performing 8 vital capacities or 3 minutes of spontaneous breathing with a standard face mask, at FiO₂=100% in order to achieve EtO₂ of >90%.^{1,2}

To decrease the desaturation during anticipated DI, 2 choices for airway management are: i. rapid sequence intubation (RSI); ii. awake fibreoptic intubation (FOI).^{3,4}

RSI comprises the preoxygenation with a standard face mask, the administration of hypnotic as well as neuromuscular blocker with rapid onsets and immediate intubation after mask removal without manual ventilation. The goals RSI are at (1) minimising the time from induction to intubation to decrease the risk of oxygen desaturation; (2) guaranteeing a fast retrieval of spontaneous breathing when intubation proves impossible with difficult face mask ventilation.

High-flow oxygenation by nasal cannulae (HFNC) had been studied in the intensive care unit (ICU) as well as in the operating room as a preoxygenation device with controversial findings. The observational studies had advocated the ability of HFNC to extend safe apnoea time during DI and to be held during FOI. This device may deliver up to 60L/min with an inspired fraction of oxygen of up to 100% and generate a moderate positive supraglottic end expiratory pressure.^{5,6}

The present study was designed to evaluate the efficacy of high flow nasal cannula during fibre optic intubation under general anesthesia in a randomized control trial.

MATERIAL AND METHODS

This was a randomized controlled trial conducted in the Department of Anesthesia, Integral Institute of Medical Sciences, Lucknow. The study was approved by the Ethical Committee of the Institute and consent was taken from each participant. A total of 25 patients in each group of age 18-65 years were included in the study with ASA grade I and II. Patients with known airway pathology, morbid obesity

¹Assistant Professor, Department of Anaesthesiology, Integral Institute of Medical Sciences and Research, Kursi Road, Lucknow, India

Corresponding author: Dr Abhishek Tiwari, Assistant Professor, Department of Anaesthesiology, Integral Institute of Medical Sciences and Research, Kursi Road, Lucknow, India

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and pregnancy were excluded from the study. Patients were randomized into 2 groups by using computer generated random tables. Patients of Group A received conventional fiberoptic intubation after muscle relaxation and patients of Group B received with high flow nasal cannula during fiberoptic intubation after muscle relaxation.

After taking 18G intravenous access in preoperative room and pre medicating patients with inj midazolam 0.05 mg/kg iv, Xylometazoline 0.01% nasal drop was instilled in each nostril. Patients were taken into operating room and standard monitors were attached. After giving iv fentanyl 2 mcg/kg and preoxygenating with O₂ @ 10 l/min, anesthesia was induced with iv propofol 2-2.5 mg/kg. After loss of verbal command and confirmation of ability to ventilate, inj Vecuronium 0.1 mg/kg was given to facilitate tracheal intubation. After ventilating patient for 3 min in Group A, fiberoptic oral intubation was done. In Group B patients, all the above steps was followed along with institution of HFNC with flow rate @ 60 l/min after ventilating for 3 minutes and thereafter fiberoptic oral intubation was done.

STATISTICAL ANALYSIS

All the analysis was carried out on SPSS 16.0 version (Chicago, Inc., USA). The results are presented in frequencies, percentages and mean±SD. The Chi-square test was used to compare categorical variables between the groups. The Unpaired t-test was used to compare continuous variables between the groups. The p-value<0.05 was considered significant.

RESULTS

The mean age of patients of Group A and Group B was 41.16±9.44 and 41.44±10.68 years respectively. Forty four

percent patients of Group A and 48% of Group B were males. More than half of patients of Group A and 44% of Group B had ASA grade I. The mean BMI of Group A and Group B was 27.42±2.51 and 28.70±2.65 kg/mtr². There was no significant (p>0.05) difference in basic profile of patients between the groups (Table-1).

Inter-incisor gap and hyomental distance were insignificantly (p>0.05) lower in Group A than Group B. However, thyromental distance and time of intubation were insignificantly (p>0.05) higher among patients of Group A compared to Group B (Table-2).

There was no significant (p>0.05) difference in hemodynamic parameters between the groups at all the time periods (Fig. 1).

DISCUSSION

The usage of sedative agents leads to the unbroken probability of hypoventilation and inducing apnoea. In addition, among those patients with pathology related chronically obstructed

Basic profile	Group A (n=25)	Group B (n=25)	p value
Age in years, mean±SD	41.16±9.44	41.44±10.68	0.92
Male gender, no., (%)	11 (44.0)	12 (48.0)	0.77
ASA grade I, no., (%)	13 (52.0)	11 (44.0)	0.57
BMI kg/mtr ² , mean±SD	27.42±2.51	28.70±2.65	0.08

Table-1: Basic profile of patients between the groups

Study parameters	Group A (n=25)	Group B (n=25)	p value
Inter-incisor gap	5.08±0.31	5.22±0.35	0.13
Hyomental distance	5.76±0.50	5.77±0.42	0.97
Thyromental distance	6.44±0.50	6.40±0.20	0.59
Time of intubation	107.88±5.82	107.48±5.26	0.80

Table-2: Comparison of study parameters between the groups

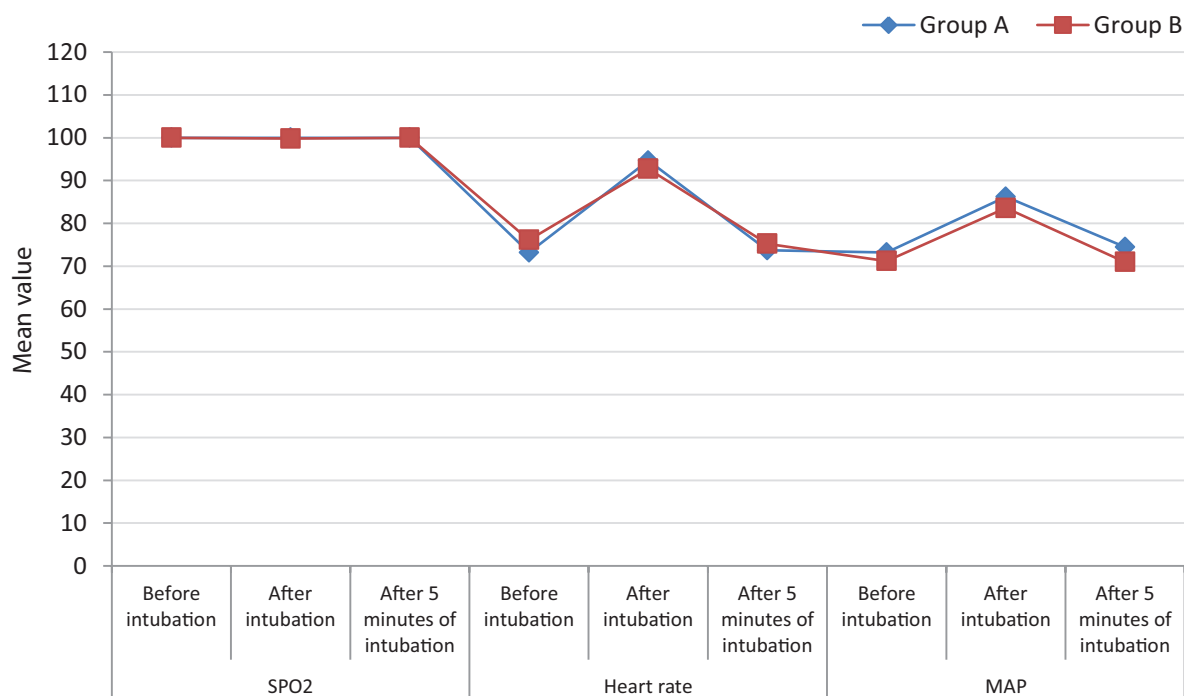


Figure-1: Comparison of hemodynamic parameters between the groups

upper airways who become apnoeic, the rate of desaturation will be greater. It is due to that they can have a lower initial alveolar O₂ tension as well as a higher work of breathing. Additionally, the application of lidocaine to the upper airway had been shown to decrease the dynamic inspiratory airflow and there had been many case reports connecting total airways obstruction with the local anaesthetic topicalization alone.⁷

HFNC was evaluated in the paediatric population for the treatment of respiratory distress. In the past years, there had been increasing interest around the use of HFNC among adult population. HFNC was utilised as an alternative method of oxygen supplementation in different clinical settings. The reviews narrated the physiological benefits of HFNC as well as with its latent applications and clinical evidence surrounding it.^{8,9}

In this study, there was increase in heart rate, SBP, DBP, MAP in both the groups during intubation and return to pre intubation level within 5 min, after intubation. Increase in heart rate, SBP, DBP, MAP was higher in group A but was not significant ($p > 0.05$). During fiberoptic intubation, there is stress response in patient due to which there is increase in heart rate. In a study by Jakusenko et al in 2008 observed haemodynamic changes in fiberoptic intubation and observed that haemodynamic changes disappeared just in 5 minutes. This haemodynamic response is due to stress and it is very fast and the effect is lost very quickly.¹⁰

In this study, in both group and in all patients, used bite blocker in oral cavity to facilitate passage of fiberoptic bronchoscope in oral cavity. Because of bite block, this study did not use lingual traction as manoeuvre to clear the airway passage. HFNC deliver an increased FIO₂ due to the higher flow rates are capable for matching or exceeding the patient's peak inspiratory flow, preventing room air entrainment. Naso and oropharyngeal dead space is washed out with oxygen rich gas and performs as a reservoir. Flows of 35 litres min⁻¹ with mouth closure had been reported to generate the positive expiratory nasopharynx pressures of up to 5.3 cm H₂O. At flow rates of 70 litres min⁻¹, it is the only existing technique to deliver 100% FIO₂ continuously throughout an oral or nasal awake fiberoptic intubation. The humidification of the gases counteracting the drying effect of high flow had been reported to lead to superior patient comfort and higher tolerance than with conventional methods as well as to help with mucociliary clearance.^{5,11}

These features advise that HFNC can be particularly useful in delivering oxygen during respiratory or anaesthetic procedures. During bronchoscopy and in sedated patients undergoing dental procedures, the use of humidified transnasal oxygenation had yielded a higher SpO₂ and oxygenation characteristics than with conventionally used nasal cannulae or venturi masks.^{12,13} In a large randomised controlled trial conducted by Jones et al found that HFNC did not confer benefit in terms of intubation as well as duration of hospital stay.¹⁴ However, a subsequent meta-analysis advocated that HFNC improved comfort and dyspnoea scores with reduced intubation rate.¹⁵

CONCLUSION

The study found that both the groups were similar in terms of all the parameters studied. The study concluded that high flow nasal cannula prevents desaturation and makes passing of ET tube over fibroscope easy, so, it must be used.

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