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Fiber Optic Nasal Endotracheal Intubation in Maxillofacial Surgeries: An Analysis of Circulatory Response

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Abstract

Purpose: The purpose of the study was to check the hemodynamic response of fiber optic nasal intubation during maxillofacial surgeries. **Material and methods:** After taking approval of the hospital ethical committee on research, 30 consenting adult patients, of either sex, of ASA physical status 1 and 2, in the age group of 18-60 years coming for oropharyngeal and maxillofacial surgery were included in the study. After induction of general anaesthesia patients were intubated nasally by flexible fiber optic intubation technique. **Results:** When heart rate and mean arterial pressure were compared before and after intubation, significant increase in heart rate and mean arterial pressure were observed. **Conclusion:** From this study it was concluded that fiber optic nasal intubation can cause significant change in hemodynamic parameters.

Keywords: Endotracheal intubation, Fiber optic intubation, Heart rate, Mean arterial pressure.

INTRODUCTION

Nasal intubation is indicated in conditions when oral route is not possible for example in cases with limited mouth opening and tumors of tongue or oropharynx or when the need for surgical access precludes an oral airway.[1] Flexible fiber optic intubation remains the gold standard for difficult airway. Fiber optic bronchoscope was introduced into anaesthetic practice in 1967 by Murphy and was revolutionized in anaesthetic management of difficult airway by Taylor and Towey in 1972.[2,3] Laryngoscopy and tracheal intubation is a noxious stimulus which results in cardiovascular response in the form of hypertension, tachycardia and arrhythmias due to sympathetic stimulation.[4,5] With fiber optic intubation, mechanical stimulation of oropharyngeal structures is avoided and thereby likely to attenuate hemodynamic response. So the present study was designed to analyze the intubation response with nasal flexible fiber optic technique.

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MATERIALS AND METHOD

Thirty patients belonging to ASA physical status 1 and 2 in the age group of 18-60 years of either sex planned for oral and maxillofacial surgery were included in this randomized controlled study which was approved by the ethical committee of the institution. Patients with bleeding disorders, cardiac or respiratory diseases, or with anticipated difficult airway were excluded from the study. All patients were premedicated with tablet alprazolam 0.25 mg at bedtime and two hours before surgery. Baseline mean blood pressure and heart rate were recorded. Two drops of xylometazoline were applied in each nostril 15 minutes and 5 minutes before the anaesthesia induction. Injection glycopyrrolate 0.2 mg intravenously was given to every patient 15 minutes before anaesthesia induction. After preoxygenation, induction of anaesthesia was done with intravenous Fentanyl 2 micrograms/kg and intravenous Propofol 2mg/kg body weight. Injection Atracurium 0.5mg/kg body weight was used to achieve muscle relaxation followed by intermittent positive pressure ventilation. Injection Propofol 20 mg was administered after 2 minutes. After 4 minutes of intermittent positive pressure ventilation i.e. just before the start of intubation, heart rate and mean blood pressure were recorded (0 minute). Endotracheal tube size, with internal diameters of 7 mm and 7.5 mm were used in female and male patients, respectively. After lubrication with water based sterile gel, endotracheal intubation was performed nasally with the help of fiber optic bronchoscope. Heart rate and mean blood pressure were recorded at 1 minute after tube insertion and thereafter at 3 minutes, 5 minutes and 10 minutes after intubation. The heart rate and mean arterial pressure (MAP) were compared at 0 minute i.e. just before the start of intubation procedure to that of 1, 3, 5 and 10 minutes after intubation to check the hemodynamic response due to intubation. Any complications during and after the procedure and time taken for intubation were also recorded.

RESULTS

Heart rate at 1 minute, 3 minute, 5 minute and 10 minutes after intubation were compared with the heart rate at 0 minute (just before the start of intubation procedure). Significant increase in heart rate after intubation was observed. This increase remained significant for 3 minutes after intubation, p-value <0.05. On comparing heart rate at different intervals, maximum heart rate was noted at 1 minute after intubation. (Table 1)

Table 1: Comparison of Heart Rate

Heart rate	0 min	1 min	3 min	5 min	10 min
Mean	83.33	104.23	93.53	90.13	83.37
sd	14.95	18.91	16.25	14.52	15.64
p value	-	P<0.0001	0.0141	0.0791	0.9920
Results	-	Significant	Significant	Not Significant	Not Significant

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Mean arterial pressure at 1 minute, 3 minute, 5 minute and 10 minutes after intubation were compared with the mean arterial pressure at 0 minute (just before the start of intubation procedure).Post intubation mean arterial pressure was compared with post induction mean arterial pressure (0 minute) and it was observed that there was significant increase in mean arterial pressure after intubation and this increase in mean arterial pressure remained significant for 3 minutes. When compared with 0 minute, p-value at 1 minute was <0.0001 and at 3 minute, p- value was 0.0003. (Table 2)

Table 2: Comparison of mean arterial pressure (MAP)

MAP	0 min	1 min	3 min	5 min	10 min
Mean	80.83	116.07	93.43	82.87	82.23
SD	13.69	17.83	11.83	12.13	9.72
p value	-	P<0.0001	0.0003	0.5437	0.6496
Results	-	Significant	Significant	Not Significant	Not Significant

Complications observed:
One patient had both pain in nose and sore throat, one patient had both epistaxis and pain in nose, one patient had only pain in nose and 7 patients had only sore throat. One patient had an episode of epistaxis.

DISCUSSION

Conventional direct laryngoscopy requires wide mouth opening, cervical flexion and extension at atlantooccipital joint. This positioning is impossible or contraindicated in certain conditions. Also, in patients with anatomical variations in airways, direct laryngoscopy cannot be achieved, despite optimum positioning and technique. In these situations indirect laryngoscopy is a good alternative to direct laryngoscopy.[2] In indirect laryngoscopy, indirect visualization of glottis is done with the help of optical aids, such as fiber optic bundles, video cameras, mirrors or lenses. The devices using indirect laryngoscopy are available, which includes video laryngoscopes, fiber optic scopes and intubating optical stylets.

The flexible fiber optic bronchoscope is the most widely used, versatile, indirect laryngoscopy device in patients with difficult airway. It was first introduced in anaesthetic practice by Murphy in 1967.[2,3] Fiber optic bronchoscopes are currently used to facilitate endotracheal intubation via either the nasal or oral route, in the positioning of endotracheal and endobronchial tubes and bronchial blocking devices, and in airway examination or evaluation.[6,7]

The need for fiber optic intubation may be anticipated based on a history of difficult intubation and various anatomical features that may predict difficult laryngoscopy. These include limited mouth opening, limited thyromental distance, restricted neck mobility, inability or limited jaw protrusion, oropharyngeal abnormalities, and obesity. Fiber optic intubation may also be indicated in patients with known or suspected cervical spine instability, anatomic malformations of the mandible or larynx, congenital deformities of the head and neck, and history of head, neck, and spine trauma.[7] Flexible scope intubation is

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the gold standard for the management of difficult airway in awake, spontaneously ventilating patient.[3] Fiber optic bronchoscope enables both oral and nasal intubation. Nasal intubation is particularly indicated in patients when the orotracheal route is not possible or for better surgical access (in oropharygeal surgeries). Also, certain intubation techniques e.g. awake intubation, blind intubation and fiber optic intubation are significantly easier when performed through nose.[8]

Laryngoscopy and passage of endotracheal tube through the larynx is a noxious stimulus which can provoke unwanted response in cardiovascular, respiratory and other physiological systems.[4] This cardiovascular response is demonstrated by hypertension, tachycardia, increase in intracranial tension and arrhythmias and the magnitude of which is related to force applied and duration of laryngoscopy.[9,10,11] This response is attributed to the mechanical stimulation of upper respiratory tract resulting in enhanced neuronal activity in cervical sympathetic efferent fibers causing reflex cardiovascular responses.[5] Fiber optic bronchoscopy was earlier hypothesized to be minimally invasive procedure but later shown to have significant stress response.[12]

This present study showed the change in hemodynamic parameters after fiber optic nasal intubation. In this study significant increase in heart rate was observed after intubation and this increase in heart rate remained significant for 3 minutes. When mean arterial pressures were compared with post induction values, there was significant increase in mean arterial pressure, and it remained significantly elevated for 3 minutes.

Omprakash et al,[13] conducted similar study in patients between 18-50 years of age of ASA grade I and II of either sex undergoing elective surgical procedures. They observed that tracheal intubation caused significant increase in mean heart rate and mean arterial pressure compared with baseline and post induction values.

Smith et al,[14] studied heart rate and arterial pressure changes during nasotracheal intubation in ASA class 1 patients aged between 16 and 48 years who required elective nasotracheal intubation for oral surgery under general anaesthesia. There was significant increase in mean heart rate and mean arterial pressure after tracheal intubation compared to pre-induction values.

Tushar et al,[15] observed significant hemodynamic response in nasotracheal intubation under general anaesthesia after fiber optic bronchoscopy in ASA grade I and II patients scheduled for an elective surgery under general anesthesia.

Tsubaki et al,[16] studied blood pressure, heart rate and catecholamine response during fiber optic nasotracheal intubation under general anesthesia. Arterial blood pressure and heart rate were recorded at one-minute intervals during several stages of intubation by fibrescope. They found significant increase in heart rate and blood pressure when compared to their post induction values.

Staender et al,[17] observed hemodynamic response to fiber optic nasotracheal intubation under total intravenous anaesthesia and found significant hemodynamic response.

Xue et al,[18] conducted a study on anaesthetized children to observe circulatory

responses to fiber optic nasal intubation and found that fiber optic nasal intubation caused significant increases in arterial blood pressure and heart rate compared with the baseline and postinduction values. All these results correspond to the present study. When complications following intubation were observed, it was found that 10 patients showed some complications like sore throat and pain in nasal cavity after intubation procedure. One patient had an episode of epistaxis.

In this study, fiber optic intubation procedure was completed in 79.5 ± 30.80 seconds (mean). In the study done by Xue et al,[19] the intubation time was (52.3 ± 6.2 seconds). In the study conducted by Smith et al,[14] mean intubation time for fiber optic nasal intubation was 37 seconds, while in study done by Omprakash et al,[13] the mean length of time (in seconds) for successful nasotracheal intubation was 61.78 ± 3.683 (range 62 to 68). The intubation time was longer in the present study which can be due to difference in expertise to perform fiber optic nasal intubation. From this study it was concluded that fiber optic nasal intubation can evoke significant circulatory response.

REFERENCES

1. Rajan S, Kadapamannil D, Barua K, Tosh P, Paul J, Kumar L. Ease of intubation and hemodynamic responses to nasotracheal intubation using C-MAC videolaryngoscope with D blade: A comparison with use of traditional Macintosh laryngoscope. J Anaesthesiol Clin Pharmacol. 2018;34(3):381-385. doi: 10.4103/joacp.JOACP_296_17.
2. Wong J, Lee JSE, Wong TGL, Iqbal R, Wong P. Fibreoptic intubation in airway management: a review article. Singapore Med J. 2019;60(3):110-118. doi:10.11622/smedj.2018081
3. Moore A, Schricker T. Awake videolaryngoscopy versus fiberoptic bronchoscopy. Curr Opin Anaesthesiol. 2019;32(6):764-768. doi: 10.1097/ACO.0000000000000771.
4. Kanchi M, Nair HC, Banakal S, Murthy K, Murugesan C. Haemodynamic response to endotracheal intubation in coronary artery disease: Direct versus video laryngoscopy. Indian J Anaesth. 2011;55(3):260-5. doi: 10.4103/0019-5049.82673.
5. Tomori Z, Widdicombe JG. Muscular, bronchomotor and cardiovascular reflexes elicited by mechanical stimulation of the respiratory tract. J Physiol. 1969;200(1):25-49. doi: 10.1113/jphysiol.1969.sp008680.
6. Henderson J. Airway management. In Miller RD, editor: Miller's Anaesthesia, ed 7, Philadelphia, 2010, Churchill Livingstone, p1573.
7. Matek J, Kolek F, Klementova O, Michalek P, Vymazal T. Optical Devices in Tracheal Intubation-State of the Art in 2020. Diagnostics (Basel). 2021;11(3):575. doi:10.3390/diagnostics11030575
8. Wong J, Lee JSE, Wong TGL, Iqbal R, Wong P. Fibreoptic intubation in airway management: a review article. Singapore Med J. 2019;60(3):110-118. doi:10.11622/smedj.2018081
9. Wycoff CC. Endotracheal intubation: effects on blood pressure and pulse rate. Anesthesiology. 1960;21:153-8.
10. Burstein CL, Lopinto FJ, Newman W. Electrocardiographic studies during endotracheal intubation. I. Effects during usual routine technics. Anesthesiology. 1950;11(2):224-37. doi: 10.1097/00000542-195003000-00011.
11. Bucx MJ, Scheck PA, Van Geel RT, Den Ouden AH, Niesing R. Measurement of forces during laryngoscopy. Anaesthesia. 1992;47(4):348-51. doi: 10.1111/j.1365-2044.1992.tb02180.x.
12. Adachi YU, Takamatsu I, Watanabe K, Uchihashi Y, Higuchi H, Satoh T. Evaluation of the cardiovascular responses to fiberoptic orotracheal intubation with television monitoring: comparison with conventional direct laryngoscopy. J Clin Anesth. 2000;12(7):503-8. doi: 10.1016/s0952-8180(00)00196-3.

13. Sundrani O, Lalwani J, Sahare K, Lakra M. Haemodynamic Changes During Nasotracheal Intubation: A Comparision Between Direct Laryngoscopic and Fibreoptic Technique. J Evol Med Dent Sci. 2015;41(4): 7114-21. http://dx.doi.org/10.14260/jemds/2015/1035.
14. Smith JE, Mackenzie AA, Sanghera SS, Scott-Knight VC. Cardiovascular effects of fibrescope-guided nasotracheal intubation. Anaesthesia. 1989;44(11):907-10. doi: 10.1111/j.1365-2044.1989.tb09145.x.
15. Bhavar T, Punia T, Bhupat I, Babrah H, Bagri B, Singla A. Haemodynamic response to nasotracheal intubation under general anaesthesia: Comparison between fiberoptic bronchoscopy and direct laryngoscopy. Int J Med Res Health Sci. 2013;2(4): 833-839. DOI:10.5958/j.2319-5886.2.4.133
16. Tsubaki T, Aono K, Nakajima T, Shigematsu A. Blood pressure, heart rate and catecholamine response during fiberoptic nasotracheal intubation under general anesthesia. J Anesth. 1992;6(4):474-9. doi: 10.1007/s0054020060474.
17. Staender S, Marsch SC, Schumacher P, Schaefer HG. Haemodynamic response to fibreoptic versus laryngoscopic nasotracheal intubation under total intravenous anaesthesia. Eur J Anaesthesiol. 1994;11(3):175-9.
18. Xue FS, Li CW, Liu KP, Sun HT, Zhang GH, Xu YC. Circulatory Responses to Fiberoptic Intubation in Anesthetized Children: A Comparison of Oral and Nasal Routes. Anesth Analg, 2007;104(2):283–288. https://doi.org/10.1213/01.ane.0000253032.09962.e5.
19. Xue FS, Zhang GH, Sun HY, Li CW, Li P, Sun HT, Liu KP, Xu YC, Liu Y. Blood pressure and heart rate changes during intubation: a comparison of direct laryngoscopy and a fibreoptic method. Anaesthesia. 2006;61(5):444-8. doi: 10.1111/j.1365-2044.2006.04584.x.

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