Original Article

A comparative study between pre-oxygenation through face mask and transnasal humidified rapid-insufflation ventilatory exchange

Nidhi Kumari Deswal[1], Neeharika Arora[2], Divya Vijay[3], Kansoo Ram[3], Gulwatan Singh Kang[1]

[1]Junior Resident, [2]Professor, [3]Assistant Professor, Department of Anaesthesia, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh, India

Corresponding Author:
Dr. Nidhi Kumari Deswal,
Department of Anaesthesia,
Rohilkhand Medical College
and Hospital, Bareilly,
Uttar Pradesh, India.
E-mail: nidhisinghdeswal@gmail.com

Received: 11-08-2022
Accepted: 29-08-2022

How to cite this article:
Deswal NK, Arora N, Vijay D, Ram K, Kang GS. A comparative study between pre-oxygenation through face mask and transnasal humidified rapid-insufflation ventilatory exchange. Int J Adv Integ Med Sci 2022;7(3):1-4.

Source of Support: Nil,
Conflicts of Interest: None declared.

Introduction: Airway management is assessment, planning, and choosing of medical procedures and devices for the purpose of maintaining ventilation in a patient. We conducted a study to compare the preoxygenation by traditional facemask and transnasal humidified rapid insufflations ventilatory exchange in patients posted for elective surgery under general anesthesia. **Materials and Methods:** Comparative study was done on 80 patients of the age group of 18–60 years of ASA Grade I and II undergoing elective surgery under general anesthesia. Twenty patients were pre-oxygenated by facemask before induction and the rest 20 with transnasal humidified rapid insufflation ventilatory exchange. **Results:** The proportion of patients who desaturated below the predetermined limit of 93% differed between the groups, but we could not find any differences in the primary result.

KEY WORDS: Airway management, apneic desaturation time, facemask preoxygenation, high flow nasal cannula, trans-nasal humidified rapid insufflation ventilatory exchange

INTRODUCTION

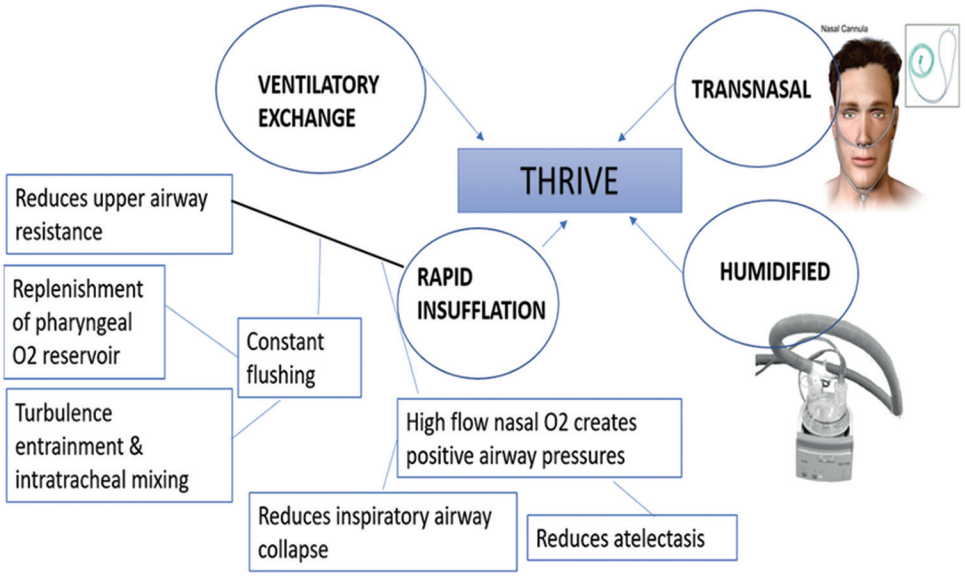
Pre-oxygenation increases the body oxygen stores and thereby delays the onset of arterial hemoglobin desaturation during apnea. Maneuvers include elevation of head; apneic diffusion oxygenation, CPAP and PEEP, BiPAP, and transnasal humidified rapid insufflation ventilatory exchange (THRIVE). Apneic oxygenation seeks to keep the patient's blood oxygenated even when they are not making an effort to breathe. The method, which uses a nasal cannula to deliver high-flow oxygen to the nasopharynx, was initially described in 1959.

Access this article online	
Website: www.ijaims.in	**Quick Response code**

The introduction and clinical implementation of THRIVE have enormously changed the management of airway. High flow nasal oxygenation was into practice over a decade in critical care for patient of acute hypoxemic respiratory failure. THRIVE is a version of HFN oxygenation which uses very high flow up to 70 L/min humidified nasal oxygen and tremendously extend the safe apnea time. THRIVE refers to a continuous constant oxygen concentration, temperature and humidity with high flow inhalation through a nasal high flow oxygen inhalation device. We conducted this study where we used THRIVE technique for pre-oxygenation in ASA I and II grade patients posted for elective surgery.

MATERIALS AND METHODS

The trial was conducted in Rohilkhand medical college and hospital on 80 adult patients 18–60 years of age, with ASA status I and II who were posted for elective surgery under general anesthesia after obtaining written informed consent[1]



during pre-operative anesthetic evaluation. The exclusion criteria included: (1) Coagulation disorders, (2) congestive heart failure, (3) severe aortic stenosis or mitral stenosis,[2] (4) history of cardiac surgery, (5) chronic obstructive pulmonary disease or any lung disease requiring supplemental oxygen therapy,[3] (6) raised intracranial pressure, (7) fever, (8) emergency cases, and (9) anticipated difficult airway.

All patients were attached with standard monitors – ECG, pulse-oximeter, non-invasive blood pressure, and temperature probe.

Patient were put into supine position with 20° had elevation. Intravenous line (wide bore) secured and intravenous fluids were started. Peripheral oxygen saturation and end tidal carbon dioxide ($EtCO_2$) were 1st recorded while patient was still breathing room air. A tight sealing face mask on room air was used for measurement of $EtCO_2$ on RA before initiation of pre-oxygenation.

Premedication was done with Injection Glycopyrrolate 0.005 mg/kg, Injection Midazolam 0.01 mg/kg, and Injection Butorphanol 0.02 mg/kg.

Pre-oxygenation with either mode was done for a minimum of 3 min.

Facemask – 100% O_2 with fresh gas flow of 10 L/min through facemask through circle system

THRIVE – Humidified, preheated 100% O_2 @30 L/min via nasal cannula

Flow increased to 40 L/min at apnea and nasal cannula left *in situ* through the entire procedure for intubation. Induction of anesthesia was performed as per the clinical practice with drugs of choice and titration done by the anesthetist in-charge. Laryngoscopy was started after neuromuscular blockade onset of action.

Apnea time was noted from the start of apnea assessed visually until 1st breath with tracheal tube in place verified by $EtCO_2$

Intubation time was noted from start of laryngoscopy; blade 1st introduced between teeth till 1st breath with tracheal tube *in situ*, verified by $EtCO_2$.

Lowest SPO_2 recorded from the start of induction until 1 min after intubation. If proceeded, the THRIVE maneuver was switched to rescue maneuver. For evaluating the comfort of the two maneuvers for the patients, VAS scale was used post op.

RESULTS

Sample size of 80 patients.

Characteristics of 80 patients pre O_2 with face mask or thrive for induction of G.A for elective cases

Parameter	Facemask	THRIVE
Age	50.8	52.8
BMI	25	24.6
Smoker	5	10

THRIVE: Trans-nasal humidified rapid insufflation ventilatory exchange

Airway characteristics an intubation condition

Characteristics	Facemask	THRIVE
MPG I	20	10
MPG II	19	20
MPG III	01	02
MPG IV	-	-

THRIVE: Transnasal humidified rapid insufflation ventilatory exchange

Thyromental distance	Facemask	THRIVE
>7 cm	26	28
6–7 cm	13	10
<6	01	02

THRIVE: Transnasal humidified rapid insufflation ventilatory exchange

Mouth opening	Facemask	THRIVE
>3 Fs	38	37
2.5–03 Fs	02	03
<2 Fs	00	00

THRIVE: Transnasal humidified rapid insufflation ventilatory exchange

	Facemask	THRIVE
Intubation time (seconds)	48	50
Apnea time (seconds)	98	146

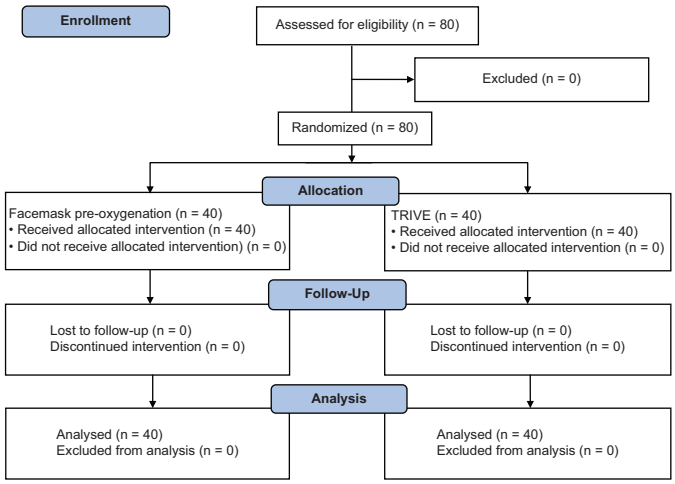
THRIVE: Transnasal humidified rapid insufflation ventilatory exchange

Mean lowest SPO_2 observe during the procedure of intubation was 98% for facemask group and 99% for THRIVE group.

Five patients in Group 1 desaturated below 93% versus none in THRIVE group. Furthermore, to be noted none of the THRIVE group, patients desaturated below 96% at any point of induction.

DISCUSSION

In our study, we observed significantly lower incident of desaturation below 93% in patient group pre-O_2 with THRIVE.



Hence, it is an effective way to prevent hypoxia during apnea period even in difficult intubation.

The THRIVE method, which showed that anaesthetized patients may be oxygenated for an extended period of time despite apnea, further refined the benefits of oxygen supplied with nasal prongs or a pharyngeal catheter during intubation at flows varied from 3 to 15 L/min.[4]

Although there was no difference in the primary outcome, which was measured as SpO_2, there was a difference between the groups in the percentage of patients whose saturation fell below the predetermined limit of 93%. This suggests that THRIVE might provide better pre-oxygenation conditions than the conventional facemask.

It has been demonstrated that apneic oxygenation with THRIVE results in a slower rise in arterial CO_2 over time, indicating that it offers partial CO_2 washout.

The fact that THRIVE increases the safety of both awake tracheostomies and awake fiberoptic intubation by improving topicalization, reducing work-of-breathing, generating positive pharyngeal and distal airway pressures, and enhancing the safety of conscious sedation in awake tracheostomies is one of the study's limitations.

It does not take the place of effective airway management and planning, and it may not be able to extend the apnea period as expected, which might result in desaturation, especially in individuals who have morbid obesity and when total airway obstruction develops.

We advocate that a secondary plan for oxygenation should always be available.

ACKNOWLEDGMENTS

Nil.

REFERENCES

1. Patel A, Nouraei SR. Transnasal humidified rapid-insufflation ventilatory exchange (THRIVE): A physiological method of increasing apnoea time in patients with difficult airways. Anaesthesia 2015;70:323-9.
2. Gustafsson IM, Lodenius Å, Tunelli J, Ullman J, Fagerlund MJ. Apnoeic oxygenation in adults under general anaesthesia using transnasal humidified rapid-insufflation ventilatory exchange (THRIVE)-a physiological study. Br J Anaesth 2017;118:610-7.
3. Binks MJ, Holyoak RS, Melhuish TM, Vlok R, Bond E, White LD. Apneic oxygenation during intubation in the emergency department and during retrieval: A systematic review and meta-analysis. Am J Emerg Med 2017;35:1542-6.
4. Rajan S, Joseph N, Tosh P, Kadapamannil D, Paul J, Kumar L. Effectiveness of transnasal humidified rapid-insufflation ventilatory exchange versus traditional preoxygenation followed by apnoeic oxygenation in delaying desaturation during apnoea: A preliminary study. Indian J Anaesth 2018;62:202-7.