The Emerging Role of Transnasal Humidified Rapid-Insufflation Ventilatory Exchange (THRIVE) in laryngeal surgery

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Introduction: Transnasal Humidified Rapid- Insufflation Ventilatory Exchange (THRIVE) is the delivery of high flow, humidified oxygen through nasal cannula. It has been widely used in the intensive care setting in respiratory failure for many years. Increasingly THRIVE is being used as the sole method of oxygenation during short laryngeal procedures and has the benefit of providing an unobstructed surgical field whilst avoiding the risks of barotrauma associated with jet ventilation.

Methodology

Pubmed/NHS evidence/ Cochrane

Search terms: “Transnasal humidified rapid-insufflation ventilatory exchange”

14 results

Search terms: “apnoeic oxygenation” limited to last 10 years

455 results

1st screening- titles only for possible relevance

45 results

Screened abstracts. Exclusion criteria- paediatrics, ITU/ED settings, not relevant to ENT

4 main studies looking at THRIVE in ENT surgery

Other non-peer reviewed sources:

- British Laryngology Association- online lecture on THRIVE
- Royal College of Anaesthetists
- Bulletin summary of THRIVE symposium
- Journal of Head and Neck Anaesthesia
- Difficult Airway Society website and publications

THRIVE: A physiological method of increasing apnoea time in patients with difficult airways

Patel and Nouraei, 2015

- Initial paper describing use of THRIVE
- 25 patients
- All due to undergo general anaesthetic
- All known or anticipated difficult airways
- + BMI/cardiorespiratory disease reduced apnoea time

- No patient desaturated below 90%
- Median apnoea time 14 minutes (5-65)
- Rise in CO₂ 0.15kPa/min

The use of THRIVE in 17 cases subglottic stenosis

To et al, Clinical Otolaryngology 2017

- Observational study
- 17 cases subglottic stenosis
- Median apnoea time 18 min (10-27)
- CO₂ rise 0.17kPa/min
- Two episodes of desaturation 83% and 80%

Apnoeic Oxygenation with high-flow nasal Oxygen for laryngeal surgery: a case series

Lyons and Callaghan, 2017

- 28 patients undergoing laryngeal surgery
- Case series
- End tidal CO₂ measured

Figure 1 The lowest recorded peripheral oxygen saturation (SpO₂) for each patient under anaesthesia.

Apnoeic oxygenation in adults under general anaesthesia using THRIVE- a physiological study

Gustafsson et al, 2017

- 31 Adults
- Recorded PaO₂ and PaCO₂ every 5 minutes
- Successful oxygenation
- Compared to transcutaneous monitoring CO₂
- Higher than previously reported rate increase CO₂

Transcutaneous CO₂ monitor

Conclusions: THRIVE has been successfully used as the sole method of oxygenation during laryngeal surgery, but patient numbers in the studies are small. THRIVE may not be suitable for obese patients with shorter apnoea times. There is also concern regarding lack of CO₂ monitoring during surgery and the resultant acidosis from the CO₂ rise. The use of laser with THRIVE is not currently recommended.

- Key points**
- THRIVE can be successfully used to oxygenate patients during short laryngeal surgery providing an unobstructed surgical field.
 - Using laser with THRIVE is not currently recommended due to concerns surrounding airway fires.
 - Apnoea times can be very variable between patients and all require discussion of airway backup plans should they desaturate.
 - It is not recommended for very obese patients or in those with significant reflux.
 - Optimal monitoring of carbon dioxide rise has not been established. There may be an emerging role for transcutaneous carbon dioxide monitors.