THRIVE

Dr. med. Alistair McNarry, Consultant anaesthetist, Western General Hospital, Edinburgh (UK)

althegasman@btinternet.com

I have been a consultant anaesthetist working in Edinburgh for the past 11 years having completed most of my training in London. My interests are in all aspects of airway management – specifically the avoidance of difficulty – and in teaching others to do likewise.
I have had the opportunity to use THRIVE in a wide variety of settings, but mainly in my weekly Head and Neck list and frequently in patients with subglottic stenosis. I am an enthusiastic exponent of THRIVE, however I am very concerned that people should do it safely.
I am the National Airway Lead for the Royal College of Anaesthetists and the Difficult Airway Society, a new post that I have held since 2016. The role aims to coordinate, enthuse and support the Airway Leads around the UK as they strive to deliver excellence in all aspects of airway management.
I am involved in teaching on a variety of workshops for DAS and the RCoA, and have been invited to lecture both at home and abroad
In my spare time I have an organizational interest in the DAS Annual Meetings between 2017 and 2019.
Although not an academic, I have been involved in writing 12 pubmed listed papers, including the 2015 DAS Guidelines.

My relationship with Fisher and Paykel:
I have received assistance with travel and accommodation from F&P, and have spoken at symposia they have organised for which I have never taken payment.

The term THRIVE (transnasal humidified rapid insufflation ventilatory exchange) was first coined by Patel and Nouraei in their 2015 paper describing technique of prolonged apnoeic oxygenation in patients undergoing ENT surgery.[1] However, the idea of prolonging the (safe) apnoea time after the induction of anaesthesia is not new. Levitan described the technique of NO DESAT (Nasal oxygenation during efforts securing a tube) in 2010.[2 3] The effectiveness of pharyngeal insufflation of oxygen was also recognized before THRIVE was described.[4]
Similarly, high-flow nasal oxygen is a recognized therapy in critical care[5–7]
However, the potential disadvantages of non-humidified techniques are recognized.[8]

Definition: Nasal high-flow describes a situation where a patient is receiving (warmed, humidified) oxygen at >30 litres per minute but is still breathing.
THRIVE describes similar high-flow oxygen therapy, but the patient is apnoeic.

THRIVE can be considered under three headings

i) Clinical use of THRIVE

This will include common sense precautions prior to its use (McNarry's tests)
Is the circuit set up correctly?
Do the saturations improve rapidly after commencement of high-flow oxygen?

a. In Ear Nose and Throat surgery
   This is where its use is most readily documented[1 9], and possibly where it is easiest to see its application. Patients with very narrowed airways are always a challenge for the anaesthetist, usually requiring some form of jet ventilation or a very transient period of apneic oxygenation.[10–12] However, the potential harm caused by inappropriately administered high pressure source ventilation are well recognized.[13]

b. During procedures (flexible bronchoscopic intubation, including flexible bronchoscopy)[14]
   Although the question that must be addressed is whether this facilitates more complex techniques or increases the chance of poor sedation practice.

c. For optimal preoxygenation
   As the nasal cannulae are not removed during the intubation process, the potential for nasal high flow to be of benefit during intubation are obvious, both in terms of optimal preoxygenation and extending the safe apnoeic window during the intubation process.
   The trials in this area are small and offer results that can be interpreted in a variety of ways.[15–18]

d. At extubation
   If the rationale behind preparing for extubation involves having a plan should extubation fail[19], then having a device that can provide optimal oxygenation and extend the apnoea time is clearly beneficial, although this depends on (c) above being effective

e. In other circumstances
   Although not strictly related to anaesthesia, evidence is emerging that suggests nasal high-flow will have a role in post-operative care. Early investigations have already shown potential benefit in cardiac and thoracic patients.[20] [21]

ii) How does THRIVE work

a. Apneic oxygenation[22]
b. CPAP[23]
c. Apnoeic ventilation[24]

These three elements are the components of the THRIVE triangle, and whilst the apneic oxygenation and CPAP components make reasonable sense, the idea of ventilation that can occur during apnoea is more complex and requires resorting to modelling of the upper airway.
Despite the apparent simplicity and elegance of the THRIVE triangle, this is unlikely to be the complete story and more scientific investigation is ongoing to fully describe the effects of THRIVE

iii) What are the limits of THRIVE?

None of they studies that show THRIVE/ nasal-high flow to be very effective have shown THRIVE to be 100% effective at providing greatly prolonged safe apnoea times. The challenge facing clinicians as its use becomes more widespread is not only to identify those patients and situations where it will provide great benefit, but also to identify those patients in whom it may not prove as effective. This is particularly important in the early phases of the adoption of the technique/ therapy.

a. Duration
b. Body habitus
c. Use with LASERS and Diathermy
   The incident described by Ahmad and colleagues[25] is perfectly explicable considering the physics of the Fire Triangle- that to have a fire three things are required: an oxygen source, a fuel, and a spark. Clearly given the physics of diathermy, using THRIVE is not recommended as a spark will be present and the tissue debris will provide a source of fuel.

LASER use with THRIVE should theoretically be safe as there is no source of fuel, however clinically the risk of fuel being inadvertently provided is high. In the UK at present experienced users of THRIVE have agreed

Do NOT use THRIVE with LASERS

Do NOT use THRIVE with DIATHERMY

Conclusion

I believe that high-flow nasal oxygenation and THRIVE offer a potential revolution in many aspects of anaesthetic practice and I hope that during my lecture and the workshop to be able to discuss these opportunities with you. However I also believe that there is the potential for people to attribute powers to THRIVE that are not described and simply do not exist. Clinicians must always regard THRIVE as warmed humidified oxygen at high-flow, not as a wonder therapy.

Using THRIVE must be carried out with care and with discussion between the anaesthetist and operating surgeon. It is always vital that a 'Plan B' is made should THRIVE prove to be ineffective.

All of these caveats considered, THRIVE is a fantastic innovation and I thoroughly recommend that you consider where it might be appropriately used in your practice.

Patel's paper was only published in March 2015, the phenomenal interest in it since then is testament to its potential.

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