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Short Communication

Transnasal Humidified Rapid-Insufflation Ventilatory Exchange (THRIVE) in High-Risk Endoscopic Procedures: A Non-Intubation Approach

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Abstract

Endoscopic procedures in patients with comorbidities such as Ischemic Heart Disease (IHD), respiratory compromise, or anticipated difficult airways present considerable anaesthetic challenges. Intubation and positive pressure ventilation, although standard, can be detrimental in such patients due to risks of sympathetic stimulation, barotrauma, or prolonged recovery. Transnasal Humidified Rapid-Insufflation Ventilatory Exchange (THRIVE) is gaining attention as a method to maintain oxygenation without intubation. We share our clinical experience using THRIVE during upper endoscopic procedures to avoid intubation in 10 high-risk patients, demonstrating its feasibility, safety, and clinical benefits.

Introduction

Upper gastrointestinal and bronchopulmonary endoscopic procedures—such as Endoscopic Retrograde Cholangiopancreatography (ERCP), Endoscopic Ultrasound (EUS), and Endobronchial Ultrasound (EBUS)—often require deep sedation or general anaesthesia. These interventions are increasingly performed on patients with high-risk profiles, including ischemic heart disease, morbid obesity, chronic respiratory diseases, and previous head and neck radiotherapy. In such cases, securing the airway through intubation may provoke undesirable hemodynamic responses and technical difficulties [1].

THRIVE, which delivers warmed, humidified oxygen at high flow rates (up to 70 L/min) via nasal cannula, allows apnoeic oxygenation and some degree of carbon dioxide clearance [1,2]. By facilitating spontaneous breathing and extending safe apnoea time, it offers a valuable alternative, especially in patients where airway manipulation carries risk.

Methods/Clinical series

We retrospectively analyzed 10 high-risk patients who underwent ERCP (n = 5), EUS (n = 3), and EBUS (n = 2) under monitored anaesthesia care using THRIVE. Patient demographics included:

- 4 with stable ischemic heart disease (EF > 45%)
- 3 with morbid obesity (BMI > 35 kg/m^2)
- 2 with previous difficult intubation (Cormack-Lehane grade ≥ 3)
- 1 post-radiotherapy for head and neck cancer with distorted anatomy

Anaesthetic technique:

- Pre-oxygenation with THRIVE at 30–40 L/min (FiO_2 1.0) for 3–5 minutes
- Sedation with propofol infusion (targeting BIS 50–60), ± dexmedetomidine
- THRIVE maintained throughout at 40–60 L/min
- Procedures lasted 20–60 minutes
- SpO_2, $EtCO_2$ (via nasal sampling), heart rate, and blood pressure were continuously monitored

- All patients maintained spontaneous ventilation or tolerated short apnoeic windows (1–3 min) without desaturation (SpO_2 remained > 94%)
- No conversion to intubation was required
- Post-procedure recovery was uneventful and faster than general anaesthesia with intubation

Discussion

THRIVE represents a paradigm shift in airway management for high-risk, short-duration procedures. Its application in endoscopy suites minimizes the cardiovascular stress response associated with laryngoscopy and endotracheal intubation, particularly crucial in IHD and hypertensive patients.

Patel and Nouraei[1] demonstrated that THRIVE can extend the apnoeic window significantly—up to 17 minutes in some cases—by maintaining oxygenation and facilitating CO_2 clearance. In obese patients, who have reduced functional residual capacity and are prone to rapid desaturation, THRIVE is superior to conventional preoxygenation techniques [2,3]. This oxygenation strategy helps extend safe apnea time and improve procedural safety.

Yoon, et al. [4] reported the benefits of THRIVE in elderly patients undergoing upper GI endoscopy, noting reduced desaturation and improved procedural stability. Similarly, in patients with distorted anatomy or prior radiotherapy, avoiding intubation via THRIVE helps circumvent risks related to failed airway management and delays.

In patients with obstructive sleep apnoea and difficult airway features, Lodenius, et al. [5] found THRIVE beneficial during induction and intubation, reinforcing its value in this subpopulation. A broader review by Lyons and Callaghan [5] emphasized the physiological mechanisms and varied uses of apnoeic oxygenation, positioning THRIVE as a valuable adjunct in modern airway management.

While THRIVE offers several advantages, caution is warranted in prolonged procedures, patients sensitive to hypercapnia (e.g., those with intracranial pathology), or when nasal patency is impaired. Capnographic monitoring and preparation for immediate airway intervention remain essential.

Conclusion

Our experience supports THRIVE as a feasible and safe alternative to intubation in high-risk patients undergoing short endoscopic procedures. It preserves spontaneous ventilation, avoids pressor responses, improves procedural access, and facilitates quicker recovery. With appropriate patient selection and vigilant monitoring, THRIVE should be considered a frontline strategy in such scenarios.

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