

INTRODUCTION

What we already know:

- Transnasal Humidified Rapid-Insufflation Ventilatory Exchange (THRIVE) aka High Flow Nasal Cannula (HFNC) has established use in adults and pediatrics as an alternative method of oxygen delivery
- Used in both adults and pediatric ICUs as a method of respiratory support or post extubation support
- More recent anesthesia studies looking at its usefulness in intubations, difficult airways and apneic oxygenation- all of which show prolonged time to desaturation

What this case series tells us:

- HFNC can be successfully utilized in airway procedures where airway access is shared
- Patients presented here were apneic during their airway procedure

STUDY DESIGN

AIM:

- Evaluate the safety and efficacy of HFNC in apneic pediatric patients undergoing airway procedures.

METHODS:

- Observational study in 7 patients undergoing general anesthesia for L&B
- Ages 3 weeks to 19 years
- Flows set at 1.0-2.1 L/kg/min
- FiO2 set to 100%
- Time to desaturation and HD stability observed

SYSTEM SET UP

Set up and system:

- Plugs in to oxygen/ air supply in OR
- Disposable humidifier, circuit and nasal cannula
- Oxygen blender allows for set FiO2
- Flow dial allows for low and high flow up to 70 LPM



- Adequate flow rates 1-2L /kg /min
- Ex: 15kg child would receive 15-30LPM

RESULTS

Patient	Surgical Attempt	Flow Rate LPM (L/Kg/m)	Duration of Apnea	Published Average for Age	Lowest Recorded SpO2 (%)	Reason for Termination
3 week old M L&B						
	1	8.5 (2.1)	2:20	1:30	94	Surgical decision
	2	8.5 (2.1)	2:02	1:30	96	Surgical completion
19 month old F L&B						
	1	20 (1.8)	6:23	1:58	99	Surgical completion
19 year old F L&B + lavage						
	1	40 (1.0)	8:03	6:20	99	Intubation
13 month old M L&B- foreign body						
	1	20 (1.7)	2:20	1:58	100	Surgical decision
	2	20 (1.7)	1:37	1:58	100	Surgical completion
7 month old M L&B						
	1	10 (1.6)	3:51	1:58	99	Surgical completion
8 month old M L&B						
	1	8.5 (1.0)	3:32	1:58	95	Surgical decision
	2	8.5 (1.0)	1:30	1:58	99	Surgical decision
	3	8.5 (1.0)	1:43	1:58	99	Surgical completion
2 year old M L&B- foreign body						
	1	0	0:20	2:40	50	HFNC not initiated
	2	20 (1.5)	3:30	2:40	90	Surgical decision
	3	20 (1.5)	6:28	2:40	97	Surgical decision
	4	20 (1.5)	5:38	2:40	99	Surgical decision
	5	20 (1.5)	4:03	2:40	96	Surgical completion

DISCUSSION

Results:

- Patients had no major desaturations using HFNC
- Ventilation still required.

Pros for HFNC

- Prolonged time to desaturation = less stopping surgery oxygenate
- Humidified – fewer mucosal bleeds & patient comfort
- Allows for higher flow rates
- CPAP up to 7cm H2O helps stent airway and open alveoli
- Doesn't require additional oral/ nasal device- avoids trauma/ risk of bleeding
- FiO2 can be selected- allowing for cautery of airway
- Slowed CO2 rise d/t passive ventilation adults > pediatrics¹

Cons for HFNC

- Requires separate HFNC circuit & nasal prongs
- For apnea- airway must be patent (jaw thrust sufficient)
- In one study- HFNC didn't wash out CO2 in kids as well as adults²
- Potential for abdominal distention (no documentation of aspiration)

FUTURE DIRECTION

- Compare other methods of oxygen delivery (low flow nasal cannula, side ports on blade/bronchoscope, nasal trumpet, etc) to HFNC
- Measure via transcutaneous CO2 monitor or ABG- the actual change of CO2 with apnea in airway surgeries between HFNC and other methods of apneic oxygenation.
- Determine safe time for apneas

REFERENCES

1. A. Patel, S.A.R. Nouraei. Transnasal Humidified Rapid-Insufflation Ventilatory Exchange (THRIVE): a physiological method of increasing apnoea time in patients with difficult airways. *Anesthesia* 2015, 70, 323-329
2. S Humphreys et al. Transnasal Humidified rapid-insufflation Ventilatory Exchange (THRIVE) in children: a randomized controlled trial. *BJA*, 118 (2): 232-8 (2017)
3. S Humphreys et al. Nasal High Flow Oxygen Delivery In Children with Abnormal Airways. *Pediatric Anesthesia* 27 (2017) 616-620