Adelaide Institute *for* **Sleep Health**

ILLAWARRA ENT
HEAD & NECK CLINIC

Targeted ansa cervicalis nerve stimulation restores airflow to airway narrowing in obstructive sleep apnoea during propofol anaesthesia

Amal M. Osman, A. Simon Carney, Eng H. Ooi, Himani Joshi, Carolin Tran, Anna Hudson, Peter Catcheside, Phuc Nguyen, Charmaine O'Reilly, Nick Gelekis, Daren Gibson, Jennifer Walsh, Kathleen Maddison, Stuart Mackay, Richard Lewis, Danny J. Eckert

THE UNIVERSITY OF WESTERN AUSTRALIA

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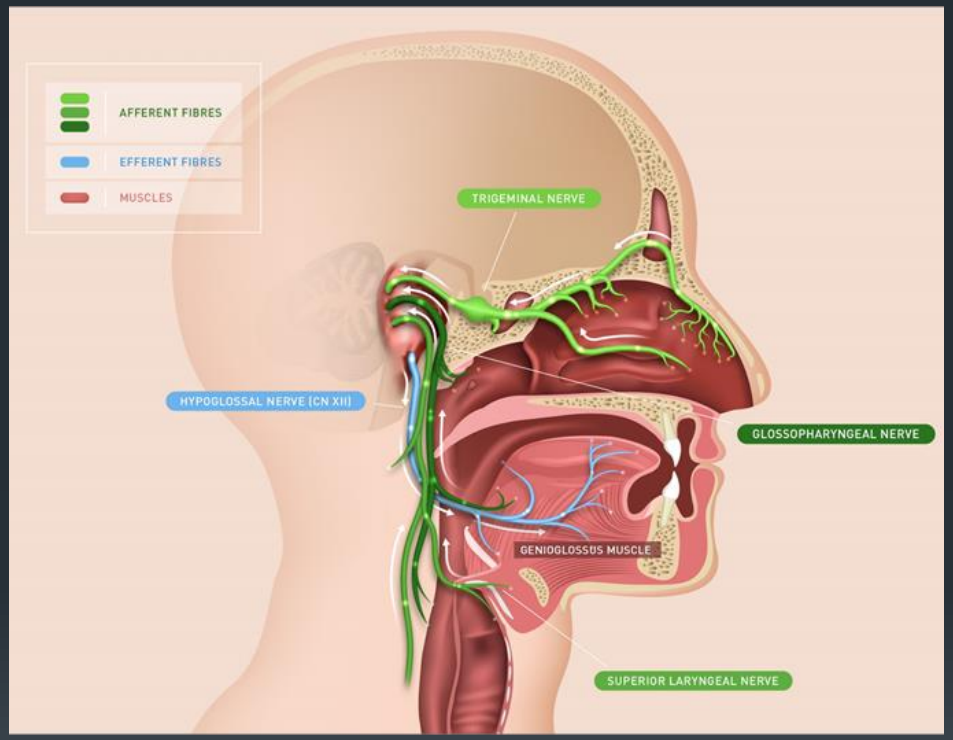
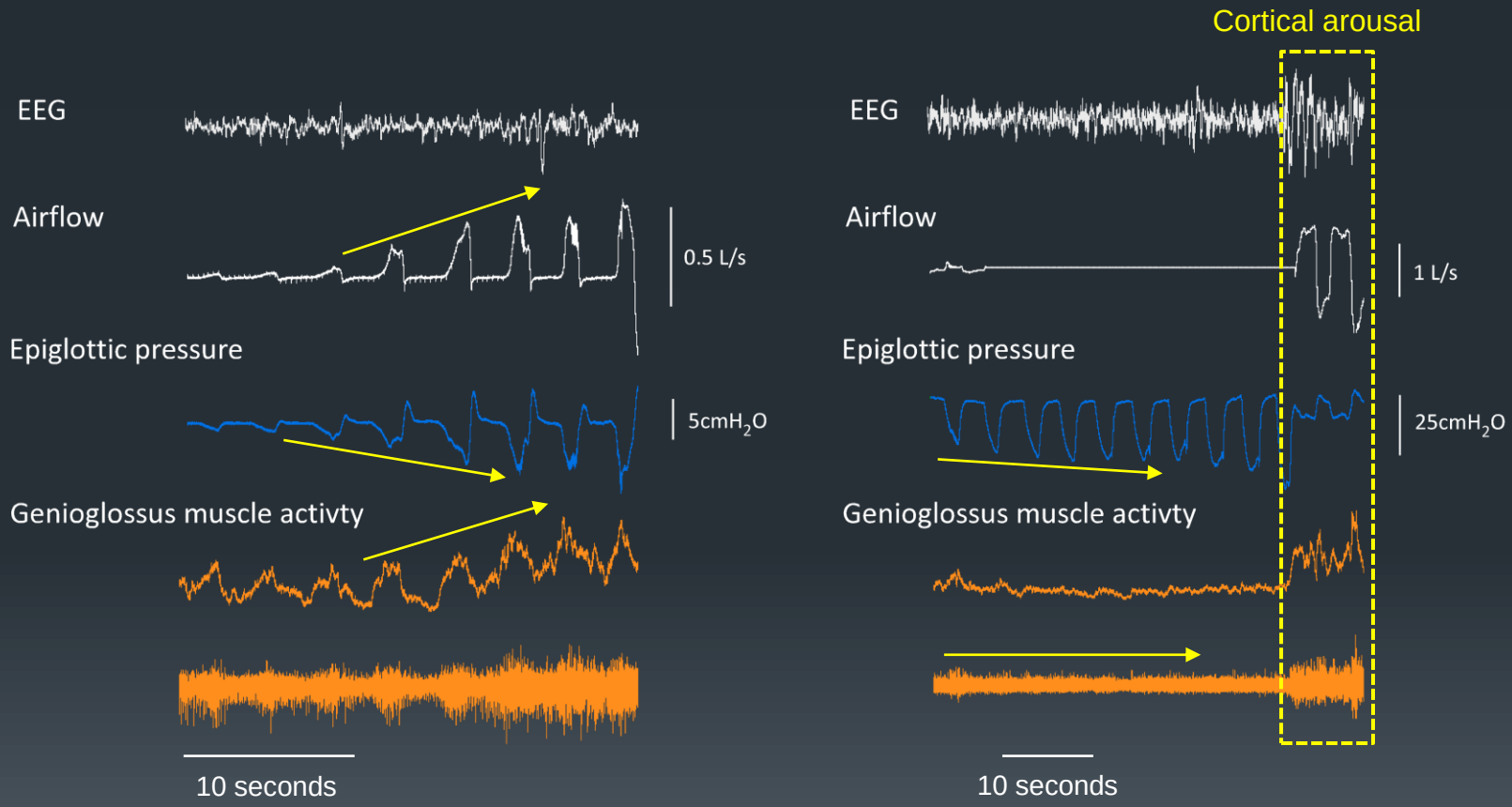
The combination of impaired upper airway anatomy and pharyngeal muscle function drives OSA pathogenesis



Osman et al, CHEST (2023)

"Good" vs "poor" upper airway dilator muscle response to increasing negative pressure



Targeted OSA therapy: Neurostimulation

- Direct electrical stimulation to the tongue muscles and/or nerves can improve airflow during sleep and anaesthesia[1,2]
- Current hypoglossal nerve stimulation devices to treat sleep apnoea use placement of a cuff or ‘saddle’ electrode around or adjacent to the hypoglossal nerve/s[1,4,5,6]
- Limitations include cost, invasiveness, and variable efficacy

1. *Schwartz et al, Arch Otolaryngol Head Neck Surg (2001)*
2. *Eastwood et al, SLEEP (2011)*
3. *Strollo et al, NEJM (2014)*
4. *Eisele et al. Otolaryngol Clin (1997)*
5. *Strollo et al. SLEEP (2014)*
6. *Schwartz et al. J Neurol Sci (2014)*

Minimally invasive, ultrasound guided, acute hypoglossal nerve stimulation

EM

Mas
press

Airflo

Epiglo
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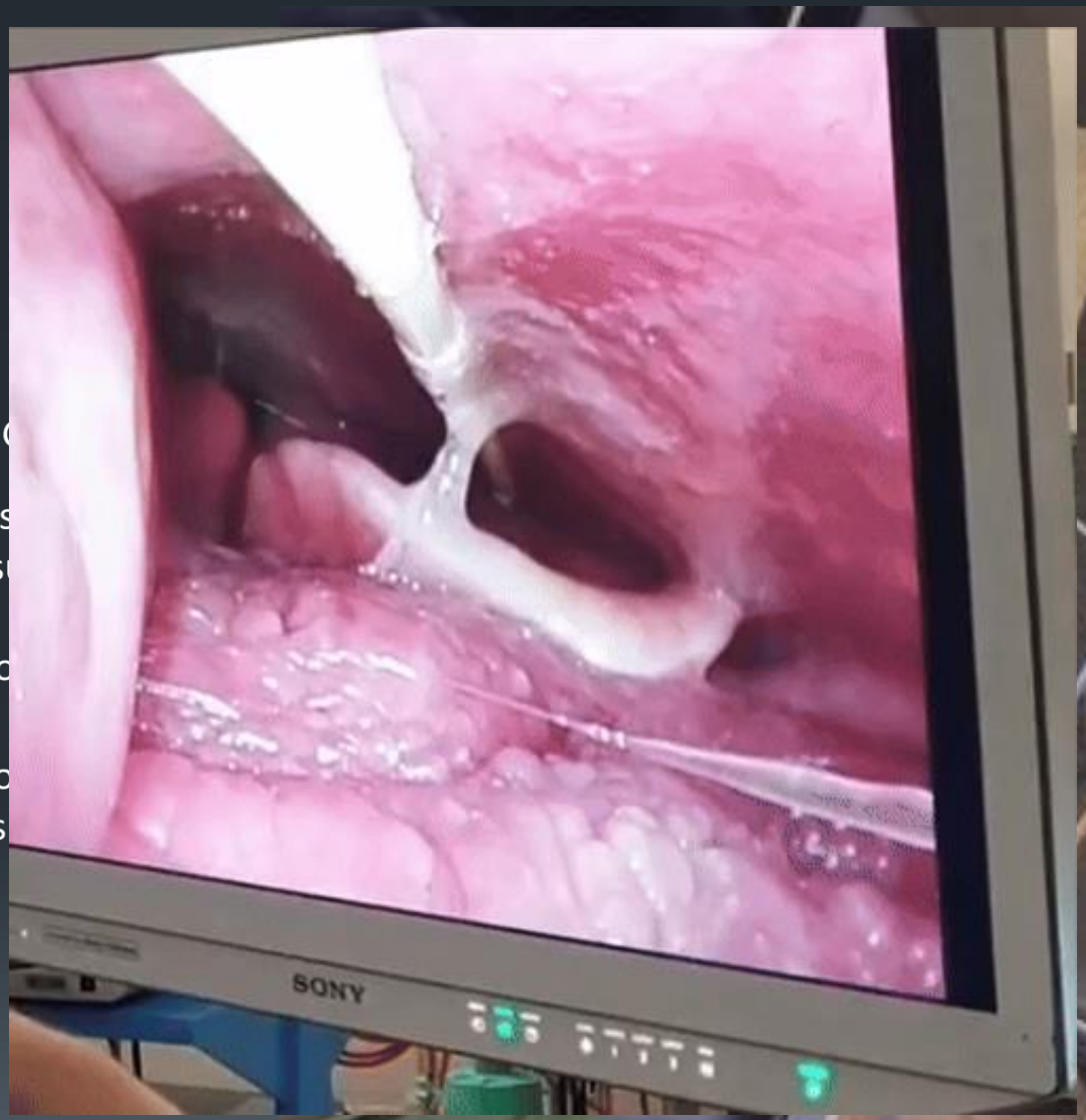
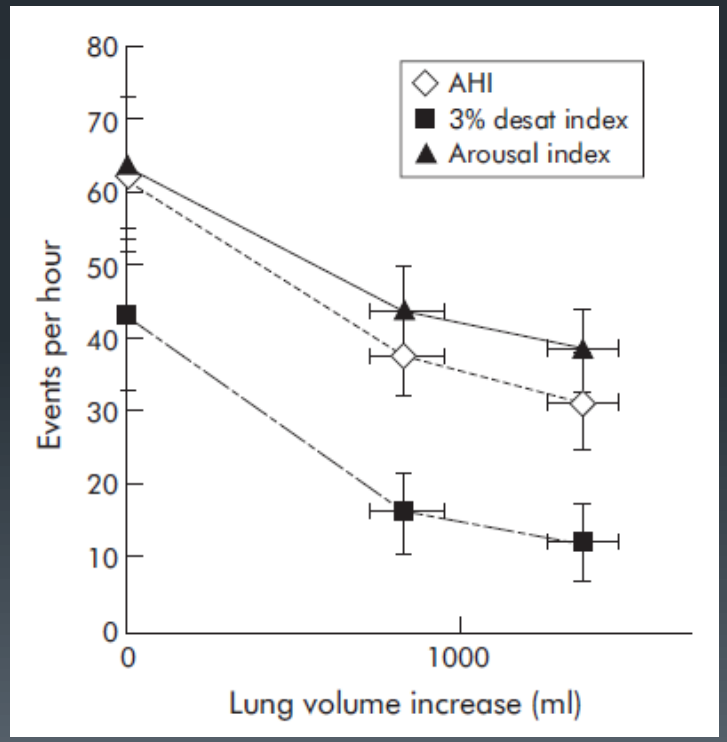


Osman et al, *unpublished findings (manuscript under review)*

Alternative neurostimulation target: Ansa cervicalis

- Increasing lung volume reduces OSA severity, CPAP level requirements[1,2]
- Targeted ansa cervicalis nerve stimulation improves airflow likely via caudal traction mechanisms[3]

1



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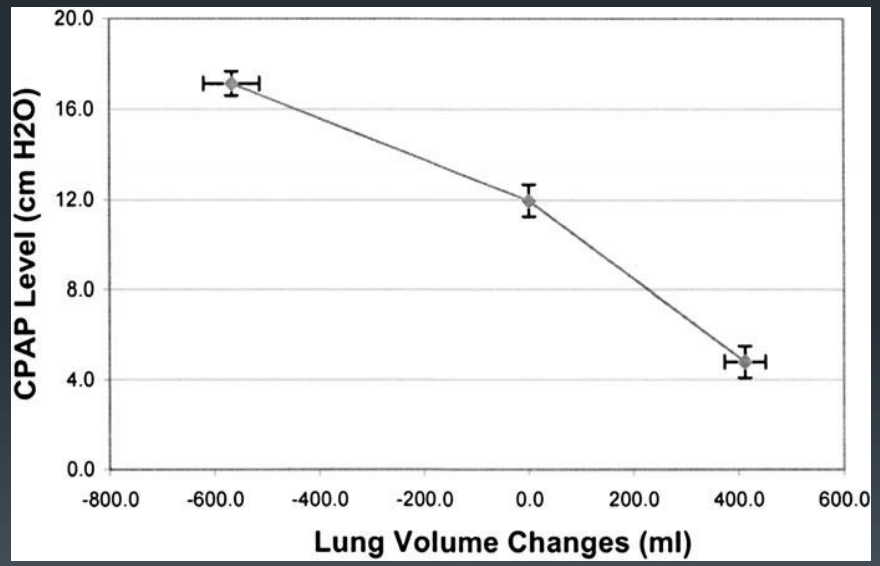

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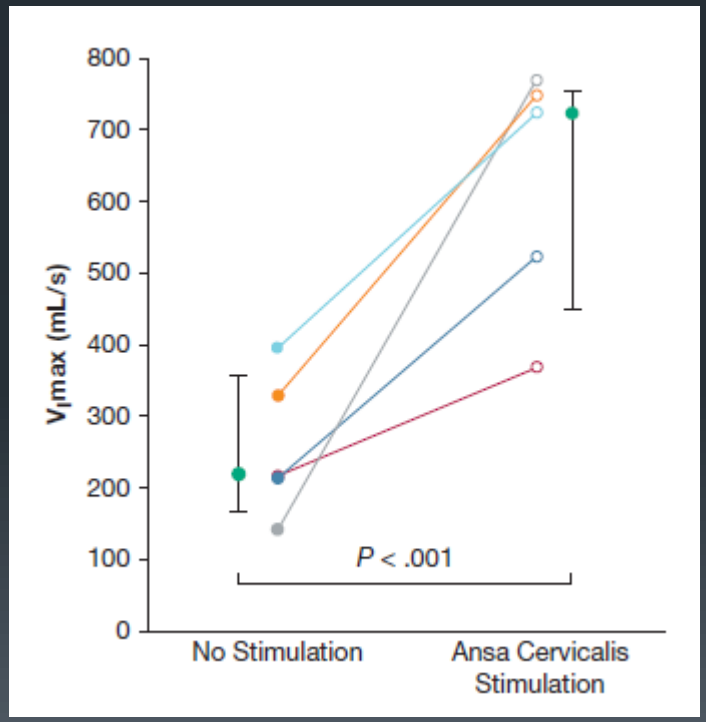
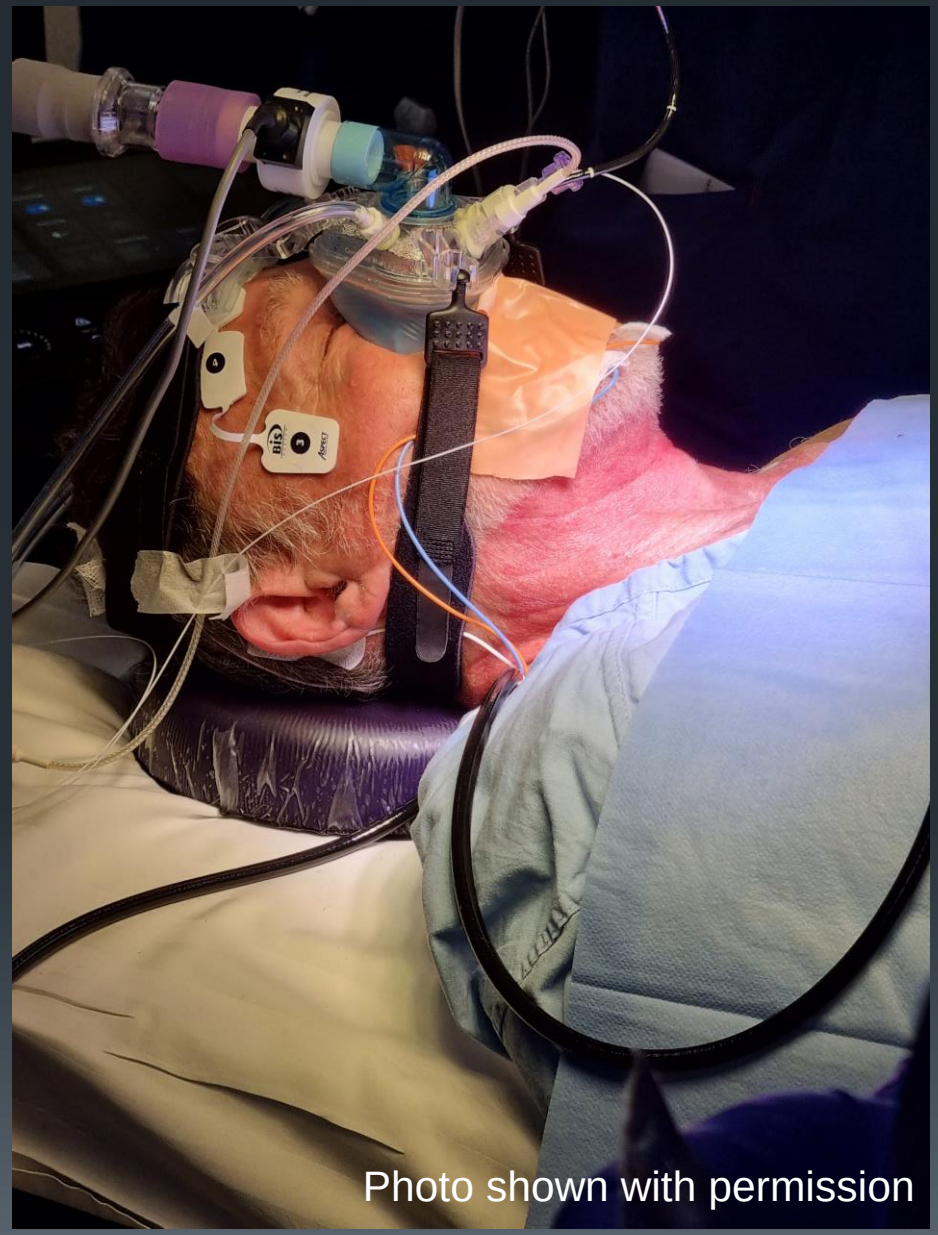


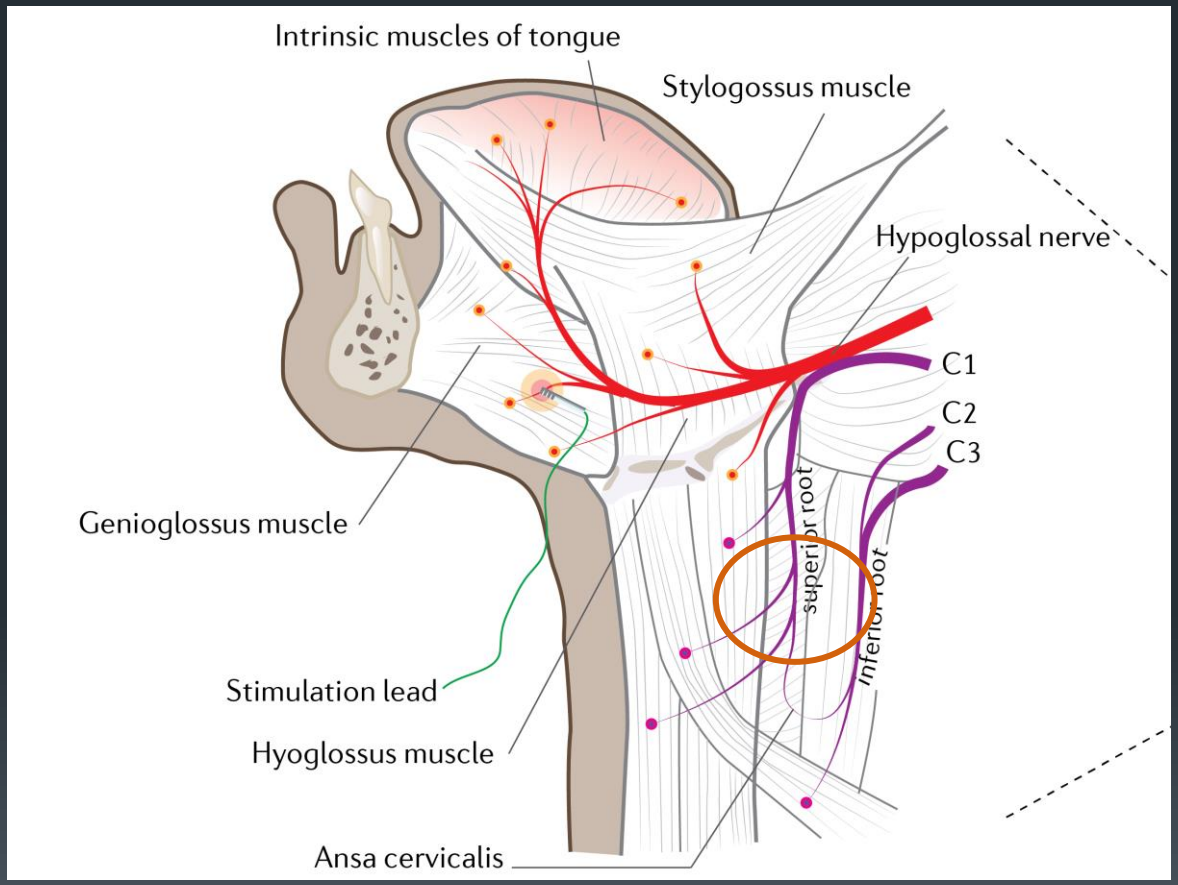
1. Heinzer et al, Thorax (2006), 2. Heinzer et al, AJRCCM (2005), 3. Kent et al, CHEST (2021)

Aims

This multi-centre Australian proof-of-concept study aims to determine the potential therapeutic efficacy of a novel neurostimulation target, ansa cervicalis using a minimally invasive, ultrasound guided surgical approach

Minimally invasive, ultrasound guided, acute ansa cervicalis nerve stimulation

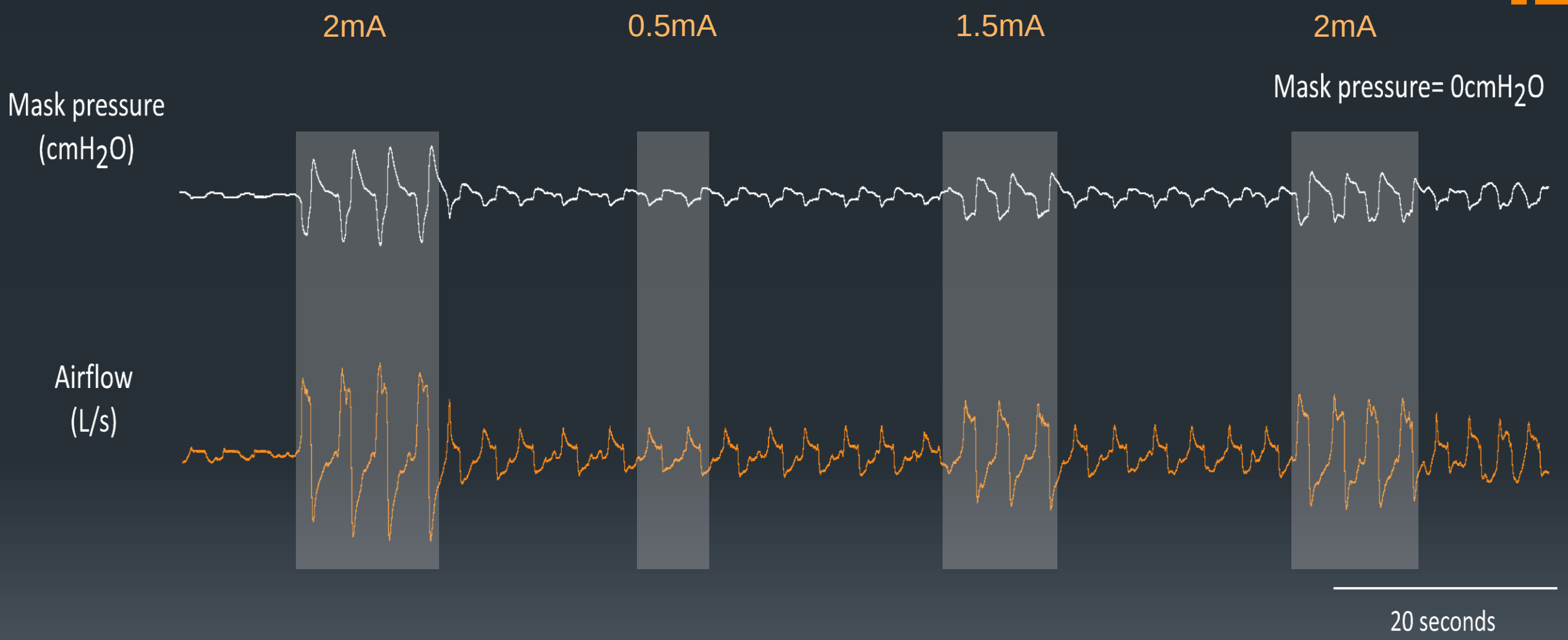




Participant and stimulus characteristics

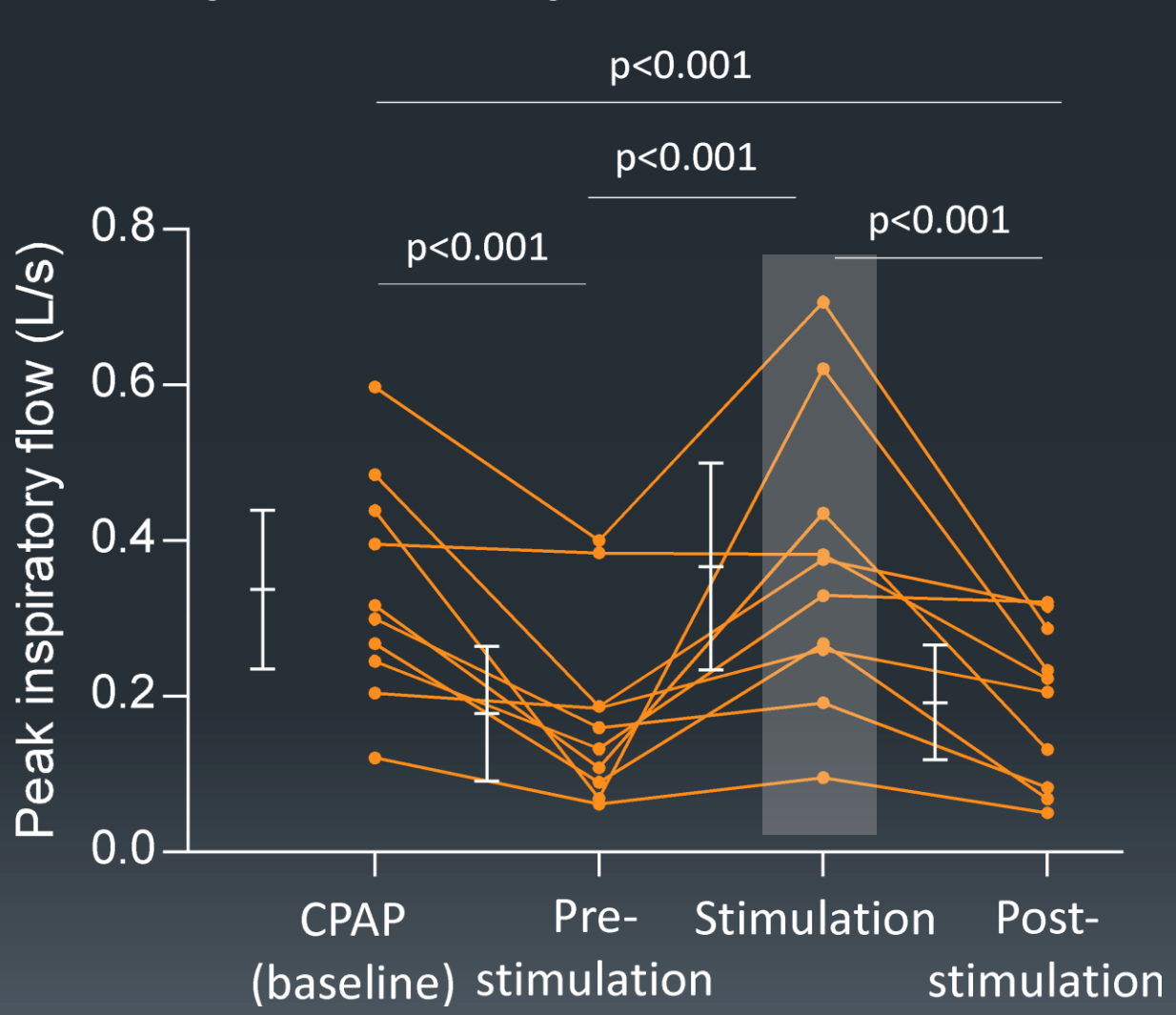
n=11 (2 female)	mean±SD	range
Age (years)	51±15	23 to 77
BMI (kg/m^2)	27±3	21 to 31
Apnoea-hypopnoea index (events/h sleep)	42±16	21 to 70

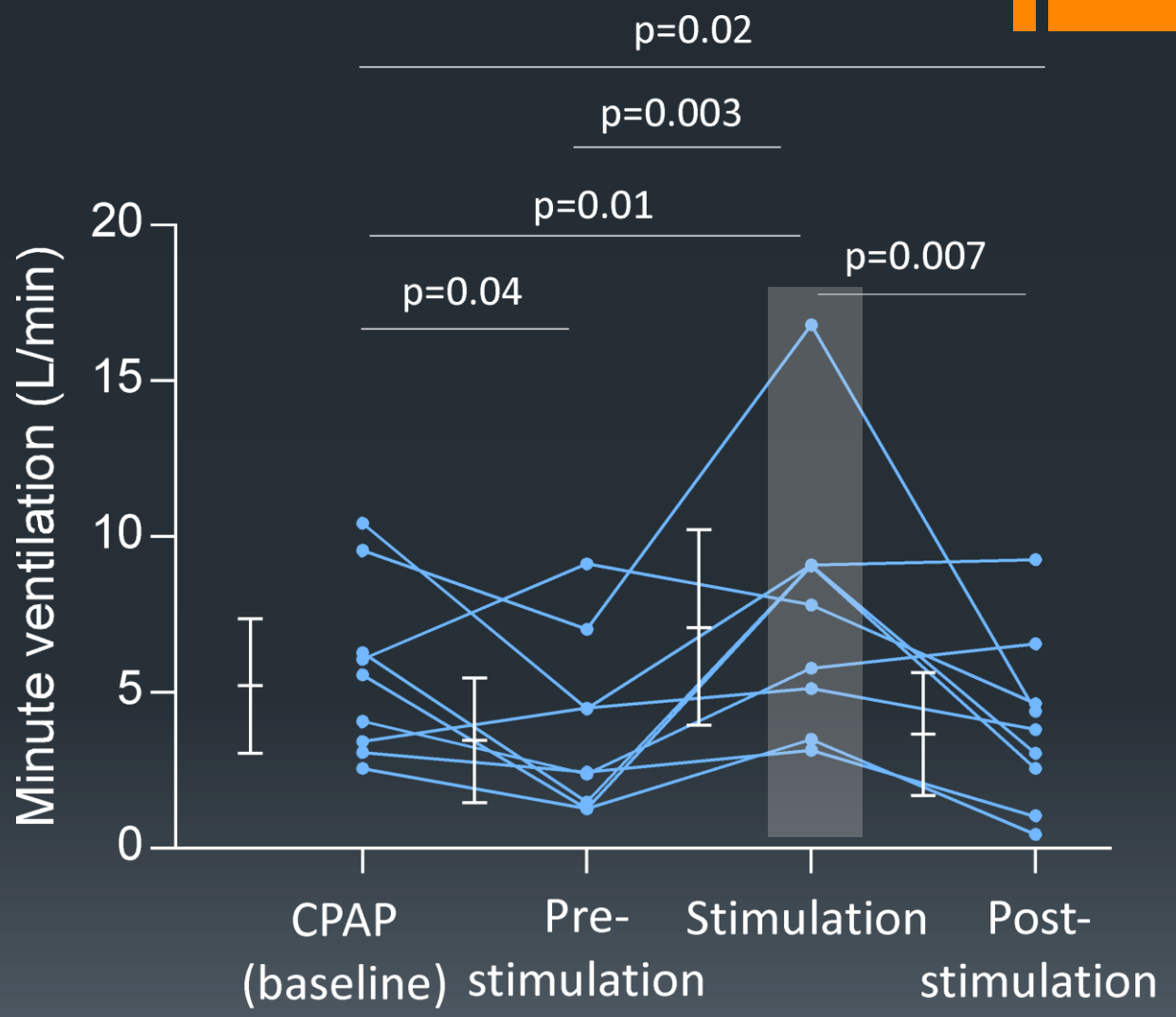
Targeted ansa stimulation restores airflow



Targeted ansa stimulation restores peak airflow and minute ventilation

On average 3.4±1.1mA, range: 1-5mA





mean, 95% CI

Summary

In people with sleep apnoea, this acute, novel, percutaneous ansa cervicalis nerve stimulation approach markedly improves:

- ✓ peak airflow and minute ventilation in 10 out of 11 participants studied
- ✓ peak airflow during stimulation were comparable to airflow levels achieved with therapeutic CPAP
- ✓ minute ventilation during stimulation was greater than airflow levels achieved with therapeutic CPAP

Thank you

Danny J. Eckert

Simon Carney

Eng H. Ooi

Himani Joshi

Carolin Tran

Anna Hudson

Peter Catcheside

Phuc Nguyen

Charmaine O'Reilly

Nick Gelekis

Daren Gibson

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Kathleen Maddison

Stuart Mackay

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