

Vulnerability to Postoperative Complications in Obstructive Sleep Apnea: Importance of Phenotypes

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Financial Disclosures

- Nil relevant

Vulnerability to Postoperative Complications in Obstructive Sleep Apnea: **Importance of Phenotypes**

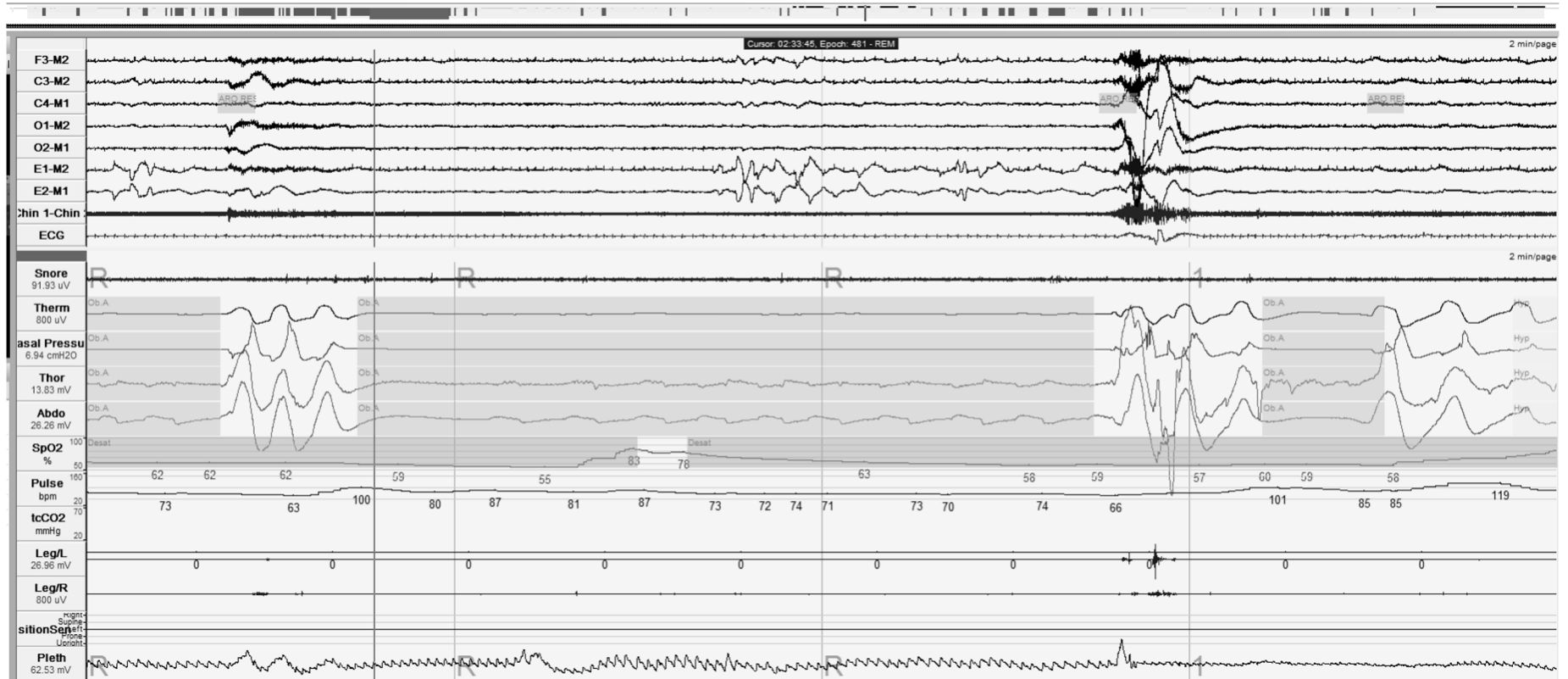
1. Obstructive sleep apnoea: overview

2. Pathophysiology of OSA

- *Four key phenotypes*

3. Phenotype-specific vulnerability in the postoperative setting

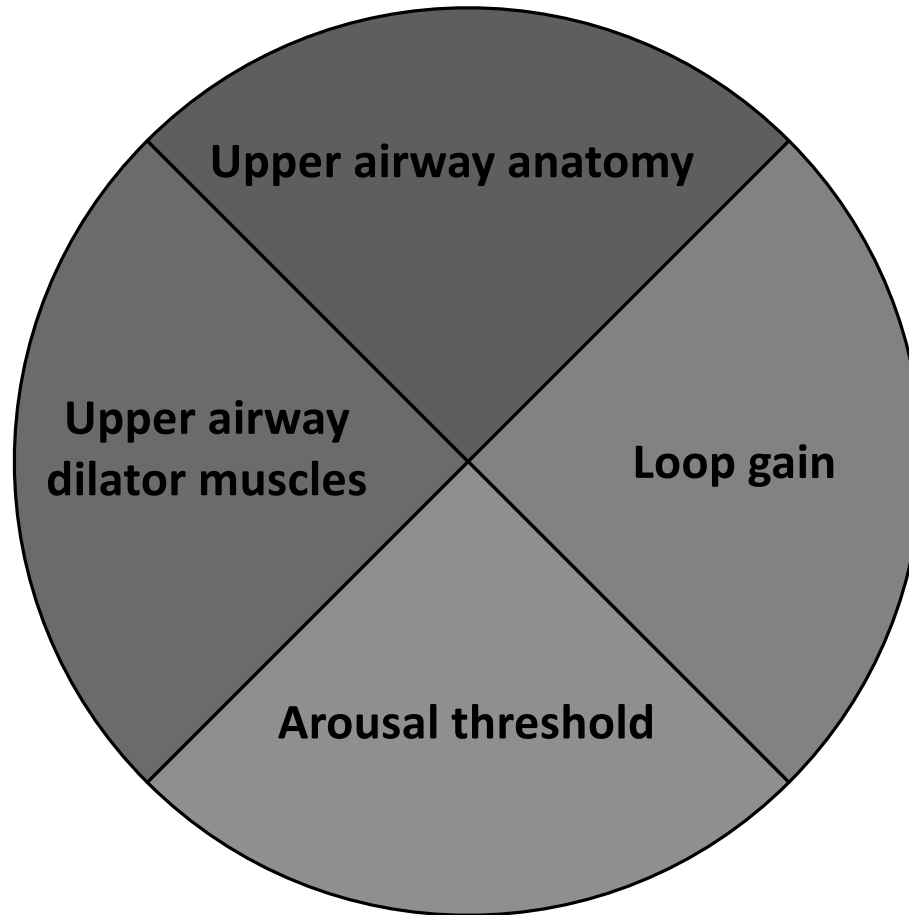
Obstructive Sleep Apnea: polysomnography



OSA and surgery

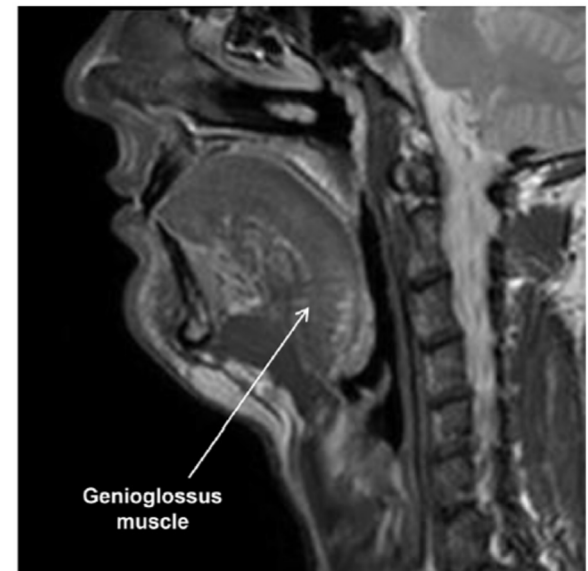
- Common
- Often undiagnosed
- May develop post-op
- Increased risk of post-op complications

OSA phenotypes



Phenotype #1: Impaired upper airway anatomy

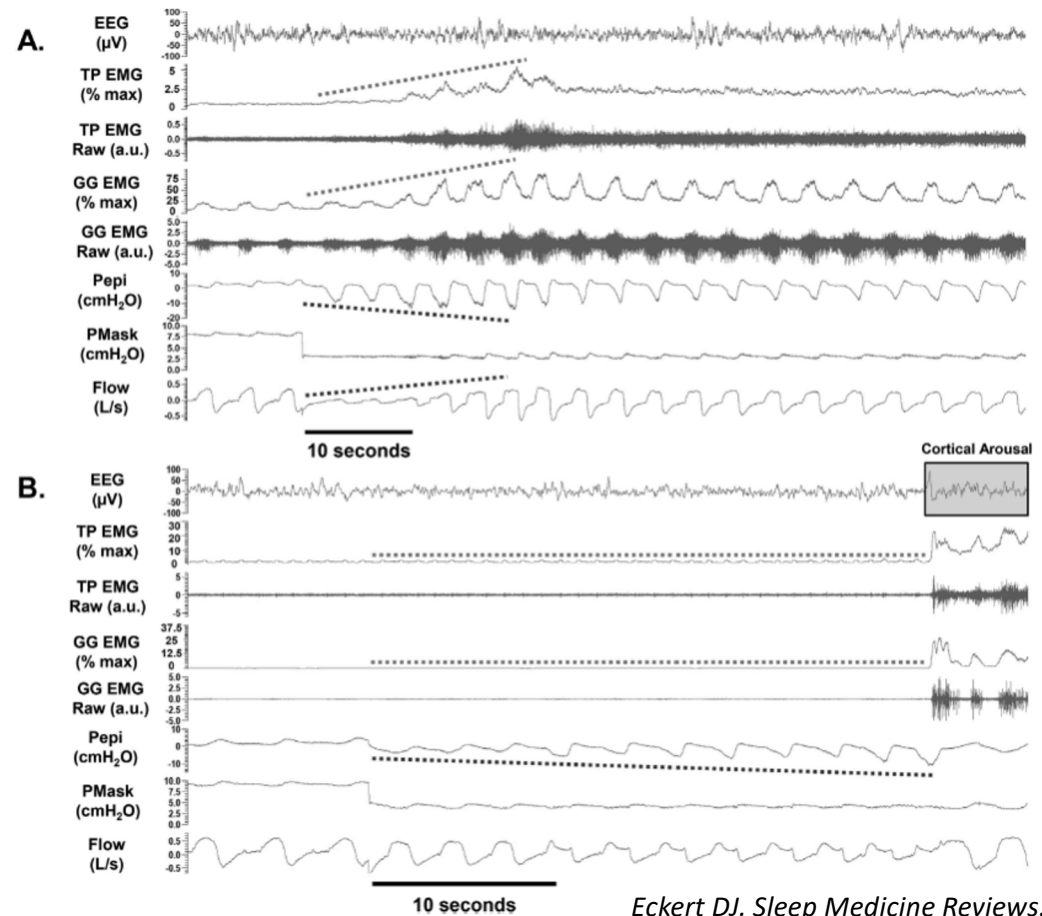
- Adipose tissue
- Craniofacial shape/size
- Body/head position
- Fluid distribution



Eckert DJ. Sleep Medicine Reviews. 2018.

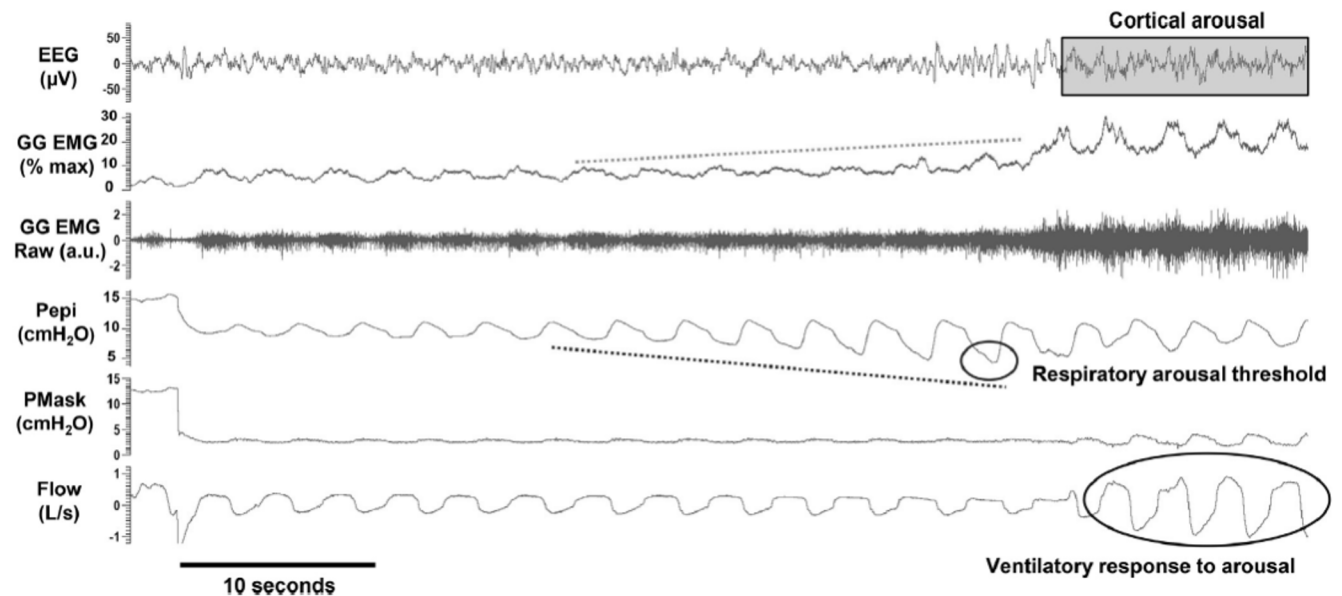
Phenotype #2: Impaired upper airway dilator muscle function

- Muscles that surround the upper airway
- Contraction → upper airway dilation
- Increase their activity levels in response to airway narrowing/negative pharyngeal pressure



Phenotype #3: Low respiratory arousal threshold

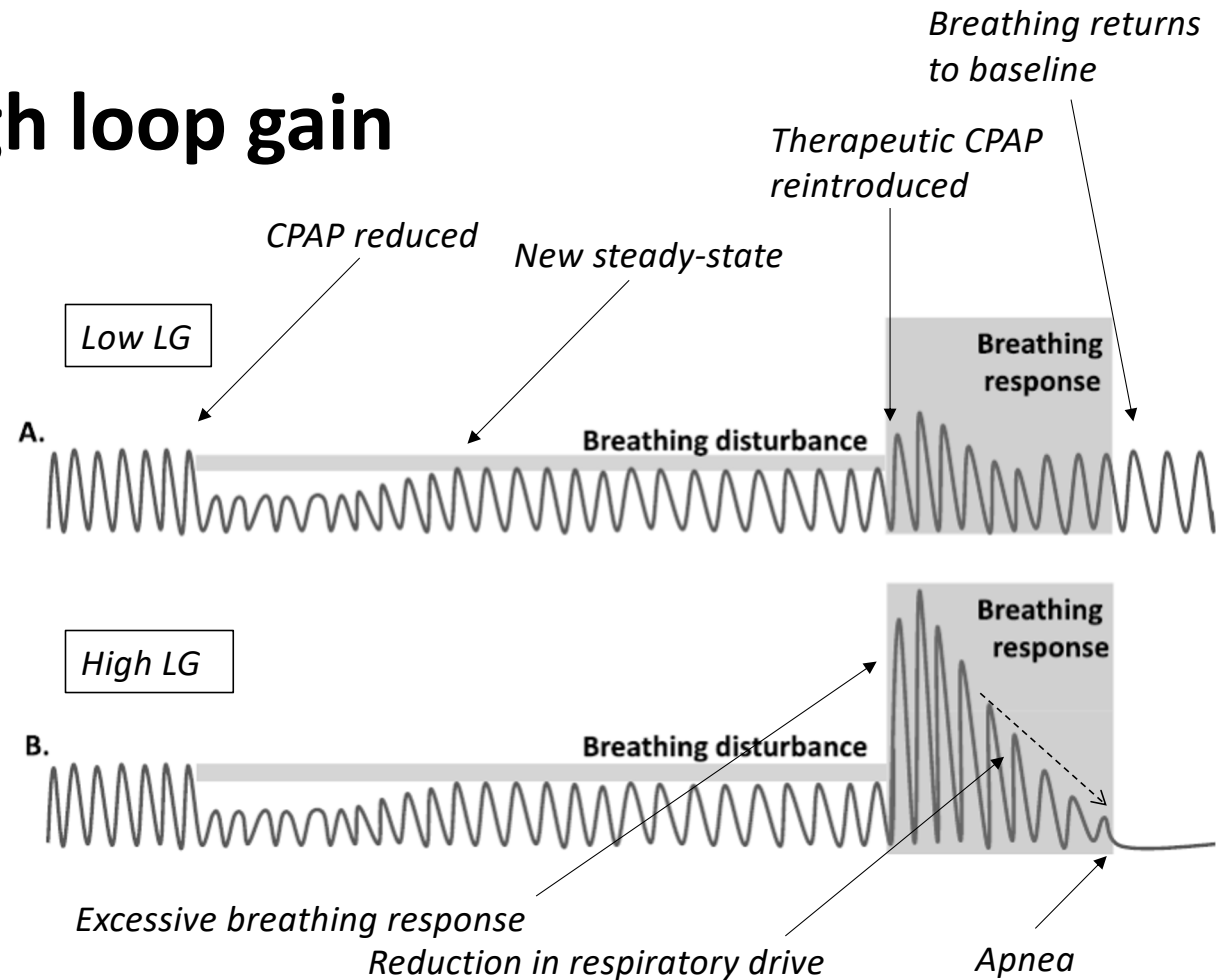
- Arousals are important responses to respiratory stimuli
- ~20% of respiratory events resolve without arousal
- ~35% of OSA patients have a low AT threshold



Eckert DJ. Sleep Medicine Reviews. 2018.

Phenotype #4: High loop gain

- Ratio of the ventilatory response to a disturbance (eg hypercapnia)
- High loop gain = ventilatory response out of proportion to the stimulus
- High LG systems are prone to oscillations (eg fluctuations in CO2 levels) and are inherently unstable



Eckert DJ. Sleep Medicine Reviews. 2018.

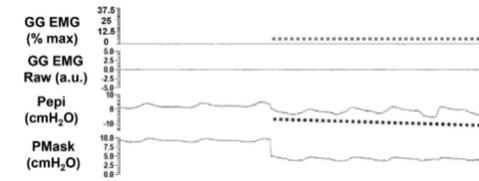
Phenotype-specific vulnerability to postoperative complications

Phenotype #1: Impaired upper airway anatomy



- **CPAP delivery**
 - Often impaired
 - Postoperative CPAP compliance \approx 45%
- **Rostral fluid shifts**
 - Cardiac failure, renal impairment
- **Opioids**
 - Conflicting evidence
 - High doses (+ other CNS depressants) would likely worsen upper airway stability post-op

Phenotype #2: Impaired upper airway dilator muscle function



• Opioids

• Conflicting evidence

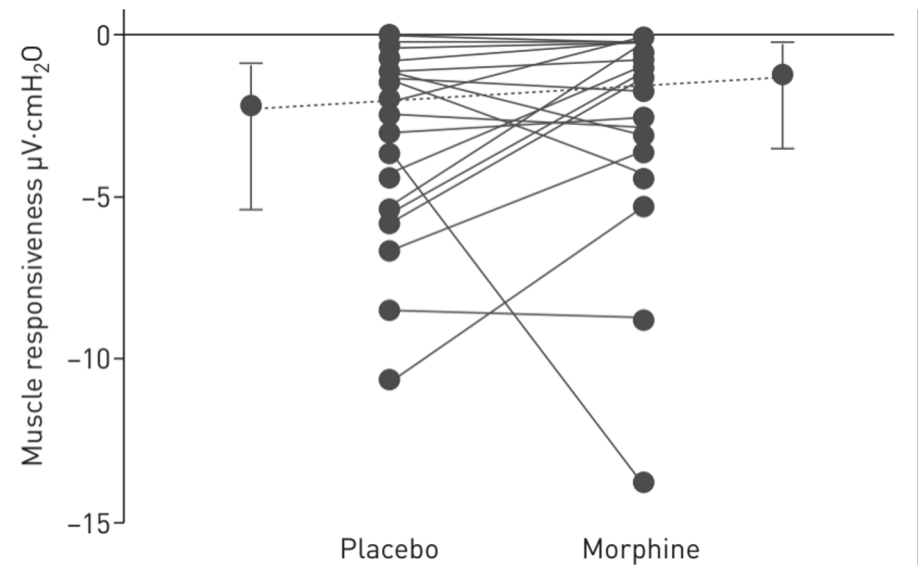
- Animal studies: fentanyl reduces upper airway dilator muscle function
- Humans: no change on morphine (limited data)

• Neuromuscular blocking agents

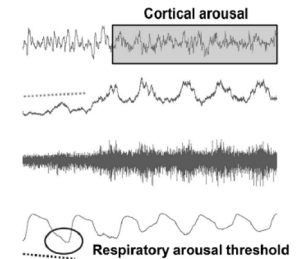
- Partial blockade reduces genioglossus function
- Incomplete reversal post-op likely worsens upper airway dilator muscle function

Morphine alters respiratory control but not other key obstructive sleep apnoea phenotypes: a randomised trial

Rodrigo T. Martins, Jayne C. Carberry, David Wang, Luke Rowsell, Ronald R. Grunstein, Danny J. Eckert
European Respiratory Journal 2020 55: 1901344; DOI: 10.1183/13993003.01344-2019



Phenotype #3: Low respiratory arousal threshold



- **Opioids**

- Low arousal threshold

- CNS depressant effects could paradoxically reduce OSA severity

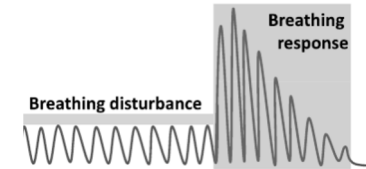
- (extrapolated from sedatives/hypnotics studies)*

- Normal/High arousal threshold

- Opioids expected to increase risk of opioid-induced ventilatory impairment in high AT/severe OSA

Importance of characterizing phenotypes!

Phenotype #4: High loop gain

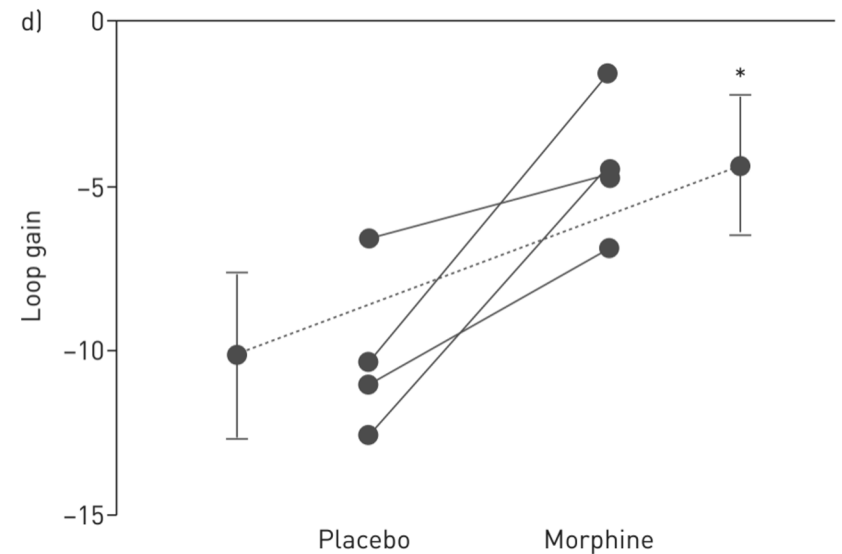


• Opioids

- Morphine reduces the ventilatory response to hypercapnia in OSA (very limited evidence)
- High LG mild-mod OSA may paradoxically improve with opioids

• Supplemental O2

- O2 reduces peripheral chemoreceptor responsiveness to hypoxia and hypercapnia in OSA
- Reduces OSA severity in high LG OSA
 - *Care in post-op setting: CO2 retention*



Martins et al. 2020 ERJ

Conclusions

- OSA is a heterogeneous disease
- Increased risk of post-op complications
- Underlying OSA phenotypes react differently to potential post-op risk factors (eg opioids)
- Importance of OSA phenotype characterization

FEATURED ARTICLES: SPECIAL ARTICLE

Vulnerability to Postoperative Complications in Obstructive Sleep Apnea: Importance of Phenotypes

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