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# ApniBloc

*A novel device to reduce apnea during endoscopies under sedation*



## BACKGROUND

**Sleep apnea** occurs when the tongue and throat muscles relax during sleep, blocking the airway and causing pauses in breathing.

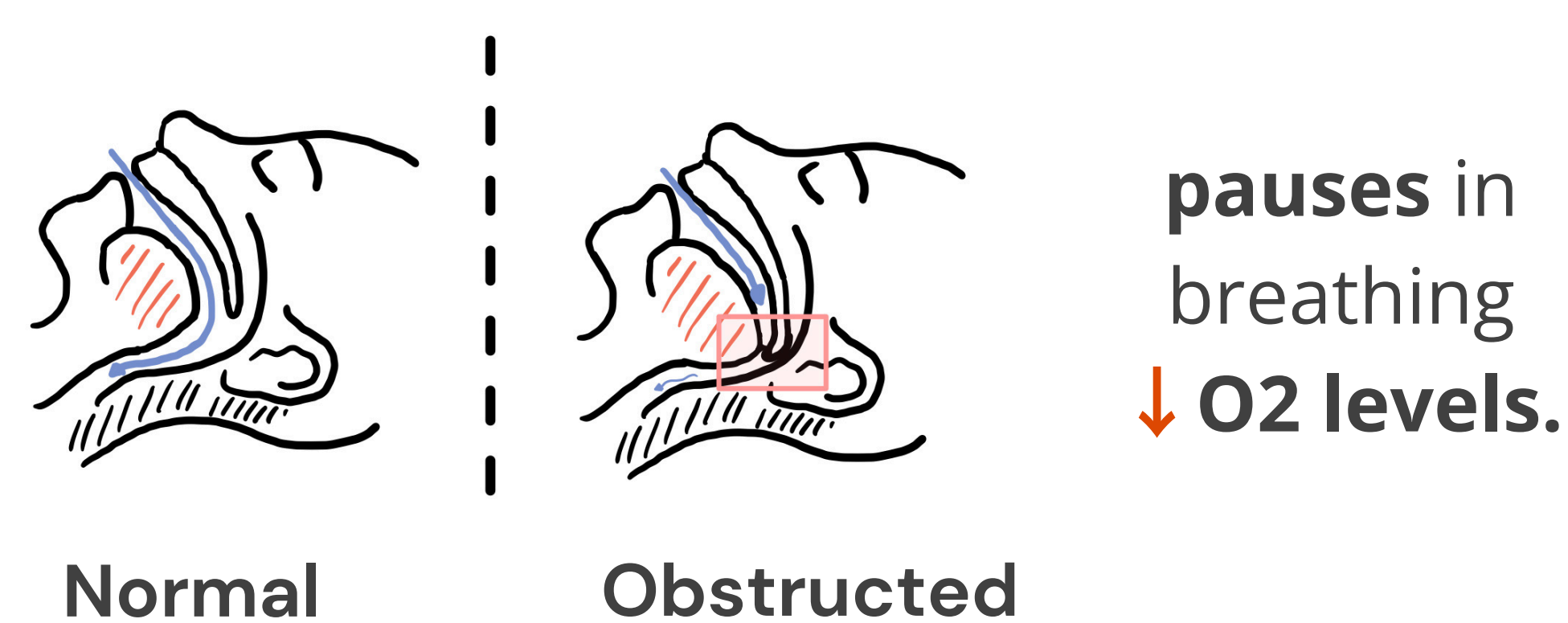


Fig 1. Airflow in Sleep Apnea

Patients normally wake briefly to resume breathing, but anesthesia blocks this reflex, causing oxygen levels to plummet. This is challenging during endoscopies, where patients breathe independently and many (41%)<sup>2</sup> have sleep apnea. Middle-aged men face highest risk of airway complications.<sup>3</sup>

### The 'gold standard' intervention falls short

When patients experience apnea, anesthesia providers open the airway by pulling the jaw forward (jaw thrust). While effective, this intervention has several drawbacks.



Fig 2. Jaw Thrust

#### Limitations:

- ✗ Temporary
- ✗ Physically demanding
- ✗ Risk of patient injury

When interventions fail, the **procedure is stopped.**

If breathing is not regained, patients **must be transferred to the ICU**

**6.7%**

Risk of ICU stay following sedation for sleep apnea patients in the US<sup>4</sup>

## NEED

**Anesthesia providers** must maintain airway control in **middle-aged male patients** with sleep apnea to **reduce post-operative hospitalization** following endoscopies.

## OUR APPROACH

A **hands-free** bite block and chin strap system that **continuously maintains a jaw thrust** to **proactively prevent apnea** episodes under sedation, **reducing anesthesia provider strain** and **improving post-operative patient outcomes.**

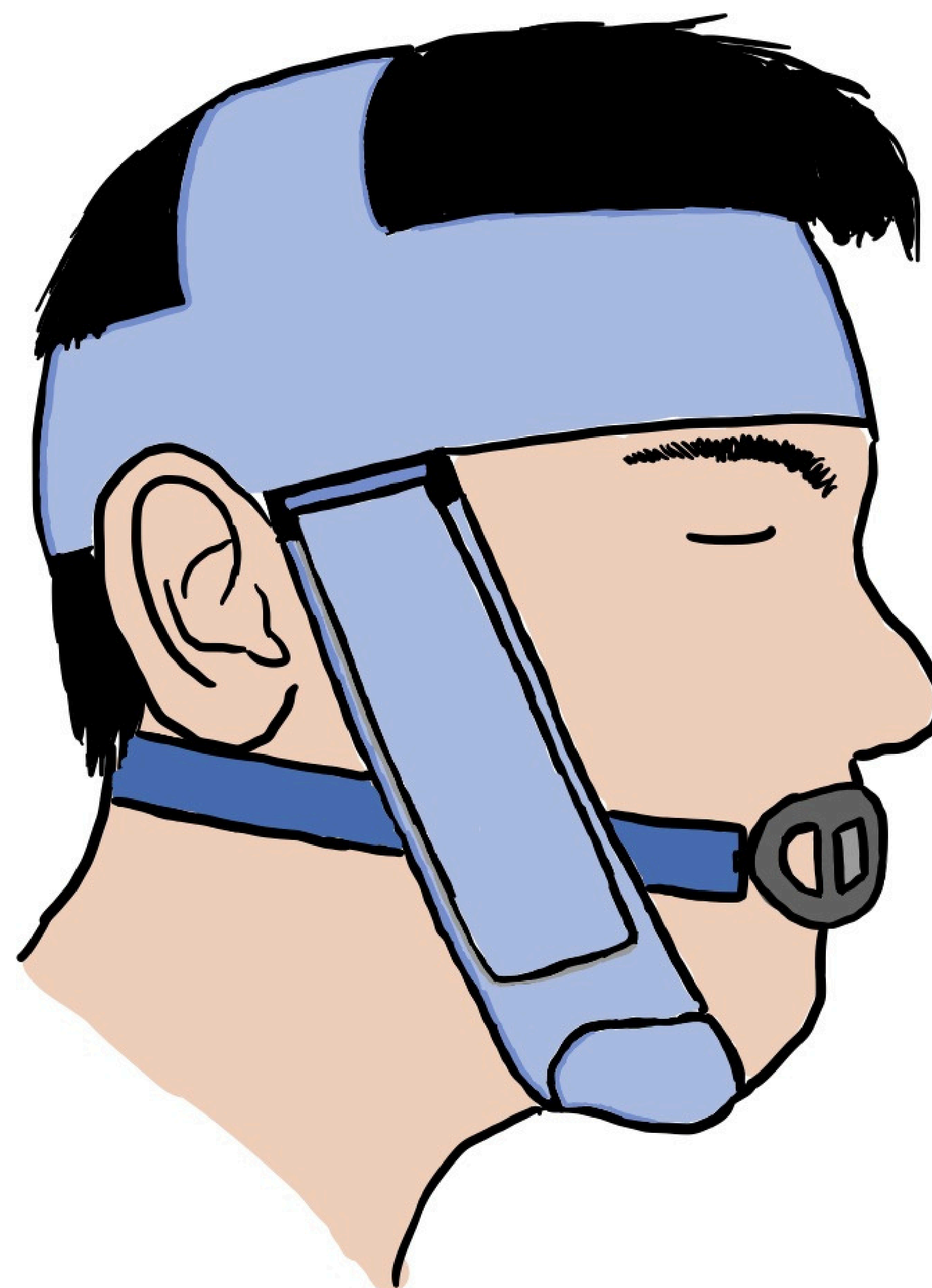


Fig 3. Schematic of ApniBloc system

### Chin Strap

*Applies upward pressure to secure bite block*

- Reusable
- Soft neoprene material prevents chafing
- Universal fit with adjustable Velcro straps
- Quick-release mechanism for emergency removal (<10 sec)

### Bite Block

*Displaces mandible forwards ("jaw thrust")*

- Single use
- Soft bite plates to protect teeth
- Large central endoscope hole
- Available in multiple sizes

### Effectively Resists Bite Force

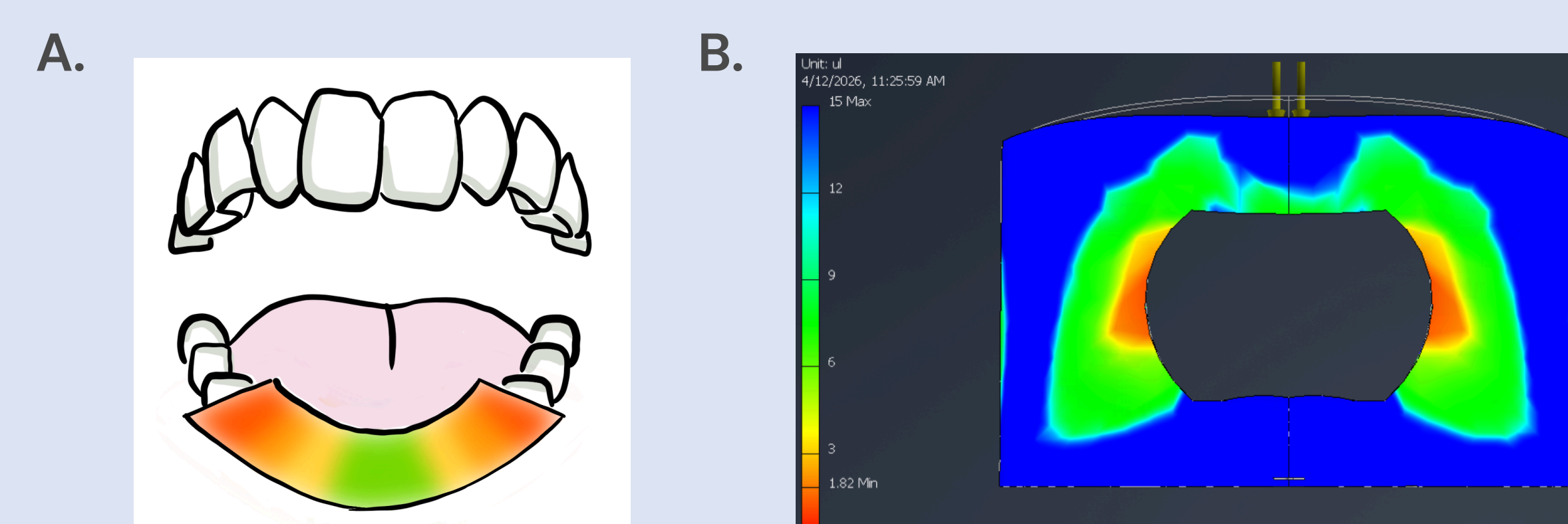


Fig 4. (A) Diagram of forces applied in Finite Element Analysis (FEA), with bite forces ranging from 81 psi at the incisors (green) to 162 psi at the premolars (red). (B) FEA simulation showing safety factor of device in response to maximum human bite force (81 - 162 psi).<sup>5</sup> Safety factor > 1 across the entire device, indicating effective resistance of bite force.

### Performs Jaw Thrust Ex-Vivo

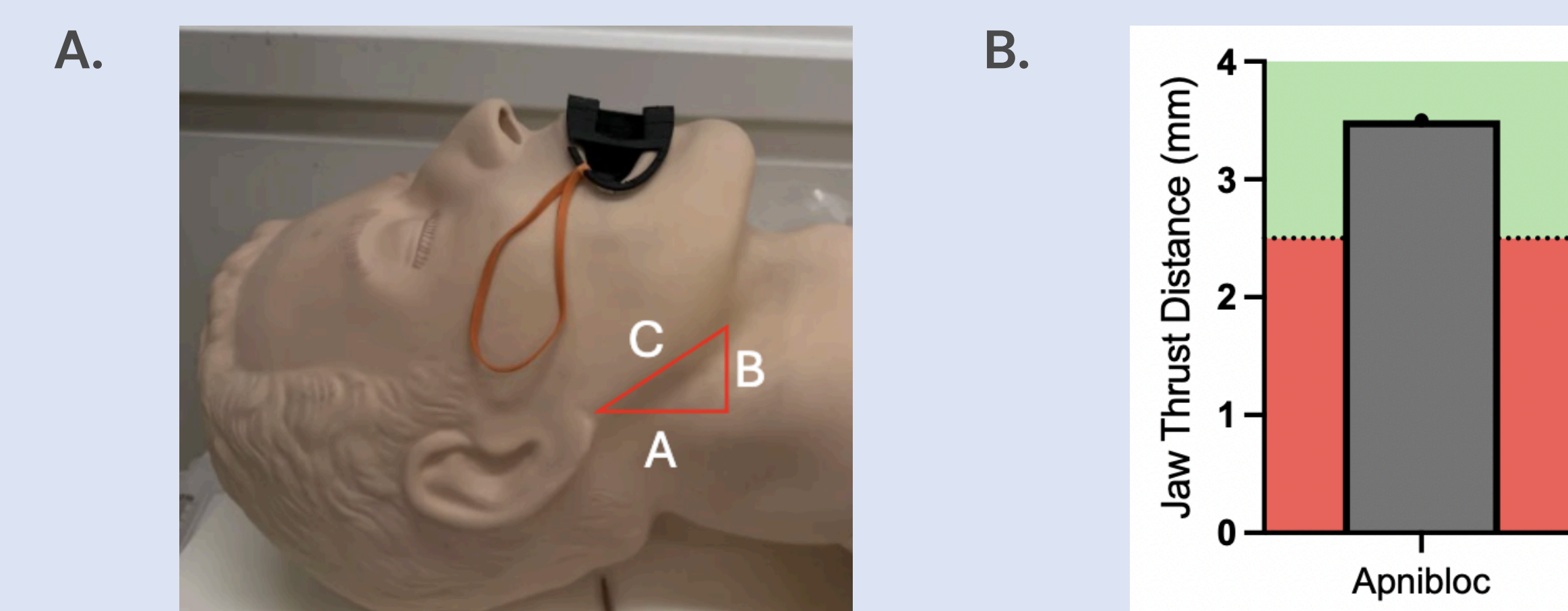


Fig 5. Device performance in Laerdal Airway Management Trainer. (A) Measured distances. Segment B represents the jaw thrust distance. (B) ApniBloc performs a 3.5 mm jaw thrust, exceeding minimum effective jaw thrust of 2.5 mm (dashed line). Baseline measurements obtained using a standard 48 fr bite block.

## REFERENCES

Image Attributions: Fig 2 from <https://medicetests.com/units/airway-obstruction>. Logo generated by Gemini. All other images were created by RW, JT, TB.  
<sup>1</sup>Cohen, F., Abayomi, N., Sariello, A., Anarantam, J., et al. (2025). Adverse events in patients with obstructive sleep apnea undergoing procedural sedation in ambulatory settings: An updated systematic review and meta-analysis. *Sleep Medicine Reviews*, 80, 102029.  
<sup>2</sup>Senarathna, C. V., Perret, J. L., Lodge, C. J., Lowe, A., Campbell, B. E., Matheson, M. C., Hamilton, G. S., Dharmage, S. C., & Walters, E. H. (2021). Prevalence of obstructive sleep apnea in the general population: A systematic review. *Sleep Medicine Reviews*, 34, 70-81.  
<sup>3</sup>Garvey, J. F., Pengo, M. F., Drakatos, P., & Kent, B. D. (2015). Epidemiological aspects of obstructive sleep apnea. *J. Thorac. Dis.* 7(5):920-929.  
<sup>4</sup>Vasut, S., Grewal, R., Doghrami, K. (2012). Obstructive Sleep Apnea Syndrome and Perioperative Complications: A Systematic Review of the Literature.  
<sup>5</sup>Human Bites: Symptoms, Treatment, Causes & Outlook. Cleveland Clinic.