Fixing Stomach Problems With Ablation

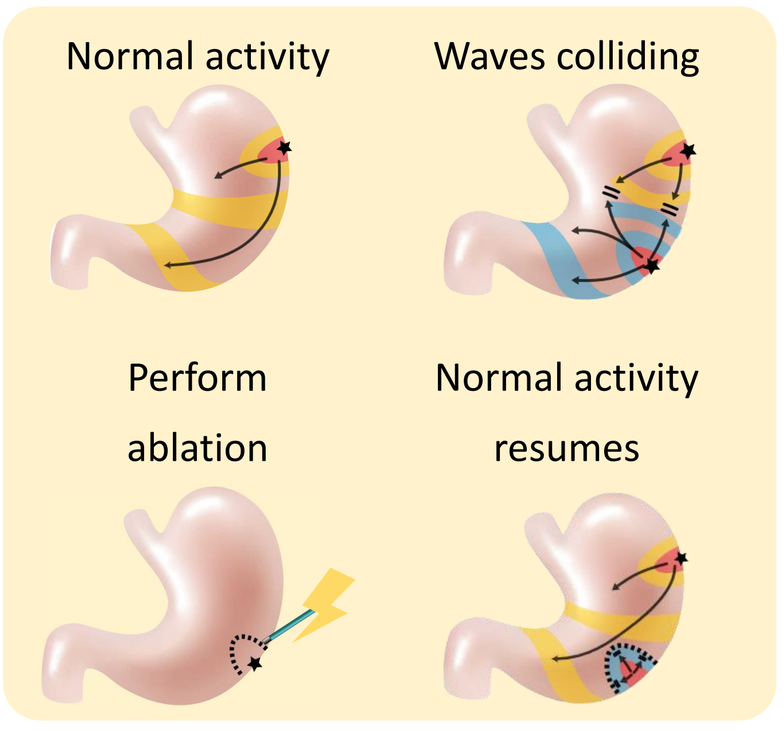
Ashton Matthee, Zahra Aghababaie, Greg Sands, Tim Angeli-Gordon

UNIVERSITY OF AUCKLAND Waipapa Taumata Rau NEW ZEALAND

AUCKLAND BIOENGINEERING INSTITUTE

BACKGROUND

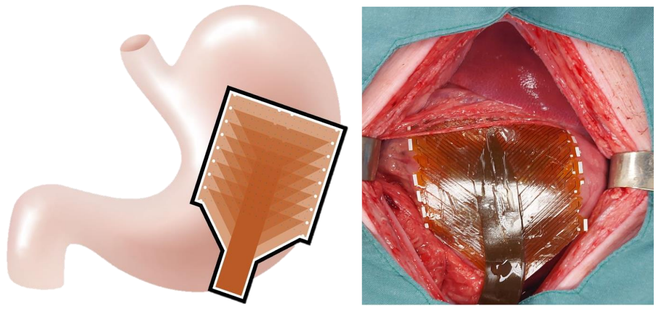
- Just like the heart, the **stomach is electrically active**. The electrical activity propagates down the stomach in waves. These waves are called **slow waves**, and they cause the stomach to contract which helps to break down the food we eat.
- Sometimes these slow waves go in the **wrong direction**, or they **collide** with each other. These behaviours have been **associated** with several **gastrointestinal disorders** which have symptoms like **nausea, vomiting,** and **pain**. These disorders affect over 40% of the population[1] and are difficult to treat. A **targeted treatment** to correct abnormal slow wave activity is **required**.
- **Radiofrequency ablation** is where we can use an electrical current to 'burn' and destroy the part of the stomach causing the disruption which **restores normal activity**. However, this ablation has been limited to only one setting and application[2].



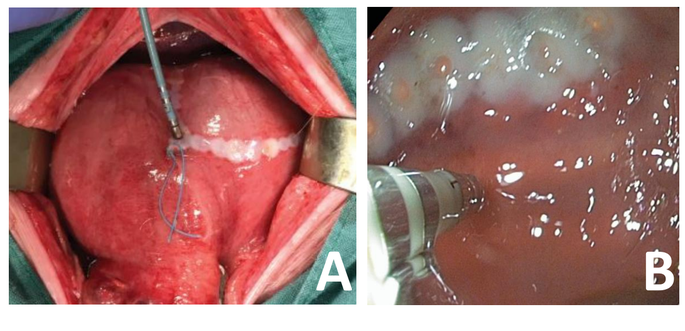
STUDY AIMS

To perform ablation on both the outer (serosal) and inner (mucosal) surfaces of the stomach and investigate different settings to identify the best application for blocking abnormal slow waves and translating to clinic.

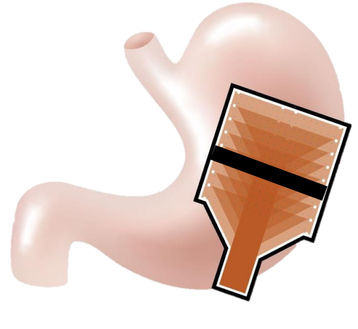
METHODS



Record baseline slow-wave activity using high-resolution electrode arrays



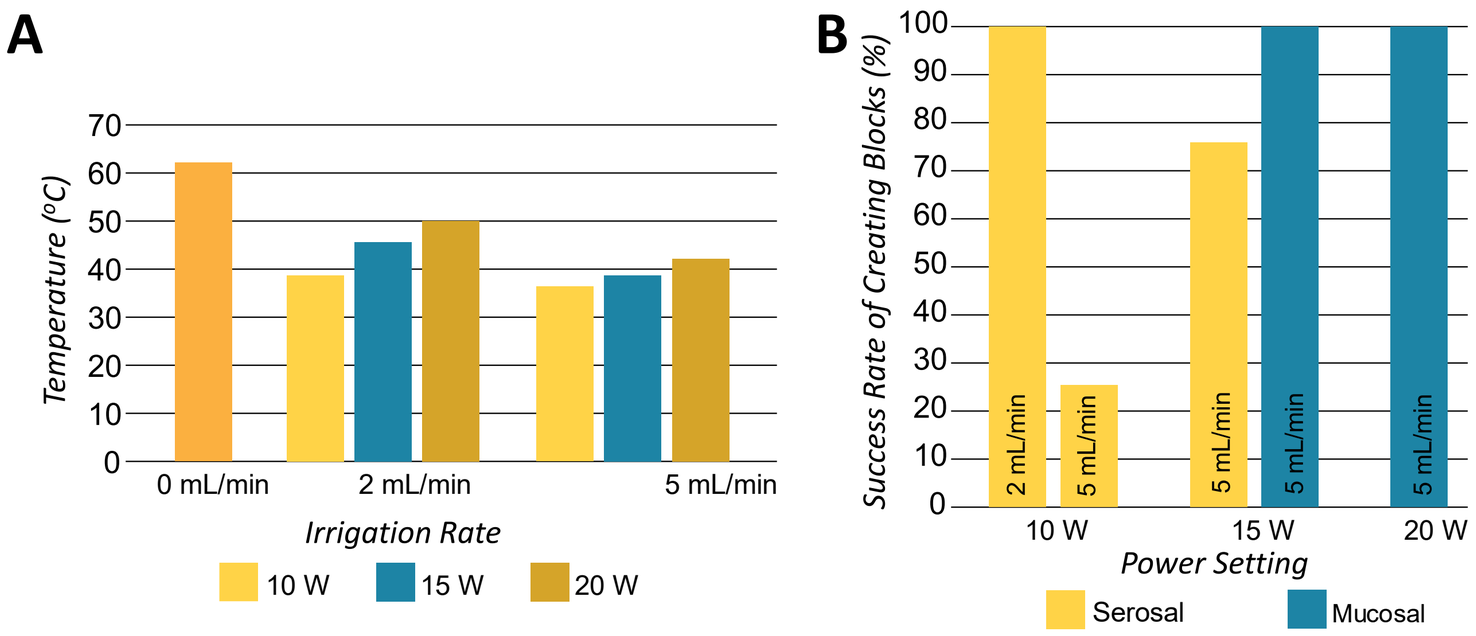
Ablate and overlap lesions to create a line on the (A) serosal and (B) mucosal surfaces with several different power and irrigation settings.

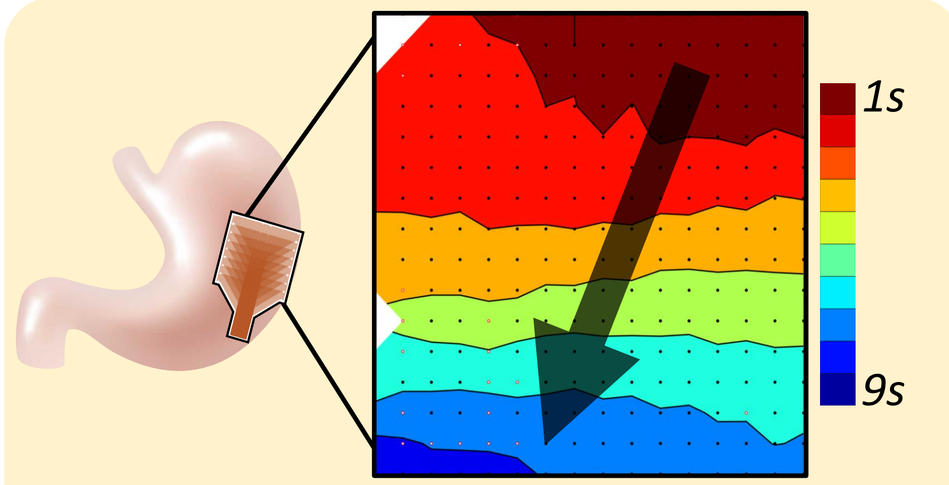


Record slow waves after ablation to verify change to slow wave activity

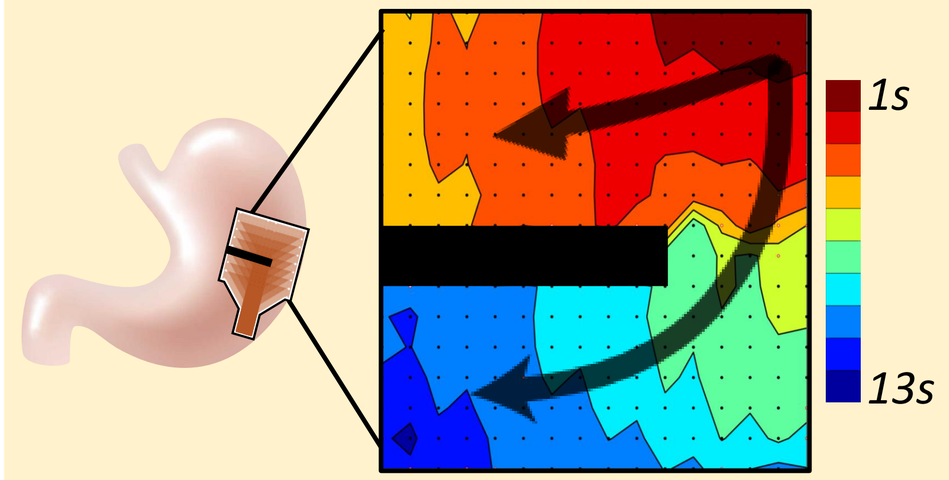
RESULTS

- Irrigation with saline during ablation effectively decreased temperature, and successfully prevented impedance rise, decreasing the risk of complications (A).
- Increasing power or decreasing irrigation rate increases the likelihood of a conduction block forming on the serosal surface (B).
- Ablation to the mucosal surface was performed via minimally-invasive endoscopy for the first time, with all settings investigated effective in creating conduction blocks.





Activation map before ablation *of a single slow wave showing propagation from early (red) to late (blue) activation.*



Activation map after ablation *showing how the slow wave splits around the lesion (black bar) but does not cross it.*

CONCLUSIONS

- We have defined an **effective range of ablation settings** for creating conduction blocks on both surfaces, **suitable for clinical translation** to eliminate abnormal slow wave activity in diseased patients.
- All ablations performed with **no safety issues** during procedure.
- **Minimally-invasive mucosal ablation was more successful** than invasive serosal ablation, presenting an attractive solution for clinical application.

Acknowledgements

Ethical approval was obtained from the University of Auckland Animal Ethics Committee (AEC3090). We thank Johnson and Johnson for donation of ablation equipment and Mrs. Linley Nisbet for her expert assistance.

References

[1]Sperber *et al.* **2021** Gastroenterology 160(1):99-114

[2]Aghababaie *et al*. **2021** Am J Physiol Gastro Liver Physiol 320(4):G573-G585

RUTHERFORD DISCOVERY FELLOWSHIPS · ROYAL SOCIETY TE APĀRANGI · TARGET LABORATORY