Effect of transcutaneous median nerve stimulation on atrial electrophysiology

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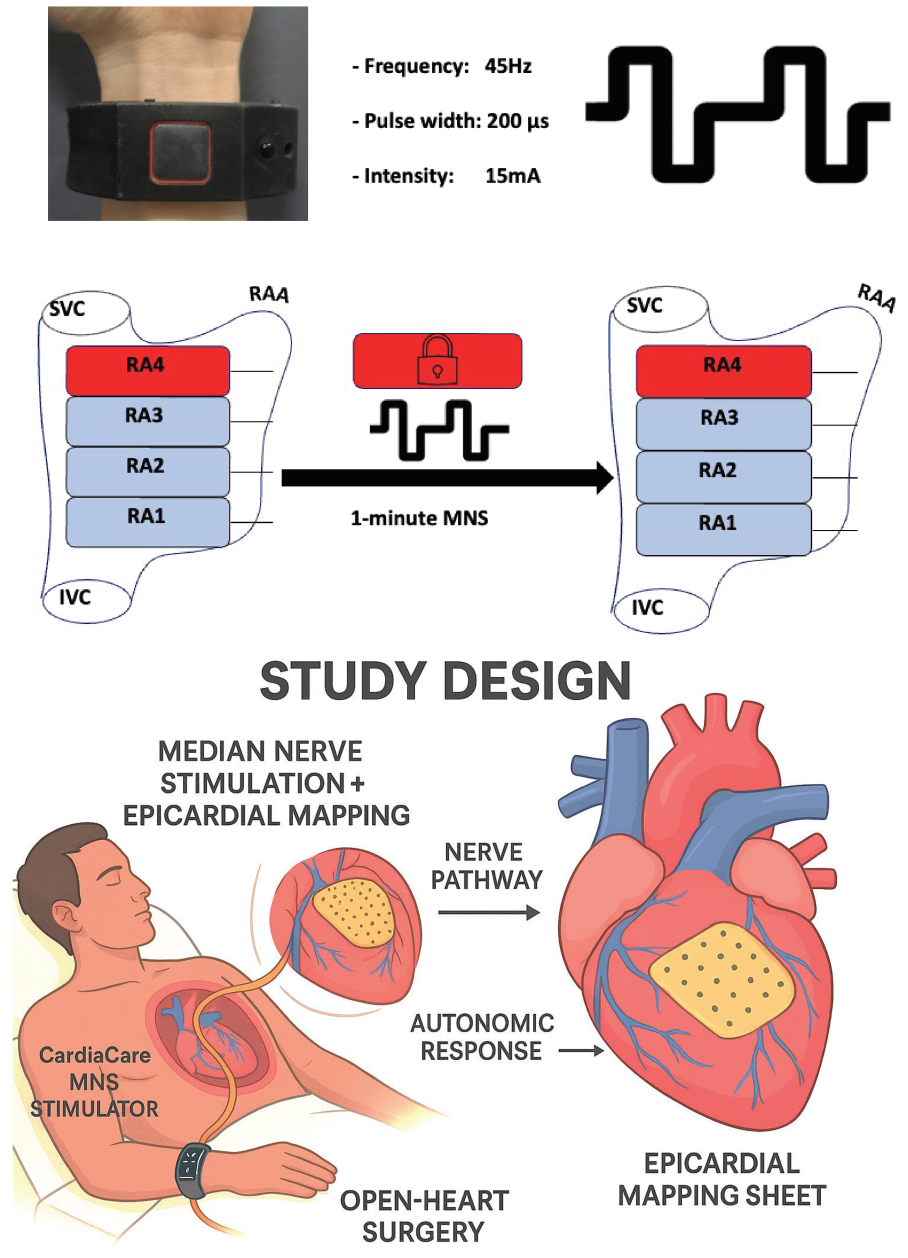
Background

Neuromodulation approaches such as low-level vagus nerve stimulation (LLVNS) have emerged as promising therapies for **atrial fibrillation** (AF).

In canine model, median nerve stimulation (MNS) reduced AF inducibility via autonomic modulation, suggesting that MNS may be a novel therapy for AF.

This study aimed to investigate the effects of **transcutaneous MNS (tMNS)** by a user-friendly, digital neuromodulation wearable (StimCardio™- formerly CardiaCare) on atrial electrophysiology.

Methods



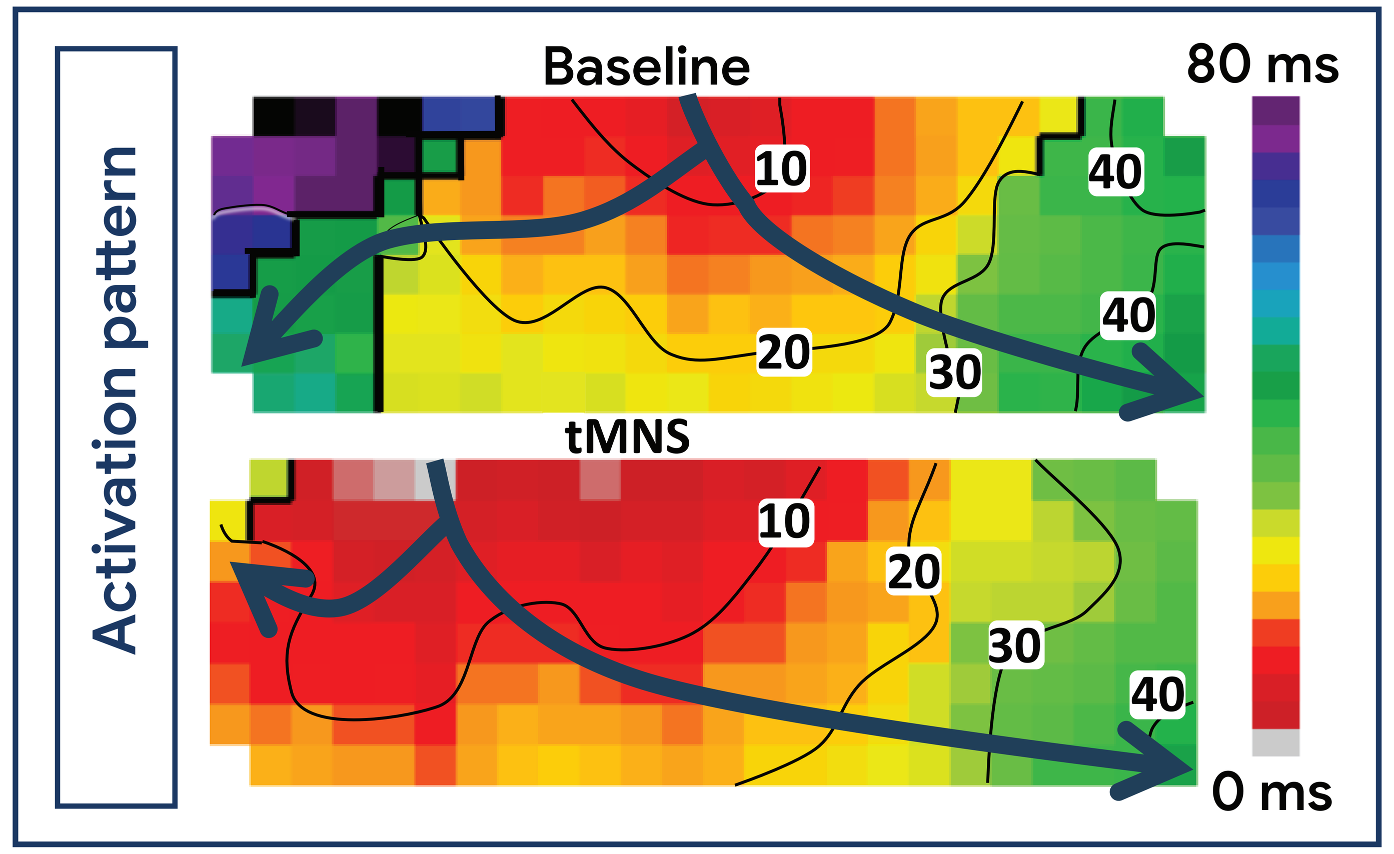
- Design: Prospective, controlled nonrandomized, proof-of-concept
- Ethics approval obtained (MEC-2024-0499)
- Written informed consent from all participants
- Surgical procedures: CABG, mitral/aortic valve surgery
- Intraoperative high-resolution epicardial mapping (interelectrode distances: 2mm, diameter: 0.45mm) of the right atrium was conducted before and during tMNS.
- tMNS neuromodulation was performed using a digital neuromodulation wearable and delivered at the right or left wrist.
- Mapping was performed before and after one-minute tMNS.
- Control arm: no stimulation

Results

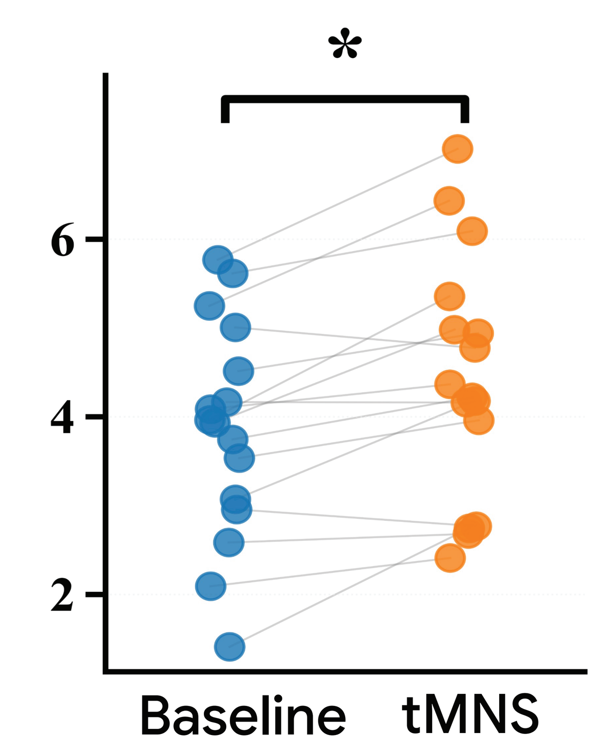
Population: N= 25 patients undergoing elective open-heart surgery

- MNS group: n=20 (16 male age 65 [41-78] years)
- Control group: n=5 (3 male, age 71 [54-73] years)

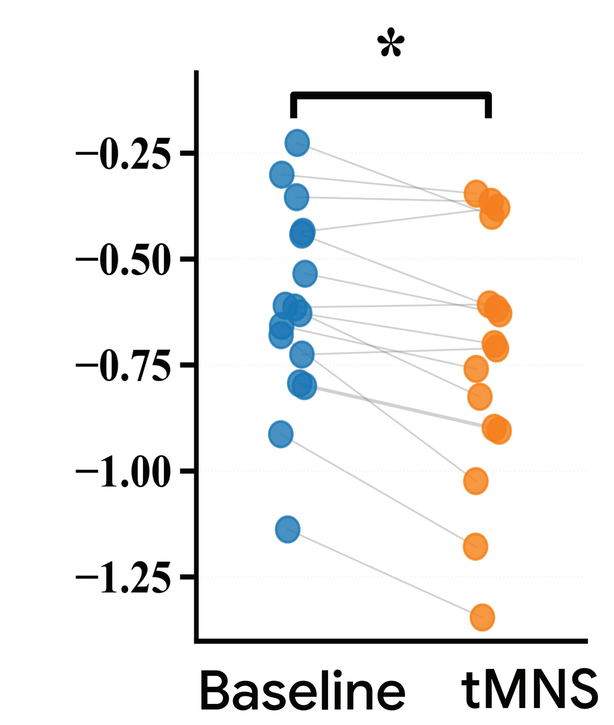
Parameter	Baseline	During MNS	p-value
Voltage	3.95 mV [3.04-4.64]	4.29 mV [3.66-5.08]	0.001
Slope	-0.62 V/s [-0.74 to -0.44]	-0.71 V/s [-0.90 to -0.55]	0.001
LVA	8.49% [6.28-11.6]	7.01% [5.43-9.68]	0.011



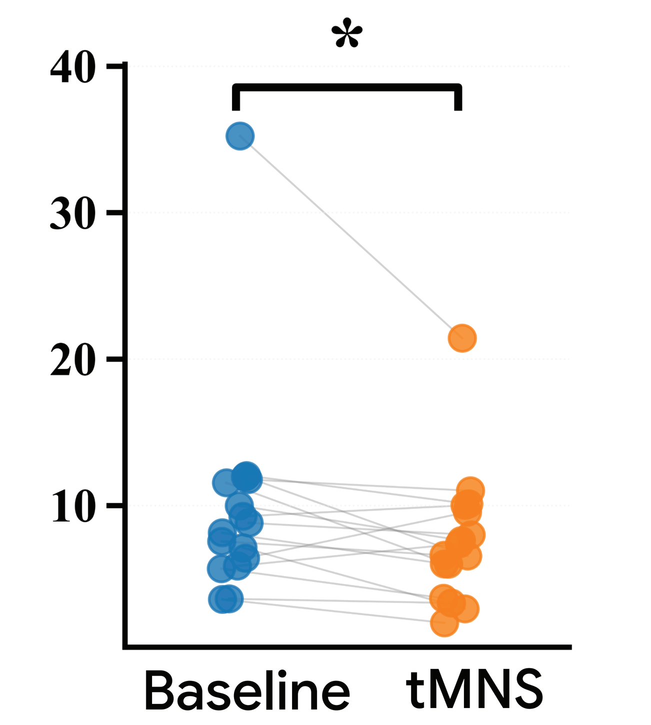
Voltage (mV)



Slope (V/s)



LVA (%)



Conclusions

tMNS acutely modulates atrial electrophysiology and Improves local intra-atrial conduction by **changing activation patterns (likely due to altering SAN exit sites), unipolar potential voltages, slopes and low voltage areas (LVA).** These findings provide mechanistic insights into the effects of MNS and support its advancement as non-invasive AF therapy.