TU684 Feasibility and Efficacy of Transcutaneous Vagus Nerve Stimulation for Knee Osteoarthritis Pain

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Background

- Central pain mechanisms are major contributors to knee osteoarthritis (**OA**) pain
- Diminished parasympathetic function has been reported in knee OA, and a major contributor to central pain mechanisms
- Transcutaneous auricular vagus nerve stimulation (**tVNS**) aims to improve parasympathetic function
- However, tVNS has not yet been used as a pain-relieving treatment in knee OA

Objective

To test the safety and preliminary efficacy of tVNS on knee OA pain

Methods

Design: A pilot trial with a single study visit

Sample: People with Knee OA


tVNS: A 60-minute, strong & comfortable intensity (up to 15mA)

Outcomes were assessed at baseline, immediately after, and 15 minutes after tVNS

Knee Pain: a 0-10 numeric rating scale during a 20-meter walk; minimally clinically important improvement (**MCII**) ≥2/10


Parasympathetic Function

Heart rate variability high-frequency power

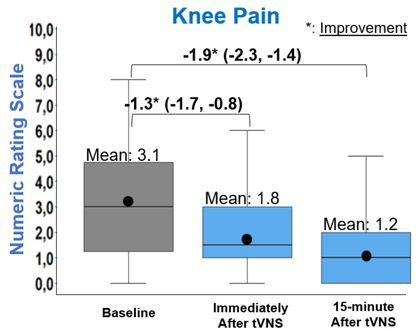
- HR monitor & validated app
- Higher high-frequency power indicates greater parasympathetic function

tVNS may be an innovative non-pharmacological treatment for knee OA pain by modulating parasympathetic function, which needs to be confirmed in large clinical trials

Results

Participant Characteristics	Age mean (SD)	Women n (%)	BMI mean (SD)	Hispanic n (%)	Depression n (%)	Anxiety n (%)	Poor sleep n (%)
N=30	55 (7.8)	20 (67)	33.1 (6.2)	25 (83)	7 (23)	10 (33)	20 (67)

Mean Differences (95% CI), Before and After tVNS

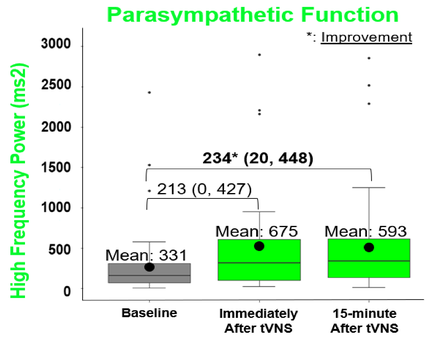


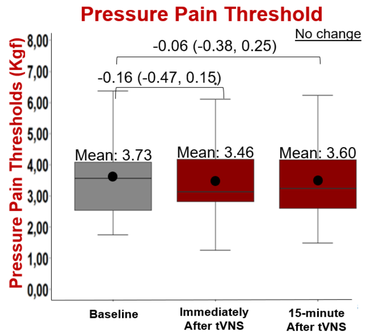
Safety and Feasibility

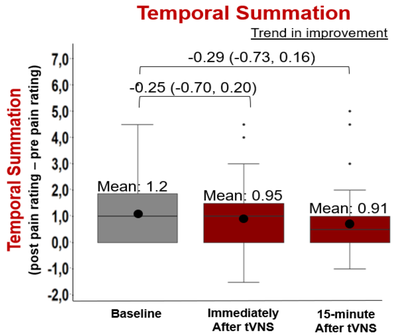
All completed the tVNS without difficulty

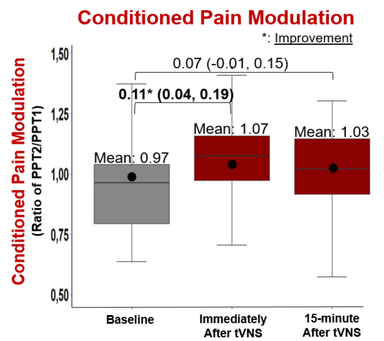
- 28/30 had no side effects
- 2 experienced either momentary nausea or dizziness

Knee Pain: 11/30 (37%) exceeded MCII









Methods, continued

Central Pain Mechanisms

Pressure Pain Threshold

- Algometer at the wrist
- Lower PPT → greater central sensitivity

Temporal Summation

- 10-second train at 1Hz with a weighted probe
- An increase in pain → central sensitization

Conditioned Pain Modulation

A ratio PPT2:PPT1 ≤ 1 → Inefficient CPM

- Analytic Approach: Linear Mixed Models
  - Changes in the outcomes after tVNS

Discussion

- A 60-minute tVNS was safe and feasible
- tVNS successfully engaged parasympathetic function in knee OA
- tVNS improved knee OA pain without local intervention
- It may suggest improvement of central pain mechanisms through modulating parasympathetic function
- Need a large fully powered trial to confirm its effectiveness on knee OA pain

Limitations:

- No control group
- A single tVNS session
- Most of the sample was people with Hispanic background

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