SEARCH PROTOCOL

COVER PAGE

Title: Tongue electrical stimulation with dental ULFTENS: comparison of stimulation at the tragus and on the lingual mucosa

Protocol NCT:

Date: 15 December 2021

PROJECT SUMMARY

Trigeminal neurostimulation of the dorsal anterior mucosal surface of the tongue has been proposed to treat a variety of pathologies and to promote neuro-muscular coordination and rehabilitation.

ULFTENS dental can also be considered a form of trigeminal neurostimulation applied to the skin surface bilaterally at the level of the tragus. With the latter mode of administration, there are central effects that can be evidenced at the level of pupil size (7,8), on the descending circuits that modulate pain, probably also on the centers that control arousal (9) and autonomic response under stress conditions monitored by HRV (10). The sensory component of the tongue is particularly developed, and the tongue itself is involved through its senses in a more complex modulation of sensory afferents than the tragus area, The aim of our project is to evaluate and compare the effects on two parameters of Heart Rate Variability (Low frequency, LF and Root Mean square standard deviation, RMSSD) in healthy women after 30 minutes of trigeminal electrical stimulation with dental ULF-TENS at the level of the dorsal anterior surface of the lingual mucosa or at the level of the tragus.

AIMS AND OBJECTIVES OF THE STUDY

In this work, we aim to test through the HRV collected with the PPG (Photoplethysmography) signal the possibility that trigeminal stimulation at the level of the dorsal anterior mucosal surface of the tongue is different than trigeminal stimulation performed bilaterally at the level of the tragus using ULF sensory TENS odontoid.

Should the hypothesis be confirmed, this type of stimulation could find its indication in clinical cases, especially chronic and difficult to manage, in which an imbalance of the centers controlling the autonomic stress response and the centers responsible for modulating arousal has been suggested, including some types of chronic TMD.

STUDY DESIGN.

This research is a randomized, open-label, parallel-group clinical trial (interventional study). The population examined will be patients, aged 18-30 years old female from the Department of Orthodontics at the University of L'Aquila. The study will be performed in the same department. Patients participating in the study will be selected according to the exclusion and inclusion criteria. The exclusion criteria are: presence of acute and/or chronic cardio-circulatory and respiratory disorders, metabolic and autonomic system disorders, intake of excitatory or inhibiting substances of the peripheral and central nervous system, presence of generalised anxiety and/or panic attacks or mood disorders. All female patients aged 18-30 years will be included in the study. The selected patients will be randomly divided into two groups by means of randomization software downloaded into a computer.

METHODOLOGY

The research protocol involves the following procedure: Patients will be randomly divided into cases (TUD group) and controls (tragus group)following an online randomization software. Recordings will be made in the morning, the patient will be made to lie on a medical examination chair for a total of 30 minutes. Patients in the TUD group will be given a stimulation device to be inserted on the dorsal mucosa of the tongue and connected to TENS, while the control group will have two electrodes placed at the level of the tragus and also connected to TENS. Sensors for assessing Heart rate variability using a photoplethysmograph will also

be placed on the index finger of the hands. The photoplethysmographic wave will assess two parameters of HRV: the Low Frequencies (LF) and RMSSD. For the first 6 minutes of recording, the photoplethysmographic wave of HRV in the absence of stimulation will be calculated, then both case and control groups will be activated stimulation with TENS at the level of the tongue and tragus respectively. HRV under stimulation for another 6 minutes will be re-evaluated again. Finally TENS will be turned off and HRV wave after stimulation will be evaluated for the last time.

Statistics

Descriptive Statistics:

Demographic and baseline characteristics will be summarized using means, standard deviations, medians, and interquartile ranges for continuous variables, and frequencies and percentages for categorical variables.

Primary Outcome Analysis:

The primary outcome will be analyzed using an independent t-test (or Mann-Whitney U test if data are not normally distributed) to compare the intervention and control groups. Changes from baseline to post-intervention will be analyzed using paired t-tests (or Wilcoxon signed-rank tests if data are not normally distributed) within each group.

Secondary Outcome Analysis:

If secondary outcomes are included, similar statistical methods will be applied as appropriate based on the type of data (e.g., chi-square tests for categorical outcomes, ANOVA for continuous outcomes with more than two groups).

EXPECTED RESULTS

The expected result is an effect at the level of the parasympathetic nervous system resulting in improved HRV parameters.

INFORMED CONSENT TO PARTECIPATE

The undersigned, having acquired the information referred to in Article 10 of Law 675/96, consents to the processing of his or her personal data, declaring that he or she has been made aware that such data fall within the category of "'sensitive'" data referred to in Article 22 of the aforementioned law, and authorizes the processing of his or her personal data for the purposes of diagnosis, treatment , fulfillment of administrative and fiscal obligations, as well as for statistical purposes.

Name……. Surname……. Date of Birth…/…../……./

Signed…….