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ORTHODONTICELL CLINICAL PROTOCOL

USE OF BIOLECTRIC STIMULATION TO ENHANCE ORTHODONTIC TOOTH MOVEMENT USING ALIGNER TRAYS

Background:
Dental malalignment is a very common problem, with several treatment options that offer variable success in achieving desired alignment. This includes primarily the use of braces and retainers that often require 18 months of wear, but offer little to no ability to retain the teeth in the new alignment.
Research has led to identification of the molecular basis of tooth movement(RANKL) and fixation(OPG). This knowledge has become the basis for the development of a new treatment option that is based on the use of programable bioelectric stimulation (BES) to significantly increase the local tissue expression of the RANKL or OPG.

A study was performed that compared the increase in local gum tissue expression of RANKL following direct needle injection of the protein into the gums in a rodent model vs delivery of the precise bioelectric micro-current signal for RANKL into the gum tissue. The results showed a 46% increase in expression by quantitative PCR, and an almost identical 44% increase with levels obtained with bioelectric stimulation.

This study will compare the rate of tooth movement of patients randomized to use of standard aligner trays vs aligners plus BES delivered via a mouthpiece that fits over the aligners.

GOAL:
The goal of this study is to demonstrate equivalent safety and superior ability of BES to significantly shorten the time required for desired teeth movement with the use of dental aligner trays by up to 50%.

Study Description:
This will be a prospective, randomized, double blind, sham-controlled study comparing measured tooth movement after two months of standard management with use of aligner trays versus use of aligner trays with additional use of Bioelectric Stimulation (BES). All subjects will receive a personal BES appliance/mouthpiece with embedded electrodes that fits over the aligners and will be connected to an external stimulator. Only the group randomized to aligners plus BES will receive actual micro-current stimulation, while the control subjects will have sham simulation of activating the stimulator.
Neither the patient or the PI will be aware of treatment assignment. Each patient will be given a test of tolerance to increasing levels of signal strength. The signal strength will only be actually increased in the group randomized to BES, whereas the Control patients will be told that many patients do not experience pain or discomfort with BES.

Tooth movement will be measured in all patients by a_____

The study, including the protocol and consent form, will have been approved without stipulations by a local or certified Institutional Review Board as meeting safe and good clinical practice before any subject will be enrolled.

Inclusion Criteria:

1. Age 12-30 yrs of age
2. Have moderate degree of malalignment of maxilla, mandible, or both
3. Able and willing to give informed consent and follow study instructions.
4. Able to tolerate up to 20 minutes of BES at the lowest intensity
5. Able and willing to make the required study visits.
6. Patients under 18 years of age must have the Consent Form signed by a parent.

Exclusion Criteria:

1. Allergic to lidocaine or epinepherine
2. Individuals with diminished decision-making capacity
3. Pregnancy or lactating period for females

Study Type: Open label, Single Arm, Prospective Registry
Target Number of Participants: 30
Target Number of Enrolling Sites: 2

Length of Treatment: 2 months
Frequency of Treatments: 2 x's/week
Duration of Each Treatment: 20 minutes
Total number of Treatments: 16
Location of Treatments: All treatments will take place in the office of the Orthodontist conducting this study.

Screening Evaluation of Bioelectric Stimulator:

All subjects will have a mouthpiece placed over their aligner tray which is then connected to the Mettler bioelectric stimulator that has been previously tested and proven to be capable of delivering the required signals. The current from the stimulator will be gradually increased in intensity to define the level (1-5) that is comfortable for that patient, and will be the intensity level used for that patient throughout the study at each treatment. If well tolerated, the patient will be eligible to participate in the Registry. A simulation of this test will be conducted for the patients assigned to Control but will not have any current delivered during this test.

Treatment:
Each enrolled patient will return to the office of the Orthodontist conducting the study for the required treatments set forth above, which will be the same throughout the study.

Follow Up Evaluations:
Images of the teeth will be obtained at baseline, and after 1 and 2 months of treatment to measure and document the comparative tooth movement.

End Points:

Co-Primary Outcome Measure:
1. Comparative difference in quantitative tooth movement

2. Incidence of treatment-related adverse events by the end of the treatment period, to include, but not exclusively, local pain, signs of inflammation or irritation on the gums.

The Registry will be paused if a total of 3 of the study subjects experience a treatment-related side effect of at least moderate severity. It will be restarted when additional investigation yields a clear cause and effective action plan has been implemented.

Data Analysis:

Data will be collected for each patient and analyzed at two time points including when half of the patients have reached the one month time point of treatment and when the last enrolled individual has reached the 2month post treatment time point. The Registry may be stopped if the data demonstrates a > 50 % improvement in tooth movement.