

Effectiveness of LORETA Z-score Neurofeedback in the treatment of headaches

ABSTRACT

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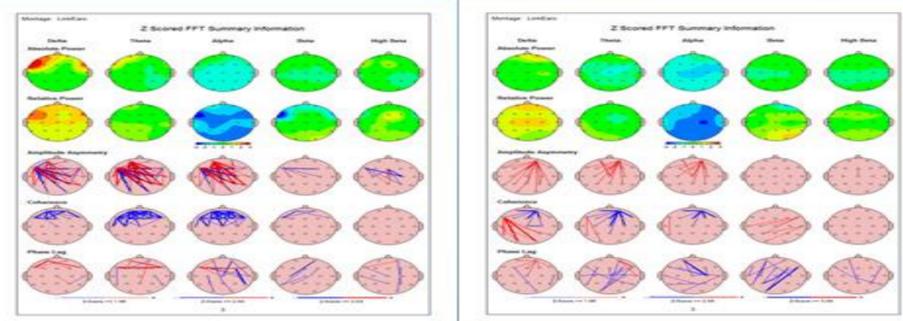
Introduction: Z-score LORETA Neurofeedback (NFB) is a new form of EEG-biofeedback which has been a promising tool in the treatment of several neuropsychiatric symptoms. Prior published papers with quantitative electroencephalography (QEEG) reports indicated elevated beta power in patients suffering from chronic headaches. Previously 1-2 electrodes NFB was shown to be an effective treatment of patients suffering from chronic pharmaco-resistant migraines. EEG-biofeedback uses scalp recordings and delivers biofeedback based on feedback from the brain as well as surrounding tissue including scalp muscles. The aim of this study was to evaluate effectiveness of this form of therapy in the treatment of chronic headaches.

Materials and methods: Patients enrolled in this study included those with frequent migraines, chronic tension headaches and other head pains. The design of this study was to complete a QEEG before beginning NFB in order to conduct QEEG-guided biofeedback treatment. A QEEG was also completed after 10 sessions of NFB therapy to see if any objective improvement in reduction of over expressed beta power was noted. Most of the patients completed at least 10 sessions of NFB and the degree of subjective improvement (if any) was recorded.

Results: 22 patients began this therapy, 2 dropped out before the study was completed. **Eighty percent (80%) of patients (16 patients) reported subjective improvement and 70% of subjects (14 patients) had both subjective and objective improvement (reduction of beta activity on QEEG).** One patient diagnosed with chronic trigeminal neuralgia on chronic pregabalin (Lyrica) therapy was able to discontinue medication completely after just a few sessions due to pain resolution. Improvements in headaches lasting longer than 3 months were usually observed. An additional "refresher" NFB therapy was completed for those patients who subsequently experienced reoccurrence of headaches.

Conclusions: This study indicates the effectiveness of Z-score LORETA NFB in pain reduction of chronic headaches sufferers. Further, a randomized double blinded study may be beneficial for further investigation of effectiveness of this type of therapy.

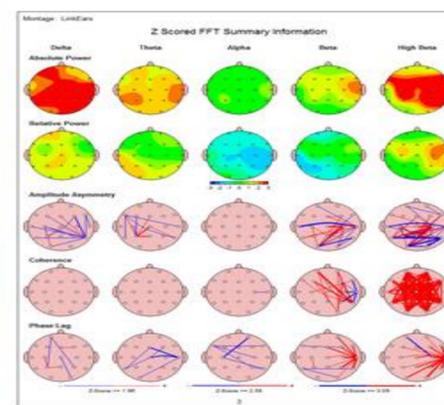
46 F with 18 months of pain due to TN on LYRICA 100 mg TID-QEEG before and after 4 sessions of NFB



Z-score surface/LORETA 19 electrodes NFB

58 year old female with long history of chronic migraine and daily HA.

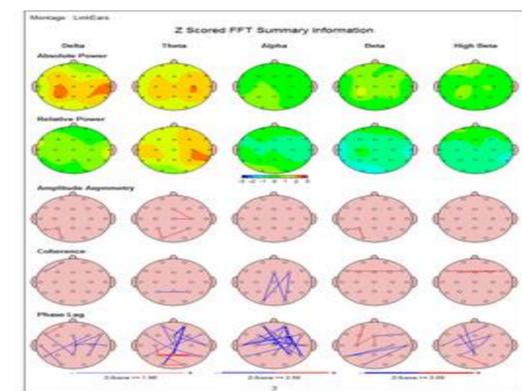
Pre-NFB QEEG (brain maps) showed marked increase in frontal and central beta power as well as increased delta and theta powers.



Z-scored surface and LORETA 19-electrodes NFB-continuation

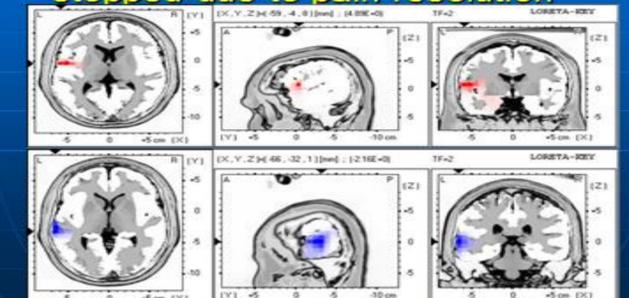
After initiation of NFB and completion of 10 sessions of therapy patient's HAs practically resolved and were in remission for 2-3 months.

F/U QEEG showed the resolution of frontal and central excess of beta activity (power).



46 F with TN LORETA before and after 4 sessions of NFB

See insular dysregulation-Lyrica was stopped due to pain resolution



INTRODUCTION:

Quantitative electroencephalography (QEEG) and LORETA has been underutilized in general neurology practice.

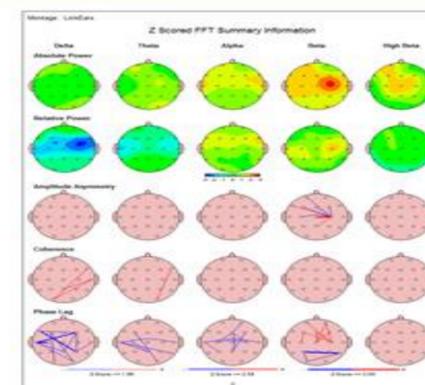
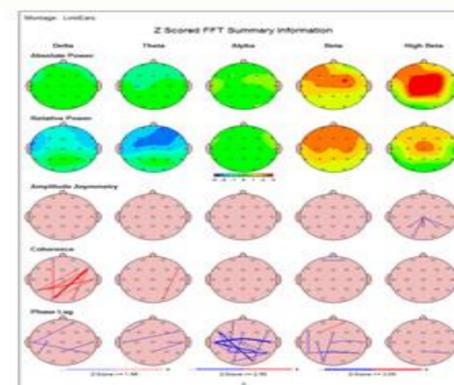
-Most neurologist are not familiar with QEEG therefore, QEEG has had very limited application in general neurology practice.

-Recent advances in computer technology have made QEEG testing relatively inexpensive and likely cost-effective (approximate USA insurance payment - \$ 300).

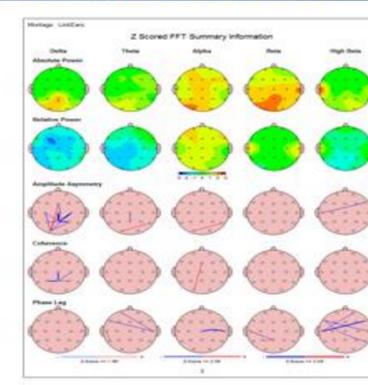
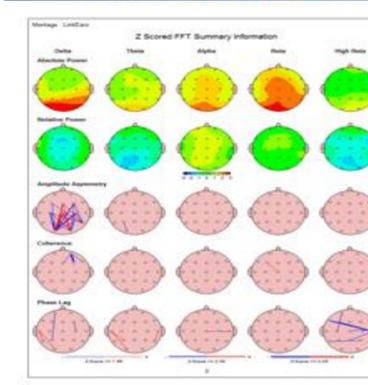
-QEEG is based on mathematical processing of 2-5 minutes of selected fragments of standard EEG recording which is able to condense the EEG data to one page color-coded summary. LORETA (Low Resolution Electromagnetic Tomography Analysis)-is a 3D mathematical transformation of QEEG data enabling relatively precise 7-10 mm localization of dysfunction (developed in the Key Institute-Zurich).This gives a neurologist unprecedented ability to look at summarized EEG information which was not previously possible with regular EEG.

This is the analysis of chronic headache cases who underwent Z-Score LORETA Neurofeedback in our practice. A commercially available QEEG software (Neuroguide, Inc.) was used for EEG and LORETA analysis. TruScan (Deymed, Inc.) EEG amplifier, software and caps were used for a EEG acquisition.

24 F with long standing Hx. of vascular and tension HA-QEEG before and after NFB



20 F with long Hx. of vascular HA and anxiety-QEEG before and after NFB



Closing Remarks

To be Determined

Detailed Analysis of Responders and Non-responders-for identification of potential bio-markers to possibly predict response to NFB

- Optimal number of NFB Sessions or NFB type (surface/LORETA)? (until desired effect?)
- Optimal frequency of NFB sessions? (daily or twice a week?)
- Discrepancy between the Subjective and Objective response rate (Placebo? or Delayed effect?).
- Duration of the clinical response after NFB? (some HA patients come back for "refresher" sessions 3-4 months after the completion of NFB therapy)

Summary

- Analysis of 20 patients from our clinic suffering from chronic HA or facial pain subjected to therapy with 19-electrodes surface and/or LORETA Z-score NFB showed 80% of subjective and 70% objective (reduction of QEEG beta activity) improvement.
- Many patients reported marked improvement after only 2-5 sessions
- Minimum Frequency of NFB-once per week.