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Efficacy of Transcutaneous Electrical Nerve Stimulation vs. Calcitonin Gene Related Peptide Antagonists in the Application of Migraine Prophylaxis

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Abstract

- Worldwide migraines affect millions of people everyday causing significant impact on their lives.
- Often times, patients have failed several first-line therapies for migraine prophylaxis.
- The purpose of this systematic literature review is to evaluate the effectiveness and tolerability of TENS devices vs. CGRP antagonists in the application of migraine prophylaxis.
- PubMed and ClinicalKey were searched with key terms, 17 sources were selected that were published after 2016.
- Sources included meta-analysis, literature review, and randomized control trials.
- Data shows that TENS devices as well as CGRP antagonists were effective and safe therapy options for migraine prophylaxis.
- More longitudinal research needs to be conducted to further evaluate the efficacy and safety profile of long-term use of these therapy options.

Keywords: Migraine, Migraine prophylaxis, Neuromodulation, TENS devices. CGRP Antagonists

Introduction

- In 2022, it was reported nearly 16% of the world's population suffered from migraines (Stovner et al).
- Current literature shows nearly 80% of patients fail first-line migraine prevention therapies based on numerous factors such as demographics, types of migraines, and availability of specific therapy options (Delussi et al., 2020)
- The purpose of this study is to better understand the efficacy and tolerability of TENS devices compared to CGRP antagonists in the application of migraine prevention.

Statement of the Problem

- Current migraine treatment options do not serve as a cure, leaving many suffering from this condition.
- Newly developed TENS device therapy targets neural pathways and pain processing centers within the brain to reduce migraine frequency.
- CGRP antagonist medications have also emerged, targeting a neuroinflammatory peptide to reduce inflammation and frequency of migraines.
- Both therapies are relatively new, leaving healthcare providers questioning the efficacy of these treatment options in prevention of migraine.

Research Question

In adult patients with migraine headaches, what is the effect of transcutaneous electrical nerve stimulation (TENS) on reduction of monthly migraine frequency compared to calcitonin gene related peptide (CGRP) antagonists for migraine prevention?

Literature Review

Prevalence of migraine

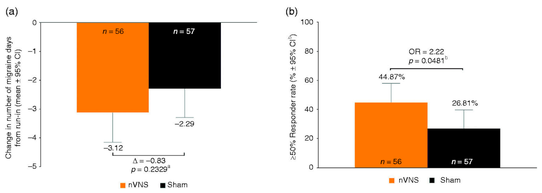
- Migraines were reported to impact nearly 16% of the world's population on a daily basis. (Stovener et al., 2022)
- The primary demographic that is impacted is women aged 20-64 years of age (Stovner et al., 2022).
- Women are impacted by migraine nearly 3x more often than men (Katsarava et al., 2012)

Application of TENS Therapy

- Meta-analysis of 19 randomized controlled trials involving 1493 participants showed TENS devices were effective in reducing monthly migraines (Cheng et al., 2022)
- Secondary outcomes revealed reduction in migraine pain severity, decreased use of migraine rescue medication, and reduced cost of conventional migraine treatment (Patel et al., 2022)

Efficacy of Vagus nerve stimulators

- RCT involving 332 participants with use of nVNS devices achieved -2.26 day reduction in monthly migraines (p = 0.15). (Diener et al., 2019)
- RCT involving 113 participants achieved -3.12 day reduction of monthly migraines (p = 0.2329) (Najib et al., 2022).
- RCT focusing on chronic migraine patients displayed -1.4 day reduction in monthly migraines (p = 0.44).
- Open-label phase resulting in -6.7 day (p < 0.0001) and -7.9 day (p = 0.0009) monthly migraine reduction at 6 and 8 months respectively (Silberstein et al., 2022).
- All studies showed a decrease in acute medication usage with a mean of -2.2 days.

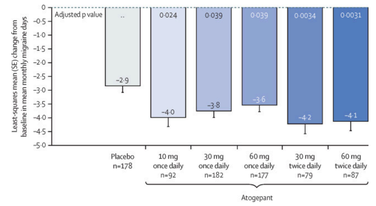


Efficacy of Supraorbital nerve stimulators

- RCT with T-SNS reduced headache days by -2.3 days (p < 0.001), demonstrating a 29.2% reduction in monthly headaches.
- Secondary outcome demonstrated -3.8 day (p < 0.001) reduction in monthly acute medication usage (Vikelis et al., 2017).
- Second RCT with T-SNS achieved -4.0 day (p = 0.0163) reduction of monthly migraines with -5.0 day (p = 0.11) reduction in monthly acute medication usage (Ordas et al., 2020)
- T-SNS is more effective in younger patients with a shorter history of migraine duration.

Efficacy of CGRP antagonist therapy

- RCT using different doses of galcanezumab demonstrated -4.8 day reduction in monthly migraine days with galcanezumab 120 mg daily.
- RCT using different doses of atogepant achieved -3.6 (p = 0.15) to -4.8 days (p = 0.034) of monthly migraine reduction. Highest monthly migraine reduction of -4.8 days was observed in the treatment population receiving atogepant 30 mg twice daily.
- RCT using erenumab achieved -2.4 day reduction of monthly migraines (Reuter et al., 2018). No significant relationship was observed between doses and increased monthly migraine reduction in either study.
- Secondary outcomes with CGRP antagonists reduced acute medication usage, migraine severity



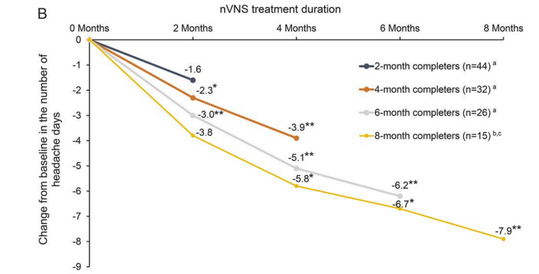
- TENS devices and CGRP antagonists were found to be effective in reducing monthly migraine days.
- nVNS devices were most effective for episodic migraines
- t-SONS showed greater benefit for chronic migraine
- CGRP antagonists were effective in reducing monthly migraine days for episodic and chronic migraine.
- TENS devices target different neural pathways compared to CGRP antagonists making them effective adjunct therapy for migraine prevention
- Overall, TENS devices and CGRP antagonists are safe and effective therapy options for migraine prevention.

Discussion

- TENS device responses have shown effectiveness in both episodic and chronic migraines, as well as reduction in acute medication usage.
- Vagus nerve stimulators were shown to be effective in the application of episodic migraine prevention
- Supraorbital nerve stimulators displayed more benefit in the setting of chronic migraine when compared to vagus nerve stimulators.
- CGRP antagonists were found to reduce monthly migraine days twice as effectively as supraorbital nerve stimulators in the setting of chronic migraine.
- When comparing TENS devices and CGRP antagonists, researchers found that these therapies targeted different pathways and reduced migraine days independent of one another. Ultimately, CGRP antagonists are more effective in migraine prevention than TENS devices.
- Overall, research shows that the usage of vagus nerve stimulators, supraorbital nerve stimulators, and CGRP antagonists are effective in the application of migraine prevention.

Applicability to Clinical Practice

- TENS devices are a safe alternative for many patients as adjunct therapy given their low side effect profile.
- Benefits of TENS devices & CGRP antagonists may take 8-12 weeks to reach full effect.
- Significant benefit was observed in reduction of monthly migraines at 6 and 8 months with nVNS device usage.
- CGRP antagonist therapy may take up to 2-3 months to reach therapeutic levels.
- Discontinuing therapy before therapeutic effects are reached may be a significant factor in poor response rates to these treatment options.
- Additionally, more research is needed to determine the prolonged effects of using TENS devices as well as CGRP antagonists.
- Concurrent use of both TENS devices and CGRP antagonists have been shown to work on different pain pathways reducing migraines synergistically without additional side effects.



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