Headache Medicine

Mechanisms of Neuromodulation in Headache: A Literature Review

Guilherme Nobre Nogueira[1]; Thaís Neri Andrade de Almeida Garcia[2]; Flávia Alessandra Mendes Barbosa[3]; Nicole Custódio Porto Silva[4]; Marianna Cassini Soares da Costa[5]; Natan de Araujo[6]; Luíza Neri Andrade de Almeida Garcia[7]; Júlia Neri Andrade de Almeida Garcia[8]; Luiza Curti6; Gabriel de Moraes Mangas[9]; Maria Tereza de Oliveira Souza[10]; Suzana Patricia Santos Rodrigues[11]; Antônio Alves Sobreira Neto[12]; Tito Bastos Siqueira Soares[12]; Li Li Min[7]

1. Universidade Federal do Ceará (Ufc), Fortaleza - CE - Brazil;
2. Universidade Federal de São Paulo, São Paulo - SP - Brazil;
3. Centro Universitário Metropolitano da Amazônia (Unifamaz), Manaus - AM - Brazil;
4. Universidade Federal da Paraíba, João Pessoa - PB - Brazil;
5. Centro Universitário de Votuporanga (Unifev), Votuporanga - SP - Brazil;
6. Pontifícia Universidade Católica do Paraná, Curitiba - PR - Brazil;
7. Universidade Estadual de Campinas, Campinas - SP - Brazil;
8. Universidade Federal de Minas Gerais, Belo Horizonte - MG - Brazil;
9. Universidade Federal Fluminense, Rio de Janeiro - RJ - Brazil;
10. Universidade Santo Amaro, Santo Amaro - SP - Brazil;
11. Universidade Federal do Maranhão, São Luis - MA - Brazil;
12. Universidade Estadual do Ceará, Fortaleza - CE - Brazil.

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Introduction

The neuromodulation is a growing area in pain medicine that encompasses both invasive and non-invasive electrical therapies. Some types, such as occipital nerve stimulation and transcranial stimulation have been studied to treat patients with headache, yet the results are optimistic and they are inconclusive.

Objective

To assess clinical efficacy of neuromodulation as potential treatment of headache based on a critical and updated analysis of literature.

Methods

The present study is an integrative literature review. Was searched through the DeCS/MeSH descriptors "Headache", "Neuromodulation" and "Cluster Headache" for the search in the PubMed, ScienceDirect and BVS databases. The period was from 1998 to 2023. 333 articles were found according to the inclusion criteria: language in English, Portuguese and Spanish, free text in full. In the end, 100 articles were analyzed, of which 6 were selected to compose the present review.

Results

This review focuses on neuromodulation therapies for treatment of primary headaches. Single- pulse transcranial magnetic stimulation and supraorbital nerve stimulation are identified as effective abortifacient treatments for episodic migraine, while initial positive evidence suggests their potential in preventing chronic migraine, is also recommended for symptomatic treatment of migraine and as a preventive treatment for cluster headache. In addition, external vagus nerve stimulation has demonstrated efficacy in the acute treatment and in the prevention of cluster headaches, continuous hemicranial headaches, and paroxysmal. Spinal cord stimulation compared to conventional medical management, appears to be more effective in cases of neuropathic pain in patients with spinal surgery failure syndrome. In general, noninvasive neuromodulation offers better tolerability due to the absence of systemic side effects and drug interactions, although pain intensity is not affected significantly. On the other hand, invasive approaches require multidisciplinary discussions and specialized teams in functional neurosurgery. Despite the notable advantages, neuromodulation techniques should be reserved for patients with headaches refractory to pharmacological treatments and still face barriers to being put into practice. Limitations include the difficulty of producing reliable data in clinical trials, the high cost of the devices, and the need for more randomized control trials to evaluate long-term efficacy.

Conclusion

There is evidence of existing efficacy for the different neuromodulation interventions in regard to the acute and chronic treatment and prevention of the various classes of headaches described in the literature. The non-invasive methods showed better adherence due to the absence of systemic side effects and pharmacological interactions and reduction in headache frequency. The notable advantages of these techniques are highlighted, but it is emphasized that they should be reserved for patients with headaches refractory to conventional treatment. Finally, it is pointed out that numerous barriers and limitations still need to be overcome for these techniques to be put into daily practice, but it has been shown to be a promising therapeutic alternative.

Keywords: Chronic Pain; Electric Stimulation Therapy; Headache; Neurology.

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