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Impact of neuromodulation targeting the trigeminocervical complex on pain reduction in refractory chronic migraine

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Introduction
Refractory chronic migraine is associated with a high degree of disability and persistent attacks, being characterized by central sensitization processes in the trigeminocervical complex (TCC). Intervention on the occipital and trigeminal nerves emerges as an alternative to promote plastic changes in the central pain pathways. This study is justified by the limited availability of evidence on the subject.

Objective
To evaluate the impact of neuromodulation targeting the trigeminocervical complex on pain reduction in patients with refractory chronic migraine.

Methods
This is a systematic literature review conducted according to PRISMA criteria to answer the question: "Is neuromodulation targeting the trigeminocervical complex effective in reducing pain in patients with refractory chronic migraine?". The search was performed in the PubMed database using the descriptors "chronic migraine", "refractory migraine", "nerve stimulation" and "neuromodulation", combined with the Boolean operator AND. Studies published in the last 10 years were included, comprising observational studies and clinical trials addressing the topic. Studies that did not present neuromodulation targeting the trigeminocervical complex as the main focus in the treatment of refractory chronic migraine were excluded. Selection was performed by reading titles and abstracts by three independent reviewers, with disagreements resolved by consensus, with a final inclusion of 7 original studies for qualitative synthesis of results.

Results
Neuromodulation targeting the trigeminocervical complex (TCC) reduced pain in refractory chronic migraine, with greater response observed in implantable occipital nerve stimulation in highly selected populations. Patients presented 17.9 to 23 monthly headache days, high disability scores on MIDAS/HIT-6, and refractoriness to multiple prophylactic classes. Combined occipital and supraorbital stimulation achieved improvement in the short and medium term, with gains in MIDAS and BDI scores restricted to the perioperative period ($p = 0.021$). Occipital nerve stimulation promoted a reduction from 17.9 to 7.3 monthly headache days, a responder rate exceeding 88% for ≥50% reduction, and improvement in MIDAS/HIT-6 scores sustained for up to 9.4 years. The therapeutic effect was attributed to continuous modulation of convergent nociceptive pathways in the TCC, reducing central sensitization and restoring the activation threshold of the trigeminovascular system.

Conclusion
Neuromodulation targeting the trigeminocervical complex was associated with pain reduction in refractory chronic migraine, with less frequent attacks, lower functional disability, and reduced medication use. Implantable occipital nerve stimulation significantly reduced attack frequency and prophylactic medication use. Despite favorable results, methodological heterogeneity and the limited volume of evidence highlight the need for larger-scale studies on the subject.

Keywords:
Neuromodulation
Occipital nerve stimulation
Chronic Migraine
Trigeminocervical complex
Refractory migraine

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