

Size matters! The neuroanatomy of trigeminal neuralgia's treatment response

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A new study published in the journal *Cephalalgia*, the official journal of the International Headache Society, shows unprecedented data regarding the neuroanatomical influence on the treatment response of patients with trigeminal neuralgia. The study, entitled "Hippocampal and trigeminal nerve volume predict outcome of surgical treatment for trigeminal neuralgia", was conducted by Dr. Tejas Sankar's research group, from the University of Alberta, Canada.

Trigeminal neuralgia (TG) is a facial pain in the lower portion of the face, mostly felt in the cheek next to the nose or in the jaw. According to the 3rd Version of the International Classification of Headache Disorders—ICHD-3, TG is described as follows:

"A disorder characterized by recurrent unilateral brief electric shock-like pains, abrupt in onset and termination, limited to the distribution of one or more divisions of the trigeminal nerve and triggered by innocuous stimuli. It may develop without apparent cause or be a result of another diagnosed disorder. Additionally, there may be concomitant continuous pain of moderate intensity within the distribution(s) of the affected nerve division(s)."

The two most common forms of TN are non-lesional types, namely, the classic TN, associated with neurovascular compression of the nerve's root entry zone, and idiopathic TN, which occurs in the absence of neurovascular compression. Occasionally, TN may be due to lesions. Microvascular decompression is a neurosurgical procedure adopted as an

alternative to patients refractory to pharmacological treatments.

Based on previous data indicating that trigeminal nerve [volume](#) and cross-sectional area appear to be consistently reduced on the affected side in patients with TN, Dr. Sankar and his team hypothesized that TN patients who do not respond to surgical treatment could be characterized by distinct neuroanatomical features.

Dr. Sankar's group assessed 37 classic or idiopathic TN patients. Neuroimaging obtained by T2-weighted [magnetic resonance](#) imaging (1.5T) was performed within the 12 months previously the microvascular decompression surgery. The trigeminal nerve, and subcortical brain structures involved in the trigeminal sensory relay (thalamus) or as potential contributors to limbic components of chronic pain (hippocampus, amygdala), were analyzed. They compared the ipsilateral and contralateral portions of the side of pain, total nerve volume (ipsilateral + contralateral), and % difference ((ipsilateral - contralateral/ipsilateral)100).

Responders rate (i.e., pain relief/no recurrence/no surgery repeat following 1 year of surgery) was 68 %, in agreement with previous studies. The main findings are listed below:

- In all patients, thalamus volume was larger contralateral to the side of pain than ipsilateral;
- Non-responders presented larger intracranial volume, trigeminal nerve volume contralateral to the pain side, and larger contralateral hippocampus volume than responders;
- Non-responders showed larger total and ipsilateral hippocampus volume than responders as well;
- The contralateral trigeminal [nerve](#) and hippocampus volume were predictors of treatment response, in which larger volumes of both structures associated with non-responders patients;

- Both ipsilateral and contralateral hippocampus were significant contributors of prediction accuracy;

Although the study reports original findings and confirms previous ones, the authors exercise caution interpreting their data and ponder: "The phenomenon of treatment resistance in chronic pain is unlikely to be driven by a single structure, despite our findings. Future network and connectivity examinations between responders and non-responders would complement this work nicely, as the hippocampus—and potentially other limbic structures as well—may represent a node within networks working together to influence pain."

The findings regarding the hippocampus underscore the relevance of this brain area as the emotional integrator of the chronic [pain](#) experience, as for headache and [facial pain](#) disorders. For example, [in migraine](#), structural brain alterations including higher connectivity in the hippocampus has been recently reported by other researchers.

More information: Hayden Danyluk et al, Hippocampal and trigeminal nerve volume predict outcome of surgical treatment for trigeminal neuralgia, *Cephalalgia* (2019). [DOI: 10.1177/0333102419877659](#)

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