Machine learning-driven system of grading trigeminal neuralgia and prediction of surgical outcome

Timur H. Latypov[1,2], Rose Yakubov[1,3], Daniel Jörgens[1], Pascale Tsai[1,2], Peter Shih-Ping Hung[2], Wanzhang Wang[1], Matthew R. Walker[1], Patcharaporn Srisaikaew[1], Marina Tawfik[4,5], Frank Rudzicz[4,5], Mojgan Hodaie[1,2]

[1] Krembil Research Institute, University Health Network
[2] Institute of Medical Science, University of Toronto
[3] Faculty of Health Sciences, McMaster University
[4] Computer Science, University of Toronto
[5] Vector Institute for Artificial Intelligence

SOCIETY for NEUROSCIENCE | Advancing the Understanding of the Brain and Nervous System

San Diego, 2022

A novel perspective on trigeminal neuralgia progression

- Patients with trigeminal neuralgia (TN) typically experience shock-like episodes of pain.[1,2]
- With time, the character of their pain may modify in frequency and quality, with eventual development of burning or dull overtones. [3,4,5]
- Previously several subtypes of TN have been described (TN type 1, TN type 2).[1,2]

Hypothesis: TN is a syndrome with a spectrum of grades, each with different brain imaging correlates, pain characteristics and surgical outcomes.

1. *J. Olesen et al., Cephalalgia. 33, 629–808 (2013).*
2. *G. Cruccu, G. Di Stefano, A. Truini, NEJM, 383, 754–762 (2020).*
3. *W. J. Elias, K. J. Burchiel, Curr. Pain Headache Reports, 62. 6, 115–124 (2002).*
4. *K. J. Burchiel, K. V. Slavin, Neurosurgery. 46, 152–155 (2000).*
5. *M. Moayedi, M. Hodaie, Pain reports. 4 (2019).*

Objective: We propose a novel machine learning (ML)-driven grading system for TN based on brain imaging and clinical data. We then use this system to estimate the likelihood of long-term pain relief.