Protocol of Pilot Trial :

Pulsed Radiofrequency on the Dorsal Root Ganglion May Reverse Changes in Functional Connectivity of the Dynamic Pain Connectome in Neuropathic Pain.

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Introduction

Pulsed radiofrequency (PRF) on the dorsal root ganglion (DRG) is a technique frequently used in pain centers throughout the world for the management of lumbo-radicular neuropathic pain. We propose a new hypothesis to explain the central effects of this technique: the modification of the pain signal at the spinal level should ultimately have its effect on the dynamic pain connectome. We are currently conducting a pilot trial to demonstrate these changes on fMRI imaging, where we compare the difference in activity of resting state fMRI before and after pulsed radiofrequency on the dorsal root ganglion.

Chronic Pain in Resting State fMRI

One common finding in functional imaging studies on chronic pain was a relative decrease of contralateral thalamic regional cerebral blood flow (rCBF) that can be reversed with analgesic treatment. Another common feature seen in chronic pain patients is the greater Default Mode Network (DMN) functional connectivity with the insula (a region involved in pain processing) and less connectivity with pregenual anterior cingulate cortex (pgACC, a region involved in pain inhibition). A third alteration described in chronic pain patients is the increase in FC between the periaqueductal grey (PAG) and the ventral medial PFC (vmPFC) but decreased with augmenting pain, indicating a compensatory mechanism where the patient constantly engages this circuit, but failing to engage his mind to wander away from pain.

Hypothesis

A longitudinal study carried out in chronic neuropathic pain patients treated with an effective analgesic intervention could demonstrate causative changes in the functional connectivity in the dynamic pain connectome. We hypothesize that after PRF intervention on the DRG a reduction of chronic pain is expected with accompanying reversibility of the altered functional neuroimaging: an increase in contralateral thalamic rCBF, a greater DMN connectivity with pgACC accompanying less connectivity with insular cortex and an increase in FC between PAG and vmPFC/rACC.

Flowchart Study Design

Figure

Expected modifications after PRF intervention on DRG.

1. Increase in contralateral thalamic regional cerebral blood flow (Thal)
2. Greater Default Mode Network (posterior cingulate cortex (PCC) + medial prefrontal cortex (mPFC)) connectivity with anterior cingulate cortex
3. Less connectivity between DMN and insular cortex (INS)
4. Increase in functional connectivity between periaqueductal grey (PAG) and mPFC