

## Fibromyalgia 2019: central sensitization, neuromodulation and HBOT - putting it all together

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Fibromyalgia syndrome, clinically characterized by widespread pain, fatigue, tenderness and associated symptoms, is currently considered a prototype of a chronic pain condition in which sensitization of the central nervous system plays a prominent pathogenetic role. This paradigm has undergone various developments and modifications since the neurophysiological phenomenon of “central sensitization” was first described by Woolf, over three decades ago. Neurophysiological mechanisms of central sensitization, such as a decrease in descending inhibitory control of pain (decreased conditioned pain modulation, or CPM) have been identified both in fibromyalgia as well as in overlapping functional disorders; aberrations in the CNS levels of various neurotransmitters involved in pain modulation have been identified and altered patterns of connectivity have been identified through the implementation of advanced functional neuro-imaging techniques such as fMRI. In addition, genetic and epigenetic markers involved in increasing susceptibility to chronic pain conditions have been described and constitute an active field of research. Moreover, the subtle role of inflammatory and immune mediated components such as glial cell activation in another piece of the puzzle regarding centralized pain, which recently has been given the taxonomic title of “nociceptive pain” – differentiating it from more classic forms of pain such as nociceptive and neuropathic pain. In light of all these exciting areas of research, it becomes increasingly apparent that fibromyalgia is all about a change in the way the central nervous systems carries out the processing of pain; thus, the concept of neuromodulation, i.e. attempting to re-wire the way in which pain is processed and transmitted, becomes particularly appealing.

Many forms of neuromodulation have been developed over the years, with ancient techniques such as movement meditative treatment (yoga, tai – chi etc.) also appearing to work towards the goal of altered brain function, even if not classically thought of in this context. More recently external physical stimulation has been developed, including trans cranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS) have been applied to the treatment of chronic pain. Neurofeedback is another a non-invasive technique aimed at changing brain function.

Hyperbaric oxygen therapy (HBOT) stands out as a unique method towards modulation central nervous system function. It has recently been demonstrate to achieve positive clinical results in the treatment of fibromyalgia and a number of recent studies have described aspects of the specific effects of HBOT on fibromyalgia patients including favorable changes in brain perfusion, alterations of immune function etc. Thus, as our understanding of the intricate paradigm of central sensitization and nociceptive pain continues to broaden, HBOT is likely to find its place in our toolkit for achieving neuromodulation and as a therapeutic option for treating fibromyalgia and related conditions.