

# Dry Needling and Fibromyalgia: Reversing Centrally-Mediated Chronic Pain

The global burden of chronic pain has reached epidemic proportions; furthermore, it is estimated that 136 million Americans are currently suffering with chronic pain.<sup>1</sup> Despite this large number, the diagnosis and management of conditions such as Fibromyalgia Syndrome (FMS) remains poorly understood, widely criticized, and routinely mistreated by physical therapists and medical physicians alike. The use of dry needling is described in the literature as a novel and potentially effective intervention for treating FMS. Despite the evidence supporting neuronal plasticity and centrally-mediated changes in chronic pain, the traditional conservative interventions for FMS have exhausted light exercise, gentle mobilization, and/or electro-thermal modalities, with little more than poor patient outcomes. Perhaps it is time to change the way we treat chronic pain and utilize the best possible evidence to guide us in delivering the highest quality of care for conditions such as FMS

A large body of evidence supports that exercise has little to no benefit in patients with FMS, and further, that chronic muscle pain appears to worsen with exercise.<sup>2,3</sup> McVeigh et al found 85% of patients with FMS reported increased fatigue and pain following exercise.<sup>4</sup> Therefore, perhaps the repetitive movement or “more exercise for everyone” model does not fit all categories or patient conditions.

The concept of neuroplasticity, or the structural and functional cortical changes related to chronic pain states, has been described by multiple sources.<sup>7,8</sup> Neurophysiologic changes have been identified at multiple levels of the central nervous system including the spinal cord, brainstem, and cortex.<sup>9-12</sup> Coghill et al found specific brain areas of increased activation in chronic pain states including the anterior cingulate cortex, primary somatosensory cortex and prefrontal cortex.<sup>9</sup> Yu et al reported specific disruptions in functional connectivity at enkephalin producing pain control centers of the periaqueductal gray in chronic pain conditions.<sup>13</sup> Moreover, the mechanism of hypersensitivity has been found to largely occur at the dorsal horn involving wide-dynamic-range neurons (WDR).<sup>14</sup> WDR neurons are regulated by diffuse noxious inhibitory controls (DNIC) via the subnucleus reticularis dorsalis in the caudal medulla.<sup>14</sup>

Patients with FMS are thought to have defective DNIC systems; that is, the WDR neurons, which are responsible for innocuous and noxious stimuli, develop increased receptive fields, thus increasing the region of perceived pain.<sup>14</sup> Disrupted brain circuitry has been described by Loggia et al who articulates that decreased activation of the periaqueductal gray area in the midbrain accounts for decreased descending pain modulation in patients with FMS.<sup>15</sup> Two studies reported augmented pain processing

in patients with FMS via disruptions of cortical areas responsible for the anticipation, attention, and emotional manifestation of pain.<sup>16,17</sup>

The role of myofascial trigger points in FMS has been largely utilized in identifying the diagnosis. The biochemical properties of myofascial trigger points, including localized acidity and the increase in inflammatory mediators, may contribute to peripheral changes in patients with FMS.<sup>18</sup> That is, sustained peripheral nociceptive input may sensitize dorsal horn neurons and supraspinal structures leading to hyperalgesia, allodynia, and referred pain.<sup>19</sup>

Peripheral and centrally-mediated changes associated with dry needling have been described in the literature; furthermore, dry needling to specific distal points in the upper or lower extremities has been found to activate sensorimotor cortical networks and deactivate limbic-paralimbic areas.<sup>20,21</sup> Deactivation of limbic areas following dry needling is thought to affect the sensory, cognitive, and affective dimensions of pain.<sup>20</sup> Studies utilizing fMRI have demonstrated that dry needling at specific distal points activates the descending pain centers including the PAG.<sup>22</sup> Moreover, dry needling with electric stimulation has been shown to activate enkephalinergic inhibitory interneurons, thereby modulating central pain.<sup>19</sup> In addition, dry needling has also been found to reduce pain by peripheral mechanisms. One recent study found peripheral opioid receptors contribute to the anti-nociceptive effects of electrical dry needling via activation of cannabinoid CB2R receptors.<sup>23</sup> Moreover, the stimulation of ATP release and the subsequent activation of adenosine A1 receptors via electrical dry needling is thought to sharply reduce inflammatory and neurogenic pain.<sup>24</sup>

The use of dry needling to target solely trigger points within muscles has been challenged.<sup>25</sup> Several authors have articulated that the effectiveness of dry needling lies in the mechanical disruption of the integrity of dysfunctional endplate at the neuromuscular junction.<sup>19</sup> That is, dry needling to the endplate region is thought to cause increased discharges, decrease acetylcholine stores, and thus reduce spontaneous electrical activity.<sup>19</sup> However and importantly, not all patients with fibromyalgia have trigger points, and not all patients with trigger points develop FMS.<sup>26</sup> Some investigators have distinguished the “tender points” associated with fibromyalgia from trigger points—i.e. tender points may lack taut bands.<sup>27</sup> Given that skeletal muscle in patients with FMS has been shown to have altered oxygen utilization,<sup>28</sup> perhaps dry needling can be useful to help improve muscle vascularity and oxygenation, and hence reduce sustained peripheral nociception.<sup>20,30</sup>

Nevertheless, the efficacy for the use of dry needling in patients with FMS is limited; that is, to date, there are few high methodologic quality studies on the topic. Two recent systematic reviews provide conflicting evidence for the use of acupuncture (i.e. the insertion of needles without injectate without

the intent of moving qi along traditional Chinese meridians) in FMS—i.e. both concluding further high quality research is needed before definitive conclusions can be made in regards to efficacy.<sup>31,32</sup> In a randomized controlled trial, Deluze et al found electroacupuncture provided significant improvements in pain perception and sleep quality (limbic system) in patients with FMS.<sup>33</sup> Additionally, a recent systematic review and meta-analysis found that dry needling may be effective in the immediate and short-term in patients with upper quarter myofascial pain syndrome.<sup>34</sup>

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