Physical Therapy and Central Sensitization: Are We Explaining to Patients with ‘Unexplained’ Pain?

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1. Introduction:

Pain evaluation and management had undergone a evidence-informed paradigm shift in Physical therapy towards a comprehensive biopsychosocial perspective where emphasis was more on pain as an emotion or an experience rather than as a symptom. Pain and nociception was understood to involve mechanisms of peripheral and central sensitization which was evidently demonstrated by neuroplasticity-induced changes in both the peripheral and in the central components of the nervous system.

Upon an emerging evidence favoring mechanism-based understanding of pain as an evolution from symptom-based or syndrome-based treatments, Kumar and Saha proposed the Mechanism-based classification (MBC) which comprised of five mechanisms: cognitive-affective, central sensitization, peripheral sensitization, sympathetically maintained pain, and nociceptive. Each of the five mechanisms were defined through a cluster of symptoms and signs to identify the predominant operating pain mechanism in a particular patient. MBC was also proposed for most 'difficult-to-treat' cancer pain.

ABSTRACT

Mechanism-based classification (MBC) of pain comprised of five mechanisms: cognitive-affective, central sensitization, peripheral sensitization, sympathetically maintained pain, and nociceptive. The objective of this editorial was to provide an overview on central sensitization and its implications for PT evaluation and management of central sensitivity syndromes associated with common clinical presentations.

Key words: central sensitization, central sensitivity syndrome, central pain, cortical reorganization, pain science.

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Anecdotally, all pain was classified into either organic and non-organic, and patients who presented with vague symptoms such as diffuse non-anatomical spread of pain, disproportionate hypersensitivity, and severe unexplained symptom manifestations often were grouped under 'malingerers' if there were displaying probable 'illness behavior' and 'catastrophizing' with psychosocial influencing factors.

The objective of this editorial was to provide an overview on central sensitization and its implications for PT evaluation and management of central sensitivity syndromes associated with common clinical presentations.

2. Definition of CS:

Understanding terms such as central pain syndrome, central pain mechanism, central sensitization and central sensitivity syndrome is essential prior to evaluating and managing clinical presentations in patients with 'chronic pain'.

Li et al described CS which involved enhanced excitability of dorsal horn neurons and is characterized by increased spontaneous activity, enlarged receptive field (RF) areas, and an increase in responses evoked by large and small caliber primary afferent fibers.

Latremoliere and Woolf opined that “CS represents an enhancement in
the function of neurons and circuits in nociceptive pathways caused by increases in membrane excitability and synaptic efficacy as well as to reduced inhibition and is a manifestation of the remarkable plasticity of the somatosensory nervous system in response to activity, inflammation, and neural injury...and CS is a state of facilitation, potentiation, augmentation, or amplification."

Woolf 9 stated, "CS manifests as pain hypersensitivity, particularly dynamic tactile allodynia, secondary punctate or pressure hyperalgesia, after-sensations, and enhanced temporal summation."

3. Clinical presentation of CS:

Clinically, CS results from an ongoing experience of persistent pain,10 and referred pain/hyperalgesia resulted from central sensitisation of viscero-somatic convergent neurons (triggered by the massive afferent visceral barrage) but also probably results from a reflex arc activation (the visceral input triggers reflex muscle contraction in turn responsible for sensitisation of muscle nociceptors).11 Suspicion of presence of CS should be elicited whenever there were associated symptoms beyond the anatomical and biomechanical pattern beyond localized muscle pain.12

CS was closely inter-related to constant severe pain in inflammatory conditions with widespread disproportionate hypersensitivity and inflammatory pain was proposed to be effectively managed by addressing CS.13

4. Prevalence of CS:

CS was also demonstrated to involve in the mechanistic pathogenesis of somatic musculoskeletal disorders14 such as low back ± leg pain;15,16 whiplash;17,18 lateral epicondyalgia;19,20 hip osteoarthritis;21 knee osteoarthritis;22 carpal tunnel syndrome;23 rheumatoid arthritis;24 and also in visceral nociception25 and visceral pain26 in visceral disorders27 such as endometriosis,28 irritable bowel syndrome,29 vulvodynia,30 post-surgical pain31 after mastectomy,32 non-cardiac chest pain;33,34 primary headache;35 tension-type headache;36,37 migraine;38,39 chronic scalp pain-Trichodynia,40 fibromyalgia41 chronic fatigue syndrome;42,43 peripheral neuropathy,44 peripheral arterial disease,45 dental surgery,46 and trigeminal neuralgia.47

5. Predicting CS:

Neurodynamic testing such as Brachial plexus provocation test was shown to predict CS in whiplash patients’ expectations of recovery.48

6. Evaluating CS:

Smart et al 15 identified a cluster of symptoms and signs to demonstrate construct and criterion validity of mechanisms-based classification and CS in patients with low back-related leg pain. Smart et al 16 performed a binary logistic regression analysis with Bayesian model averaging and identified a cluster of three symptoms and one sign predictive of CS, including: ‘Disproportionate, non-mechanical, unpredictable pattern of pain provocation in response to multiple/non-specific aggravating/easing factors’, ‘Pain disproportionate to the nature and extent of injury or pathology’, ‘Strong association with maladaptive psychosocial factors (e.g. negative emotions, poor self-efficacy, maladaptive beliefs and pain behaviours)’ and ‘Diffuse/non-anatomic areas of pain/tenderness on palpation’. The central sensitization inventory comprising of key symptoms checklist was validated by Mayer et al 49 for screening individuals for ‘central sensitivity syndromes’.

7. Management of CS:

Mechanism-based management of CS comprised of a comprehensive multifaceted intervention including acetaminophen, serotonin-reuptake inhibitor drugs, selective and balanced serotonin and norepinephrine-reuptake inhibitor drugs, the serotonin precursor tryptophan, opioids, N-methyl-d-aspartate (NMDA)-receptor antagonists, calcium-channel alpha(2)delta (a2δ) ligands, transcranial magnetic stimulation, transcutaneous electric nerve stimulation (TENS), manual therapy and stress management each target central pain processing mechanisms.50 Mechanism-based therapy using burst TENS was studied for its effects on CS in patients with OA knee.51
Nijs et al52 listed indications of pain physiology education as: “1) the clinical picture is characterized and dominated by central sensitization; and 2) maladaptive illness perceptions are present. After biopsychosocial assessment pain physiology education comprises of a first face-to-face session explaining basic pain physiology and contrasting acute nociception versus chronic pain (Session 1). Written information about pain physiology should be provided as homework in between session 1 and 2. The second session can be used to correct misunderstandings, and to facilitate the transition from knowledge to adaptive pain coping during daily life.”

8. Implications for physical therapy and Journal of Physical Therapy (JPT):

CS offers a biopsychosocial perspective for understanding chronic widespread pain in conditions such as fibromyalgia and chronic fatigue syndrome53 and its social relatedness was demonstrated by chronic unexplained symptoms of pain, fatigue and memory complaints presenting in post-deployment syndrome.54

It should not be misunderstood that only CS operates in chronic pain and painful syndromes, and the role of peripheral tissue nociception-induced sensitization could not be underestimated and/or ignored.55

JPT holds responsibility to foster future research on mechanism-based examination and treatment for all painful conditions using physical therapy by publishing original and review articles on CS in painful conditions.

CONFLICTS OF INTEREST

None identified and/or declared.

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