NEUROPATHIC PAIN FROM A REHABILITATION PERSPECTIVE: INTERVENTIONAL ASPECTS

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Neuropathic pain (NP) arises from a lesion or disease affecting the somatosensory system, either peripheral or central, and represents a significant challenge in rehabilitation medicine. It is characterized by symptoms such as burning, shooting pain, allodynia, and hyperalgesia, often leading to functional limitations and psychological distress. While pharmacological and physical therapies remain foundational, interventional approaches are increasingly used in comprehensive rehabilitation strategies to manage refractory neuropathic pain. Understanding the Role of Rehabilitation In rehabilitation, the primary goals for patients with neuropathic pain are to restore function, reduce pain-related disability, and improve quality of life. A multidisciplinary approach involving physical therapy, psychological support, and pharmacological treatment is standard. However, in patients who do not respond adequately to conservative therapies, interventional pain management becomes essential. Interventional Techniques in Neuropathic Pain

1. Peripheral Nerve Blocks and Pulsed Radiofrequency (PRF) Selective nerve blocks can offer diagnostic and therapeutic benefits. In conditions like postherpetic neuralgia or diabetic neuropathy, targeted peripheral nerve blocks with local anesthetics and corticosteroids may transiently reduce pain and inflammation, facilitating participation in rehabilitation. PRF, which delivers high-frequency currents below neurodestructive thresholds, has shown promise in modulating pain pathways without causing nerve damage, particularly in dorsal root ganglia (DRG)-related pain [1].

2. Epidural Steroid Injections (ESI) In cases of radiculopathy with neuropathic features, such as lumbar disc herniation, ESIs under fluoroscopic or ultrasound guidance are frequently used. By reducing inflammation at the nerve root level, these injections can alleviate neuropathic symptoms and enhance engagement in physical therapy programs [2].

3. Sympathetic Blocks Sympathetically maintained pain, such as in complex regional pain syndrome (CRPS), may respond to stellate ganglion or lumbar sympathetic blocks. These interventions can disrupt abnormal sympathetic activity and facilitate motor recovery and desensitization therapies in early CRPS management [3].

4. Spinal Cord Stimulation (SCS) SCS is a more advanced intervention used in chronic refractory neuropathic pain, including failed back surgery syndrome (FBSS) and peripheral neuropathies. Through neuromodulation of dorsal columns, SCS modifies pain perception and may significantly improve pain scores and reduce opioid consumption [4]. From a rehabilitation standpoint, SCS enables re-engagement in functional training and improves long-term outcomes.

5. Ultrasound-Guided Interventions Ultrasound guidance has revolutionized interventional rehabilitation by enhancing precision, safety, and efficacy of peripheral nerve and fascial plane injections. It is particularly useful in entrapment neuropathies, such as carpal tunnel or meralgia paresthetica, where visualization of nerve pathology and guided intervention can provide both diagnostic clarity and therapeutic benefit [5].

6. Botulinum Toxin Injections Botulinum toxin type A (BoNT-A) has demonstrated analgesic effects in focal neuropathic pain syndromes, possibly via inhibition of neuropeptides like substance P and CGRP. Its utility in post-stroke shoulder pain, peripheral nerve injuries, and trigeminal neuralgia supports its role as an adjunct in pain-focused rehabilitation [6].

7. Intrathecal Drug Delivery Systems (IDDS) In select cases of intractable neuropathic pain, especially cancer-related or spinal cord injury-associated pain, IDDS can deliver opioids or baclofen directly to the cerebrospinal fluid. Although less commonly employed in general rehabilitation settings, it is crucial in end-stage refractory cases to facilitate comfort and functional participation [7].

8. Regenerative Interventions Emerging techniques such as platelet-rich plasma (PRP) and stem cell injections show potential in neuropathic conditions secondary to nerve injury or entrapment. While evidence remains preliminary, these modalities represent a frontier in regenerative pain rehabilitation [8]. Conclusion The management of neuropathic pain in rehabilitation medicine has evolved with the integration of targeted interventional procedures. These techniques not only reduce pain intensity but also facilitate participation in physical and occupational therapies, improve mood and sleep, and reduce reliance on systemic medications. Optimal results are achieved through individualized, multimodal strategies.

Keywords: Neuropathic pain / Interventional Pain/ Ultrasonography

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