

Hand Therapy Treatment



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KEYWORDS

- Pain • Mechanism of pain • Peripheral and central mechanisms • Upper quadrant evaluation
- Abnormal impulse generators • Mirror therapy and graded motor imagery

KEY POINTS

- Pain is a multifactorial process.
- Treatment must target all pain mechanisms.
- Specific treatments include upper limb neurodynamic therapy.
- Specific treatments include mirror therapy and graded motor imagery.
- Treatment of pain must be holistic including the peripheral and central nervous system.

INTRODUCTION

Treating pain is a common part of the therapist's daily routine. Therapists dealing with upper extremity pain often look for the peripheral symptoms and design a treatment program solely aimed at treating the peripheral symptoms. We have all been taught that pain is a normal physiologic response that provides a survival advantage to our bodies. Pain from tissue damage triggers protective behaviors preventing further damage and allowing for the healing and repair processes to occur. Pain serves as a warning sign to alert an individual of potential harm so that an appropriate response can result.¹ However, this protective response does not represent a complete picture of pain. Pain can morph from a healthy protection to a pathologic response that prevents recovery.

Pain is a complex process propagated by many systems: the level of injury, the peripheral nervous system, and the central nervous system (CNS). Thus, therapists treating hand injuries must consider pain using a broad holistic perspective. One must assess the damaged tissue with its peripheral pain symptoms but also consider that there may be a CNS component contributing to the pain. With pain and persistent pain (pain continuing after the tissue has healed), it is the brain that makes a decision if the input is dangerous and if so what action to take. The

CNS, brain, and spinal cord can become sensitive to a nociceptive input resulting in more pain with less provocation. It is important to realize that the brain not only responds to physical stimuli but also inputs from thoughts and emotions.

This article covers recent advancements in the neuroscience of pain that impact evolving strategies to identify and treat pain mechanisms. The use of physical agents for upper extremity musculoskeletal pain management is not the focus of this article, but is found in the literature.² We discuss recent research focused on pain mechanisms, which has highlighted the importance of pain behaviors and afforded evidence in the most effective treatment strategies for better functional outcomes.

IMPORTANCE OF PAIN

Pain is often the reason patients seek medical care. For the upper limb, pain can be extremely debilitating, impacting many basic daily functions. According to Butler,³ pain is a complex unique experience to each individual: there is no pain exactly alike. The International Association for Study of Pain has helped define the terminology of pain. The International Association for Study of Pain defines pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Pain is multidimensional, involving not only the sensation of pain but also the

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Hand Clin 32 (2016) 63–69

<http://dx.doi.org/10.1016/j.hcl.2015.08.007>

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emotional experience with which it is associated. The International Association for Study of Pain also suggested that pain should be categorized in terms of the mechanisms causing the pain, not by a time factor, such as acute and chronic.^{4,5}

One of the challenges for clinicians treating pain is to move past the sole focus on the injured tissue. A not uncommon clinical scenario is the physician frustrated with a patient whose bone is healed but is still complaining of pain. According to Woolf,⁴ health care providers continue to believe that pain in the absence of tissue pathology is not real. Unfortunately, there is a lack understanding of the “neurobiologic phenomenon” that generated pain without obvious noxious stimuli. The pain in these patients is not always caused by secondary gains (work, or insurance-related compensation), opioid drug seeking, and psychiatric disturbances (ie, malingering, lying, or hysterics). Therapists can serve a critical role in treating the patient at every level including the pain generated from central mechanisms.

In the past, acute pain has been described as a direct result of tissue damage in which free nerve endings called nociceptors (sensory neurons) are activated by noxious stimuli. In the hand, the nociceptors are located in the skin, muscles, tendons, bony structures, and within the *nervi nervorum* in peripheral nerves. Historically clinicians have most commonly treated the nociceptive input. This was appropriate when the pain mechanisms were nociceptive in nature, such as the pain immediately following injury or postoperatively. However, what is the correct clinical strategy for treating a patient that has allodynia (nonpainful stimuli that is painful) and is hypersensitive (an increased response to a stimuli that is normally painful)? These patients will not move their limb because of the fear of moving or the misunderstanding that movement is harmful. This is where one must identify and treat other pain mechanisms (central and/or peripheral) on the initial assessment before initiating a treatment plan. The treatment modalities differ depending on what is generating the pain.

The three main categories of pain generators are (1) peripheral nociceptive, (2) peripheral neurogenic, and (3) central sensitization. Central sensitization is an area of increasing focus. It is thought to be the site accountable for the maintenance of persistent pain that cannot be explained by peripheral tissue damage. It is also thought to play a large role in chronic pain. According to Sluka,⁶ pain is considered chronic if the pain lasts more than normal tissue healing time, the impairment is greater than expected, and the symptoms now occurring may not be from identifiable tissue

damage. Reviewed next are the mechanism for the three categories of pain.

PAIN MECHANISMS

Peripheral Nociceptive

Peripheral nociceptive pain results from peripheral tissue damage or potential tissue damage. This is often the acute pain commonly seen after trauma and is a symptom of the tissue injury. Therapists are comfortable treating peripheral nociceptive pain. They can identify hand tissue damage from trauma, overuse, or surgery. Peripheral nociceptive pain symptoms are from a clear pathology and have a predictable time frame to get better, which is usually within 3 months.

Peripheral nociceptive pain is generated by various traumas, such as chemical, mechanical, or thermal injury. The acute response to noxious insults produces an inflammatory response that begins the process of healing. These responses include peripheral impulse generators carried by specific sensory receptors called nociceptors. With peripheral nociceptive input the course of the injury usually follows a predictable pattern and the symptoms decrease because there is a reduction in inflammation as healing occurs.

Patients with nociceptive and inflammatory pain complain of intermittent sharp pain with movement; constant dull ache or throb at rest, localized to the areas of injury; and clear, proportionate mechanical and anatomic in nature to aggravating and easing factors. Hand therapist intervention is most helpful for pain management and tissue healing during the time frame of the peripheral nociceptive mechanisms. The usual therapy interventions include patient education, pain management, and treatment of edema, protection of the joints by orthoses, range of motion, and the progression of normal movement patterns, and activities of daily living.

Peripheral Neurogenic

The peripheral neurogenic mechanism moves beyond the tissue that was directly injured. Peripheral neurogenic pain is related to activation of nerves anywhere from the exit of the spinal cord to the distal segments of the peripheral nervous system. This category includes neuropathic pain, but is not specifically discussed. Peripheral neurogenic pain symptoms may be generated anywhere along the course of the nerve from a cervical radicular neuropathy to a distal branch of a nerve. Peripheral neurogenic pain can present a challenge to the clinician because distal nerve injury signs and symptoms may originate from a more proximal nerve injury.

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