Role of Physiotherapy in Pain Management

Saroj M Sanghavi*, Dakshesh M Sanghavi**

Introduction

Pain is generally the symptom that brings a person to a healthcare practitioner looking for relief. As informed by the American Pain Society, 45% of the American population seeks medical attention for chronic pain.1 Because complaints of pain are so varied, non-specific or diverse,2 what may be tolerable at one instance suddenly becomes unbearable to the same person in another circumstance. The exact same injury to two different persons has totally different responses. This is not easily explained as the nervous system, that is chiefly responsible for pain perception and awareness. The nervous system is connected to other systems and organs in an intricate network and the pain transmission methods are equally complex. There is constant mediation of higher centres that make it even more challenging to figure out.3

Physiotherapists attempt to utilise a combination of strategies to bring pain relief to their patients. They know that pain is not only subjective, but an objective experience.

Physiotherapy Examination Guidelines for Signs and Symptoms

Quite a few individuals with pain are referred for physiotherapy (physical therapy) for an instant cure or have resigned to accepting a lifetime of pain and disability. Often, secondary gains have a larger overlay on the physiology that is causing pain and this may prove to be the most difficult hurdle for the therapist to overcome. However, a thorough examination of the patient is essential to establishing a treatment plan with attainable goals.

Range of motion of the affected and unaffected parts – this may be directly impacted due to anatomical insult or maybe impaired due to protective spasm, guarding or faulty positioning. Range of the joint is not limited to the peripheral joints but the therapist also may need to assess the joint mobility of the vertebral body(ies) in the various anatomically available ranges. A working knowledge of the available joint play in each direction for different levels of the spine is essential to determine a decrease in range of motion.

Posture/Gait Deviations – Deviations from the typical gait and posture may be a result of pain or may actually cause the pain. Postural deviations should be assessed not only in the supine or prone position but also in standing and sitting which are the more functional positions that impact the patient’s performance.

Pain History and Presentation

This includes observation during and after the evaluation and includes the origin/onset, site, pattern, quality, intensity, radiation, characteristics, contributing and relieving factors, previous treatments and their effectiveness, and other visceral signs and symptoms.

Palpation – determining the end-feel at the available movement allows the therapist to estimate the nature of the cause of the pain. Neurological function testing involves assessing tone, reflexes, sensations and coordination.

Orthopaedic testing for stability and mobility of joints and various signs to differentially diagnose the condition/pathology.

Neural tissue tension testing involves a pressure and stretch to determine the glide of the peripheral nerve trunk and assess possible restrictions along its course.

Functional assessment is probably the most important element that a physiotherapist needs to include in a patient’s assessment; the impact that pain has on the person’s functional abilities can uniquely be addressed by a physiotherapist. The patient’s inability or difficulty to perform Activities of Daily Living (ADLs) must be the cornerstone of the patient evaluation. Simple activities
such as sit-to-stand may be a problem due to low back pain or inability to dress/undress due to shoulder pain is usually the cause the patient is looking for a physiotherapist's services. Therefore, the functional assessment should be performed in the position that the patient performs the activity in. For example, if the patient reports pain in the low back after standing, an assessment in standing should be performed to understand the impact of gravity in the functional position. Preferably, the pain-causing activity/position should be used to best understand the pathophysiology using a kinesiological framework. A movement analysis approach may be required to determine inappropriate firing of the muscles that impact the timing of the movement.

Objective Measures of Pain Used in Physiotherapy

Pain memory is not an accurate measure of pain intensity. Researchers have demonstrated that it is worse when it comes to assessing chronic pain. Therefore, an objective measurement of pain on an ongoing basis while under the care of the therapist is an integral part of patient care. In addition to the measured intensity, the duration, frequency, location and description of the pain should also become a part of the ongoing assessment. Typically, the therapist will assess these elements to determine the efficacy of the treatment.

Visual Analogue Scale (VAS) is an easily understood concept but it is not found to be reliable. Also, it cannot be used in patients that have cognitive impairments or those that cannot understand an abstract concept such as a linear representation of their pain.

Simple Descriptive Pain Scale (SDPS) is used for patients that cannot abstractly understand a pain scale. FACES – is usually best used with young children and those that are unable to express their pain verbally. “Pain Drawings” may also be used.

Conditions and Treatment

Physical – this involves directing the treatment interventions to the physiological and anatomical aspects. Healing the tissue that was damaged due to injury, disuse, etc. is the main focus. This is often the target for relief in acute pain that is due to a very recent injury or recurrent and repetitive physiological stress. Such physical interventions are often passive and the effect may be limited to a short duration.

Cognitive – are typically based on suggestions from the clinician that encourage the patient’s active participation in the healing process. This is often used in chronic pain patterns that cannot break the cycle of pain à disability/disuseà pain. This must be initiated by the patient as it focusses on addressing the patient’s perception of pain and its resulting limitations.

Behavioural – changes on part of the patient are probably the most effective methods to bring about long term pain relief. Exercises, biofeedback, relaxation techniques, etc. are examples. There is a learning period where the patient is trained to perform these methods and when trained is able to perform them independently.

Physiotherapy treatment for pain using physical agents may be traced back to ancient Rig Veda talks of using light and heat to relieve pain. In early 250 A.D. Romans used electric eels to treat pain due to gout, headaches, etc. As technology advanced, we currently use various modalities in the form of LASERS, electrical stimulation, ultrasound and heat in addition to other manual therapy forms (Figure 1).

Laser used by physiotherapists are: Ruby, Gallium Arsenide (GaAs), diode with different wavelengths. The authors have used GaAs with pulsed Infrared (904nm wavelength with 1.5 to 2 cm depth of penetration) with good results. Laser causes release of ACTH and beta-endorphins, reduction of prostaglandin E and SOD activity, immunostimulant, balance of intra-extra cellular activities and accelerates ATP and collagen synthesis. Laser is contra indicated over eyes, cancerous lesions, pregnancy, pacemakers, thrombosis and photochemical drugs.

Commonly used physical agents in physiotherapy are heat, electricity, light, sound, and cold. Most of these agents are used to improve the lymphatic and blood circulation to the area due to a local vasodilation effect and possible muscle relaxation.

Thermotherapy or the use of heat is likely to decrease excitability of muscle spindles and increase activity of Golgi tendon organs and result in decreased muscle spasm. Sedation of sensory nerve endings if the heat is mild may also promote pain relief. Also, gating at the spinal cord level may raise the pain threshold level and therefore allow the patient to perform with decreased difficulty. Several modalities may be used to deliver localised heat in a controlled and safe manner. Superficial heat can be delivered using conduction techniques such as moist heat packs or paraffin wax baths. The depth of penetration using such techniques is less than 1 cm. Fluidotherapy is an example of the use of convection heat that is produced when molecules are agitation and emit heat due to this excitation. This is generally used for hands and feet.
which are “immersed” in the machine that produces heat. Radiation may be used to heat large body parts that are not bony and infrared is commonly used examples of this.

Heat to deeper tissues can be delivered using energy conversion techniques such as diathermy or ultrasound. **Shortwave diathermy** uses a constantly reversing and oscillating magnetic field which heats up the tissue temperature. It is used generally for moderate to large body parts and is contraindicated in patients with underlying cancer, multiple sclerosis, any metallic implants including pacemakers. Its use is generally avoided during pregnancy or over growing epiphysis and over eyes. **Ultrasound** is sound waves transmitted at a high frequency of 1-3 MHz. The higher the frequency the lesser is the depth of penetration. It can heat up tissues 2-5 cm. depending on the frequency employed. The advantage of ultrasound is dual – it has thermal effects in the treated area but also has non thermal effects due to the mechanical properties of the sound head being physically in contact with the body. Because of its effect on A and C fibres, it can provide pain relief and decrease muscle spasm. Since the conductor, or treatment head, is in close contact with the treated area, it is used to obtain localised relief. Ultrasound can cause micro streaming and this improves metabolic processes, enzyme activity and alters the ion exchange speed in the area treated. When pain-relieving ions are introduced using ultrasound, the technique is referred to as “phonophoresis”. Commonly used chemicals introduced in this manner are lidocaine, hydrocortisone or NSAIDs like piroxicam for pain relief or decreasing inflammation. Medication molecules were found to travel up to tissue depth distances of two inches. **Cryotherapy**, uses the physiological effects of cold, is generally considered in the treatment of acute inflammatory conditions and muscle spasm. Cooling causes the large myelinated and small unmyelinated nerve fibres to decrease their nerve conductivity. Pain perception and contractility of the muscles, therefore, decreases and consequently, muscle spasm is diminished. Initially, the blood flow to the area decreases but after 15 minutes, it increases. It is contraindicated in patients with Raynaud’s phenomenon and used cautiously when treating people with peripheral vascular disease, circulatory problems or sensory loss. Therapeutically, cryotherapy is used either by a direct application of a cold/ice pack or by a vapocoolant spray usually prior to manual therapy techniques deep friction tissue or stretching. The latter is generally used in treatment of trigger points. Cryotherapy has been found to be particularly helpful in acute rheumatoid arthritis by improving function.

**Transcutaneous Electrical Nerve Stimulation (TENS)**, as the name suggests, employs electricity to control pain (Figure 2). While the exact mechanism of TENS is not sufficiently clear, the working theory is that the large diameter A –beta fibres are specifically stimulated. The two mechanisms generally attributed for this physiological effect of electricity are the “gate control theory” or through the stimulation of tonic descending pathways that inhibit pain. Recent research has also demonstrated that low frequency TENS can increase the level of endogenous opiates in the nervous system. The gate control mechanism at the spinal cord level produces moderate paraesthesia when sensory-level TENS (high rate) is used. When low rate TENS is used, it may produce muscle contractions and this is thought to produce opiates in the CNS that can bring pain relief. This has been more beneficial in chronic pain as the pain relief lasts for a few days as compared to the high rate TENS where pain may be alleviated for a few hours. Therefore, adjusting the TENS parameters is essential to pain relief and an understanding of electrophysiology is necessary. It is contraindicated, like all electrical stimulation, in patients that have a pacemaker, and in patients that are pregnant. Patients that may have sensory disturbances, caution must be exercised and the patient closely monitored. One of the benefits of TENS is its ease of application and portability and therefore it can be taught to the patient or caregiver to use on a regular basis, without being dependent on the therapist.

**Iontophoresis** is a method to introduce chemical ions using a small electrical current through the skin (Figure 3). Chemical ions of medication are used in a gel form that is applied to the skin and the direct current introduced via the electrode that is placed over the skin. Lidocaine, hydrocortisone, iodine, methyl salicylate, acetic acid are examples of chemical substances used for pain relief or reduction
of muscle spasm. Allergic reaction to the medication is a contraindication of this method.16

Manual therapy techniques such as gentle massage have been used for centuries. It improves local circulation from the mechanical forces on the area treated and may also be eliciting the gating mechanism at the spinal cord level.17 Contraindications for massage include dermatological conditions, acute infection or thromboembolism. One of the techniques that have gained a lot of attention is lymphatic massage which is used for patients post mastectomy where pain and swelling can be disabling. Myofascial release is another specialised technique that works on realigning the fascia layers and allowing the myofascium to function properly.18 Joint mobilisation is one of the most commonly used manual therapy techniques by physiotherapists around the world. By guided and controlled passive oscillations in specific directions and amplitude, collagen fibres in the joint and surrounding areas are loosened. This produces pain relief and regains joint mobility to improve function. Based on the amplitude and force applied, mobilisation is characterised from Grade I to V. It is contraindicated in patients that may have osteoporosis, malignancy, vascular disease, acute infection in the area treated, etc.

Cognitive strategies such as relaxation techniques, body imaging, humour, hypnosis, etc. are also potentially used for pain relief and may be included modalities in addition to the physical agents.

While physical modalities and manual techniques are important, these are best used as adjuncts to an exercise programme. The most important aspect of a pain management programme that is developed and executed by a physical therapist is a patient-centred exercise programme. Range of motion, stretching, or strengthening exercises are all beneficial to improve mobility, strength and muscle tone. Aerobic exercises may be incorporated as well if cardiovascular fitness needs improvement. One of the other desirable effect of sufficient intensity of exercise is the release of beta-endorphin levels which in turn can help alleviate pain and improve mood. Exercise programme may target specific muscles or muscle groups for strengthening or joints for stretching to improve mobility. To optimise compliance, it is necessary that the patient becomes an active partner in the development of the programme rather than a passive recipient. Exercises should be ‘tailor made’ to suit each individual. Pain relief that is aimed at improving the overall quality of life is the ultimate goal of a physical therapy programme. While temporary relief obtained with the use of modalities may appeal to most patients, the long term effect of exercise should be emphasised right from the first session of therapy. An intelligently designed exercise programme that is prescribed to the patient, with the patient’s needs and lifestyle in mind, should become the cornerstone of a pain management programme.

Conclusion and Follow Up

Physiotherapy must be started as early as possible to minimise pain, stiffness, contractures and deformities. Ergonomic guidance must be followed regularly.

Follow up is equally important specially for chronic spinal and arthritis pain. Exercises should be done under the guidance of qualified Physiotherapist and progressive exercises to be given as patient improves.

References