



Complications Associated With the Local Non-invasive Treatment of Pain

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Pain is the most common symptom in clinical practice in the developed countries. Pain can be divided into nociceptive and neuropathic pain. Nociceptive pain is most likely acute. It is the commonest type of pain and it is usually due to any kind of injury, localized inflammatory process or disease. Neuropathic pain is, by definition, chronic and may escalate with time. It refers to pain that is generated or sustained by the peripheral or central nervous systems. The distinction between acute and chronic pain is relied upon a usually 3-month interval of time from the onset of pain. Pain that extends beyond the expected period of healing may also be defined as chronic [1-10].

Pain is often the principal manifestation of diseases affecting bones. Bone pain differs in many respects from other types of pain. While skin pain is characterized as sharp, pricking, stabbing or burning, bone pain is frequently perceived as aching. It may be accompanied by referred pain and muscle spasm, which hardly ever occur with skin pain. In the orthopaedic patient, the acute pain may be due to acute traumatic injuries that have occurred within the last 2 days, surgical procedures, or medical disorders, while the chronic nonmalignant pain is usually post-traumatic or musculoskeletal. Under-treated acute pain may lead to chronic pain. Chronic musculoskeletal pain is a disabling clinical symptom on today's ageing populations, suffering from osteoarthritis, while other disorders that accompany degenerative arthritis, such as joint rigidity and deformity, are remarkably less disturbing [11-17].

Both cold and heat treatment modalities decrease pain and muscle spasm, but they have opposite effects on tissue metabolism, blood flow, inflammation, edema, and connective tissue extensibility. Cryotherapy decreases these effects while thermotherapy increases them [18-27].

Cryotherapy has both a local anesthetic effect called cold-induced neuropraxia and a central one at the level of the spinal cord via neurologic and vascular mechanisms. It is most commonly used for immediate care of acute soft tissue injuries. Cryotherapy, compression and elevation are the basic principles for the treatment of musculoskeletal injuries. It is safe with only short duration of treatment and when an intervening material is used between the ice pack and the skin. Cryotherapy is usually indicated during the first 2 post-injury days. In athletes with chronic injuries it may be useful after exercise to reduce swelling and pain. It may be used in the form of various ice applications or topical anesthetic skin refrigerants. Complications of cryotherapy include cardiovascular effects, nerve damage, frostbite, Raynaud's phenomenon, cold urticaria, and slowed wound healing [28-50].

Thermotherapy may be either superficial or deep. It provides analgesia, increases blood flow and decreases muscle tonicity and joint, as well as soft tissue, stiffness. Some of the benefits provided by topical heat therapy may be mediated directly in the brain. It is most commonly used for rehabilitation purposes. It should not be applied to acute injuries or when signs of inflammation are evident. It is usually indicated in chronic injuries complicated by muscle pain and stiffness, in the advanced stages of an arthrosis, before and after implantation of artificial joint replacement, and in rheumatoid arthritis. Its use in athletes with chronic injuries, before exercise, may stimulate blood flow and increase flexibility. With thermotherapy, skin burns may occur, especially in patients with diabetes mellitus, multiple sclerosis, poor circulation, spinal cord injuries and rheumatoid arthritis [51-64].

Therapeutic electrotherapy, ultrasound, diathermy, acupuncture/electro-acupuncture, hydrotherapy/spa treatment are also widely used, although the effects and benefits have not been fully established [65-84]. The use of ultrasound is contraindicated over the eyes, testes, heart, pregnant uterus, spinal cord injuries, laminectomy sites, anesthetic areas, malignancy, growth plates, and in vascular insufficiency. Additionally, ultrasound should not be used in patients with

joint prostheses, since overheating may cause cracking and melting of the prosthetic joint and loosening of the cement. Whirlpool use and other types of hydrotherapy, with either hot or cold water, have been complicated with infections of the skin, urogenital and pulmonary systems [25].

A wide variety of substances has also been used either as complementary and alternative medicines or in the form of ointments and gel preparations, due to the thermal or curative biological activities of their components, such as menthol, ethanol, salicylic acid, ginger (*Zingiber officinale*), capsaicin, aloe vera, garlic, onion, turmeric, etc. [85-96].

There is a rapidly growing demand for safe and effective pain management. The use of local non-invasive treatments for mild-to-moderate pain is widely recommended and used. The safety record of local treatments, either of acute or chronic pain, in orthopaedic injuries and disorders is high but complications do occur. Complications are categorized as systemic when the entire organism is involved and as localized when they arise at the site of administration. The former are usually allergic or toxic in nature, while the latter are usually due to contact dermatitis or faulty techniques and inappropriate application usually associated with burns and scalds (Figures 1-7).



Figure 1: Pernio in a healthy 11-year-old girl after excessive application of ice packs to treat a dance injury of the left forefoot. The painful purple discoloration and swelling of the toes cleared in a week. There was no associated collagen vascular disease



Figure 2: A 35-year-old man with a crescent-shaped violaceous atrophic scar that resulted from the excessive application of ice to his knee following trauma



Figure 3: A 40-year-old woman with a hyperpigmented scar due to the local application of an ice pack following a knee injury



Figure 4: A 43-year-old woman with red to violaceous scaly crusted patches and surrounding hypopigmentation due to a chemical burn following repeated application of onion to relieve severe pain in the upper arm and shoulder



Figure 5: A 60-year-old woman with a well-demarcated triangular shaped reddish-brown crusted patch with erosions. She suffered from severe cervical spondylosis and repeatedly applied thermal plasters to relieve the pain. The burn resulted 3 days ago when she rubbed her neck with alcohol after removing the thermal plaster



Figure 6: A 67-year-old woman with a painful left wrist joint. The skin lesions of allergic contact dermatitis appeared one day after the local use of Aloe vera leaf gel and were confined to the applied area. Localized swelling without itching was also evident



Figure 7: A 75-year-old woman with a painful knee deformans osteoarthritis. The skin lesions of irritant contact dermatitis appeared immediately after the local application of warm mud compresses

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