



Pain medicine: general view to the problem

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Abstract. *The explosive growth of our knowledge of every aspect of pain in recent years has produced major advances in the classification and management of the varieties of pain. However, despite of advancing knowledge in the field of pain medicine for last decades, the burden of pain remains unacceptably high. Epidemiological studies point to the high prevalence of chronic pain across the world associated with staggering socioeconomic costs. Unfortunately, existing therapies fail to offer good pain relief to the majority of these patients. There have been some modest advances with the approval of some new therapies, but nevertheless pain medicine is still waiting to find out new initiatives and approaches that serve to a better understanding of pain mechanisms leading to effective therapies.*

Key words: *pain concept; acute and chronic pain; pain management.*

Introduction

The explosive growth of our knowledge of every aspect of pain in recent years has produced major advances in the classification and management of the varieties of pain. The traditional view of pain is that injury or other somatic pathology activates pain receptors and fibers that transmit their signals directly up the spinal cord to the brain where they are perceived. This concept explicitly assumes that pain perception always has an underlying physical cause – injury, infection, or some disease process. Pain in the absence of such a cause is usually attributed to psychological illness or malingering [5].

The author of this viewpoint was René Descartes, dramatically changing the prevailing views on pain. He probably appeared as the first analytical scientist in sensory physiology describing the basic template for the idea of pain as a signal of physical pathology (later ‘Specificity Theory’ of pain) in his definition of pain. Descartes’ depiction of pain as a simple, straight through neural transmission system requires further consideration. These early events after injury,

in fact, represent only the *first stage*, the transmission of noxious signals to the brain – of Descartes’ larger conceptual scheme for pain. The *second stage* is much more complicated conversion of the nerve messages into conscious experience within the brain. Descartes in 1662 ascribed transformation to a non-physical mind (at that time meaning soul) that resides in the central part of the cerebrum [11]. Nowadays, the challenge to scientists is to discover what happens in the brain during the second stage. How are nerve impulses transformed into the conscious experience of pain? Pain research evolution has advances from skin-to-brain transmission mechanisms to the creative transformation by the brain of patterns of nerve impulses into perceptual qualities, emotions, and cognitive subjective experience.

The frontiers of pain theory have advanced still further in the cerebrum. At present it is well known that specialized parallel processing systems in the brain are selectively associated with the sensory-discriminative, affective-motivational, and cognitive-evaluative dimensions of subjective

experience. The brain structures involved in pain include somatosensory projection areas, the anterior cingulate cortex and other limbic system structures (the amygdala, hypothalamus, and dorsal hippocampus), the prefrontal and posterior parietal cortices, the insula and midbrain periaqueductal grey area, and extensive interconnecting pathways. These brain areas compose a 'central pain matrix' [5].

Despite of advancing knowledge in the field of pain medicine for last decades, the burden of pain remains unacceptably high. Epidemiological studies point to the high prevalence of chronic pain across the world associated with staggering socioeconomic costs. Unfortunately, existing therapies fail to offer good pain relief to the majority of these sufferers. There have been some modest advances with the approval of some new therapies. A step change in analgesic drug efficacy seems possible, too, as evidenced by the dramatic pain relief offered by blockers of the nervous growth factor and transient receptor potential channels in a series of clinical trials. Pain medicine is still waiting to find out if side effects will limit or stop these initiatives. But the examples serve to illustrate that a good understanding of pain mechanisms can lead to effective therapies [7].

Shortly on the forms and types of pain

The management of pain depends on the kind of pain. First of all, pain is one of the body's important alarm systems, designed to protect and warn living organisms that they are under threat. When a person experiences pain, one of the most natural responses is for that person to give attention to where the pain is coming from, or discover what is causing the pain or threat.

The words '*acute*' pain and '*chronic*' pain refer to the time since the pain started – not the pain level. Acute pain is defined as less than three months. Chronic pain, or persistent pain, is usually defined as pain which lasts longer than the accepted tissue healing time: usually three months or longer. Chronic pain can have an enormous impact on people. It may interfere with a person's sleep patterns, their sexual activity, their ability to work and conduct daily activities, and it can cause emotional distress and lead to serious mental health problems, including depression.

Acute Pain

Acute pains, usually after an injury or infection, have genuine survival value. They may prevent or minimize serious damage to the body and are important for learning to avoid future encounters. Continuing pain during healing may also prevent reinjury. The memory of pain following injury or illness is an important part of learning.

Chronic Pain

In contrast to acute pain, chronic or persistent pains are destructive and serve no useful purpose. They can cause the physical hurt (such as low back pain) or illness (appendicitis) has often partially or fully resolved (healed), and yet pain persists. Chronic pain or smooth pain is defined as "pain that continues after an injury has healed or after an illness has passed". In acute pain, the problem usually relates to local

tissue injury or damage. However, with chronic pain, the problem is often less related to local tissues and involves a broader (systemic) problem. In acute pain most of the nociceptors tend to be more local at the site of any infection, inflammation or injury – the body's systems are designed to recognize the injury or damage and coordinate the mind and body to favor recovery.

In chronic pain, things change: there is growing involvement from other body systems (for example, the immune system, the hormonal system). Changes occur in the way in which the nervous system interprets pain and other normal input or information: signals that might cause pain normally can cause much more pain and things that don't normally hurt (e.g. normal daily movement or activities, gentle touch) can actually be painful. This is because the nervous system is not hard-wired but plastic, and the changes are due to the neuroplasticity of the nervous system and other systems, including the immune and endocrine systems. These neuroplastic changes in the nervous system contribute to ongoing pain [10]. Studies on functional plasticity in neural circuits of pain have provided mechanistic insights and linked various modulatory factors to a change in perception and behavior. However, plasticity also occurs in the context of structural remodeling and reorganization of synapses, cells and circuits, potentially contributing to the long-term nature of chronic pain [4].

Types of Pain

Pain types do differ. Usually, there are three widely accepted pain types relevant for the musculoskeletal system: nociceptive pain, inflammatory pain and neuropathic pain. It is not uncommon to have a "mix" of pain types. Current research suggests that understanding pain types is important because it may influence what pain management treatments are best for patients. Usually, pain management is never decided just on pain type, but this can be an important factor in considering what pain treatments are best suited to the problem [9].

Nociceptive Pain

Nociceptive pain can be thought of as pain associated with tissue injury or damage or even potential damage. Nociceptors as sensory endings of nerves can be excited or sensitized and signal potential tissue damage. Whether or not these nociceptors excitation is experienced as pain, depends on many factors including the context of the experience and the priority of brain/mind gives to the potential threat of injury [6].

Inflammatory Pain

Once there has been tissue damage, it is normal to have an inflammatory response and this is a good thing. Inflammation is a coordinated body system response that is designed to help heal the tissue damage. The inflammatory response is well coordinated and involves blood-borne chemicals, immune system cells and some chemicals released from specialized nerve fibers. These chemicals talk to each other to help coordinate tissue repair. There may be signs of tissue injury such as swelling, redness and later purple or yellowing of the skin, a limb that looks distorted, increased sensitivity

to touch and movement. Simple analgesia by paracetamol or non-steroidal anti-inflammatory drugs (NSAIDs) can be helpful in managing inflammatory pain by reducing noxious sensations.

Neuropathic pain

Neuropathic pain is pain associated with injury or disease of nerve tissue. People often get this type of pain when they have shingles, sciatica, cervical or lumbar radiculopathy, trigeminal neuralgia, or diabetic neuropathy. Neuropathic pain is often described as burning, shooting, stabbing, prickling, electric shock-like pain, with hypersensitivity to touch, movement, hot and cold, and mechanical pressure, and even a very light touch or gentle movement can be very painful [2].

Major advances have occurred in understanding how glia, cytokines and immune cells in the nervous system respond to painful inputs and contribute to unhelpful immune-mediated pain. Immune-like cells such as microglia, astrocytes, T cells and natural killer cells in the brain, spinal cord and peripheral nerves appear to play a major role in all forms of pain [1, 3, 8].

Some diseases with chronic pain

One form of chronic pain is associated with unremitting diseases such as arthritis and cancer that destroy body tissues. Chronic pain may also be caused by protruding discs in the spine, insufficient blood supply to heart tissue, severe burns, and variety of other pathologies of body's functions. The second type of chronic pain is usually out of proportion to an injury or other pathology and may persist long after healing is complete, its causes often being mystery. Trigeminal and postherpetic neuralgia, pelvic and urogenital pain, most back pains and headaches, and 'myofascial pains' are some of the kinds of chronic pain that are difficult to control [5].

Chronic pain management

The goals of pain treatment and management are to enhance functioning and reduce suffering and distress, while minimizing the risk of adverse effects. While it is rare to eliminate chronic pain completely, it should be possible to control pain to a tolerable level and allow people to function at an acceptable level.

A collaborative doctor-patient relationship that is based on mutual respect and includes two-way communication is particularly helpful for patients with chronic pain. Patients who have good relationships with their doctors tend to be more satisfied with their care.

Assessment of pain is essential to successful pain management. A pain assessment guides the selection of treatments, and provides a baseline against which to measure a patient's progress during treatment. Physical examination is only one aspect of pain assessment. Self-reports are the most reliable indicators of pain severity or intensity. A variety of pain measurement tools are available for doctors to use. They include numeric scales, visual analog scales, and verbal rating scales.

Psychological, social and occupational functioning

A pain assessment should include evaluation of a patient's psychological functioning. A person with chronic pain may develop negative beliefs about their experience of pain or negative thoughts about themselves. A high proportion of people with chronic pain also suffer from depression and anxiety. A person who has anxiety or depression often feels their pain more acutely and is more disabled by it. If left untreated, anxiety or depression may increase and loom over all aspects of the patient's life and make pain control and return to normal life very difficult. People who have poor psychological functioning may need referral to a psychologist who can help them with strategies for dealing with any detrimental thoughts, emotions or beliefs. The bio-psycho-social model acknowledges that psychosocial factors are inherent in chronic pain and require assessment if meaningful diagnostics and treatments are to occur. [13].

Treatment options for chronic pain

Management of chronic pain generally requires a multi-modal approach which emphasizes the role of non-drug techniques. It should not rely on pharmacological therapy alone. Non-pharmacotherapy options include patient education, behavior therapy, cognitive therapy, cognitive-behavior therapy, physical therapy, family therapy, complementary and alternative therapy (e.g. manipulative methods, acupuncture), and surgery and other invasive procedures.

Pharmacological management of chronic pain

Medication frequently forms part of a patient's treatment. Selection of medication should take into account the patient's medical history, the nature of the pain (e.g. type, site, severity), and factors that may affect a patient's compliance with the prescribed regimen such as age, cognitive state, route of administration and tolerance. It is important that the appropriate dose is prescribed. An appropriate dosage is one which achieves satisfactory functioning with adequate pain control and tolerable side effects. A common error is to use inadequate doses of opioid and non-opioid analgesics [12].

Conclusions

Optimal outcomes in pain management are only now beginning to be defined and more research is needed. When possible, pain should be prevented and controlled to a degree that facilitates function and quality of life. Pain treatment and purposes must be tailored to the needs, desires and circumstances of individual patients and therapies often differ for acute and chronic pain, but still focus on prevention and pain relief. Goals for pain management should be specific, measurable and patient centered. It is both unrealistic and undesirable to cast 'no pain' as a treatment goal. Aims for pain management should be written in the plan of care and may include the patient expresses adequate pain relief, minimal side effects from the analgesic regimen, maintenance or improvement in functional status, or satisfaction with pain management.

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Медицина болю – загальний огляд проблеми

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Резюме. Бурхливе зростання наших знань щодо усіх аспектів болю за останні роки дозволило досягти значних успіхів у класифікуванні та лікуванні різних типів болю. Однак, незважаючи на прогресування знань в галузі медицини болю за останні десятиліття, тягар болю залишається неприйнятно високим. Епідеміологічні дослідження вказують на високу поширеність хронічного болю в усьому світі і пов'язані з цим приголомшливі соціально-економічні втрати. На жаль, існуючі методи лікування не дають хорошого знеболюючого ефекту у більшості цих пацієнтів. Досягнуто певних скромних успіхів, схвалено деякі нові методи лікування, але тим не менше медицина болю все ще залишається в пошуках пізнання нових ініціатив і підходів, які служать для кращого розуміння механізмів болю, що веде до ефективної терапії.

Ключові слова: концепція болю, гострий і хронічний біль, контроль над болем.

Медицина боли – общий обзор проблемы

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Резюме. Бурный рост наших знаний о каждом аспекте боли за последние годы позволил добиться значительных успехов в классификации и лечении разных типов боли. Однако, несмотря на продвижение знаний в области медицины боли за последние десятилетия, бремя боли остается неприемлемо высоким. Эпидемиологические исследования указывают на высокую распространенность хронической боли во всем мире и связанные с этим ошеломляющие социально-экономические издержки. К сожалению, существующие методы лечения не дают хорошего болеутоляющего эффекта большинству этих пациентов. Имели место некие скромные успехи в одобрении некоторых новых методов лечения, но тем не менее медицина боли все еще остается в поисках познания новых инициатив и подходов, которые служат для лучшего понимания механизмов боли, ведущего к эффективной терапии.

Ключевые слова: концепция боли, острая и хроническая боль, контроль над болью.