Section 9

Comparison of Nociceptive and Neuropathic Pain

Nociceptive Pain

Nociceptive pain results from tissue damage. Intact neurons report damage, and pain is experienced. Nociceptive pain can be subdivided into somatic and visceral pain. Nociceptive pain can be experienced as sharp, dull, or aching. There may be radiation of the pain, especially visceral pain, but it will not be in a direct nerve distribution. For example, gallbladder pain can radiate to the scapula. Nociceptive pain is generally responsive to NSAIDs (nonsteroidal anti-inflammatory drugs) and opioids. Conditions associated with inflammation, bone pain, and joint disease are particularly responsive to NSAIDs.

Neuropathic Pain

Neuropathic pain may occur when there is either damage to or dysfunction of nerves in the peripheral or central nervous system. Examples of neuropathic pain include diabetic neuropathy and trigeminal neuralgia. Neuropathic pain frequently coexists with nociceptive pain. Examples include trauma that damages both tissue and nerves, such as severe burns that burn skin as well as damage nerve endings and a lumbar disc herniation that results in tissue pain along the distribution of the sciatic nerve..

Neuropathic pain is often described as having a burning or electrical quality. It may feel like a shock or lightning bolt. Sometimes stimuli that usually do not cause pain, such as light touch, may elicit a paroxysm of pain. A light stroke of the cheek that results in the sudden pain of trigeminal neuralgia is an example of this type of pain. Sometimes patients do not describe the sensation as being "painful" but rather as feeling unpleasant, strange or tingly. This feeling is called a dysesthesia.

Neuropathic pain in the peripheral nervous system frequently follows a nerve distribution. This distribution may replicate a particular nerve, as in sciatic pain or trigeminal neuralgia, or may represent the distribution of terminal nerve endings, as in the stocking-glove distribution of peripheral neuropathies.

Neuropathic pain is relatively resistant to NSAIDs and opioids, although they may be helpful in certain cases. The other major classes of medications that are prescribed for neuropathic pain include tricyclic antidepressants, anticonvulsants, and sodium channel blockers.[1]

Analysis of Somatic, Visceral and Neuropathic Pain

Somatic, visceral and neuropathic pain can all be either acute or chronic in nature. Somatic, visceral, and neuropathic pain can all be felt at the same time or singly and at different times. Most cancer patients experience both somatic and visceral pain. Only about 15-20% of all cancer patients report neuropathic pain. The different types of pain respond differently to the various pain management therapies. Somatic and visceral pain are both easier to manage than neuropathic pain.[2]

Somatic Pain

Somatic pain is caused by the activation of pain receptors in either the cutaneous musculoskeletal tissues. When it occurs in the musculoskeletal tissues, it is called deep somatic pain. Common causes of somatic cancer pain include metastasis in the bone (an example of deep somatic pain) and postsurgical pain from a surgical incision

(an example of surface pain). Deep somatic pain is usually described as dull or aching but localized. Surface somatic pain is usually sharper and may have a burning or pricking quality. [3]

Visceral Pain
Visceral pain is caused by activation of pain receptors resulting from infiltration, compression, extension, or stretching of the thoracic, abdominal, or pelvic viscera. Common causes of visceral pain include pancreatic cancer and metastases in the abdomen. Visceral pain is not well localized and is usually described as pressure-like, deep squeezing. [4]

Neuropathic Pain
Neuropathic pain is caused by injury to the nervous system either as a result of a tumor compressing nerves or the spinal cord, or cancer actually infiltrating the nerves or spinal cord. It also results from chemical damage to the nervous system that may be caused by cancer treatment (chemotherapy, radiation, surgery). This type of pain is severe and usually described as burning or tingling. Tumors that lie close to neural structures are believed to cause the most severe pain that cancer patients feel.

Acute versus Chronic Pain Signs and Symptoms

Acute Pain
Acute pain begins suddenly and is usually sharp in quality. It serves as a warning of disease or a threat to the body. Acute pain might be caused by a traumatic event or its etiology and onset can be insidious in nature. Acute pain might be mild and last just a moment, or several days, increasing in intensity over time (subacute pain), or it can occur intermittently .Acute pain can also be severe and last for weeks or months. In most cases, acute pain does not last longer than three months, and it disappears when the underlying cause of pain has been treated or has healed.

The longer acute pain persists the more susceptible it is to other influences and developing into a chronic pain problem. These influences include such things as the ongoing pain signal input to the nervous system even without tissue damage, the increased potential for physical deconditioning, and psychological manifestations of depression and anxiety.

Sub Acute Pain: Subacute pain is a subset of acute pain: it is pain that has been present for at least six weeks but less than three months (van Tulder et al. 1997).

Chronic Pain
Chronic pain is defined as pain lasting for more than 3 months. It is much more subjective and not as easily described as acute pain. Chronic pain persists despite the fact that the injury has healed. Pain signals remain active in the nervous system for weeks, months, or years. Physical effects include increased muscle toneity, decreased ranges of motion, lethargy,and changes in appetite. Emotional effects include depression, anger, anxiety, and fear of re-injury. Common chronic pain complaints include:

- Headache
- Low back pain
- Cancer pain
- Arthritis pain
- Neurogenic pain
- Psychogenic pain

Chronic pain might have originated with an initial trauma/injury or infection, or there might be an ongoing cause of pain. However, some people suffer chronic pain in the absence of any past injury or evidence of body damage.

Effectively treating chronic pain poses a great challenge for physicians. This kind of pain usually affects a person's life in many ways. It can change someone's personality, ability to function, and quality of life.[5]

Types of Chronic Pain Scenarios

There are two different types of chronic pain scenarios - chronic pain due to an identifiable pain generator (e.g. an injury), and chronic pain with no identifiable pain generator (e.g. the injury has healed).

Chronic pain due to an identifiable pain generator
This type of chronic pain is due to a clearly identifiable cause. Certain structural spine conditions (for example, degenerative disc disease, spinal stenosis and spondylolisthesis) can cause ongoing pain until successfully treated. These conditions are due to a diagnosable anatomical problem.

Chronic pain with no identifiable pain generator
This type of pain continues beyond the point of tissue healing and there is no clearly identifiable pain generator that explains the pain. It is often termed "chronic benign pain".
Pain can set up a pathway in the nervous system and, in some cases, this becomes the problem in and of itself. In chronic pain the dysfunctioning nervous system sends a pain signal even though there is no ongoing tissue damage.

The term "chronic pain" is generally used to describe pain that lasts more than three months, or beyond the point of tissue healing. Chronic pain is usually less directly related to identifiable tissue damage and structural problems. Examples of chronic pain are: chronic back pain without a clearly determined cause, failed back surgery syndrome, and fibromyalgia.

Causes of Pain By Region

Visceral pain sensation is often referred by the CNS to a dermatome region which is be far away from the originating organ. These correlate to the position of the organ in the embryo. Examples of this include the heart which originates in the neck, thus producing the classical neck and arm pain experienced during acute cardiac pain.

Head and Neck
Jaw - Temporal arteritis, trauma .
Ear - otitis media, otitis externa, trauma.
Eye - glaucoma, trauma.
Head - migraine, tension headache, cluster headache, cancer, cerebral aneurysm, sinusitis, meningitis.
Neck pain – myocardial infarction, trauma.

Thorax
Back - cancer, trauma.

Breast - premenstrual, cancer, trauma.
Chest – Myocardial infarction, pancreatitis, hiatal hernia, aortic dissection, pulmonary embolism, Costochondritis.
Shoulder - cholecystitis.

Abdomen
Left and right upper quadrant - peptic ulcer disease, gastroenteritis, hepatitis, pancreatitis, cholecystitis, abdominal aortic aneurysm, gastric cancer.
Left and right lower quadrant - appendicitis, ulcerative colitis, Crohn's disease, ectopic pregnancy, endometriosis, pelvic inflammatory disease, diverticulitis, urolithiasis, pyelonephritis, cancer.

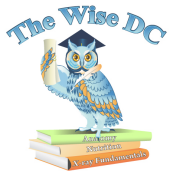
Back
Back - Muscle strain, cancer, spinal disc herniation, degenerative disc disease, coccydynia.

Limbs
Arm - myocardial infarction (classically the left arm, sometimes bilateral).
Leg - deep vein thrombosis, peripheral vascular disease (claudication), musculoskeletal, spinal disc herniation, sciatica.

Joints
Classically small joints - osteoarthritis (common in the elderly), rheumatoid arthritis, systemic lupus erythematosis, gout, pseudogouttarsal/carpal tunnel syndrome.
Classically large joints (hip, knee) - osteoarthritis (common in the elderly), septic arthritis, hemarthrosis, trauma.
Other - psoriatic arthritis, Reiter's syndrome.

Genotype and Pain
Pain may be experienced differently depending on genotype (i.e, genetic background). A study by Liem *et al.* suggests that redheads are more susceptible to thermal pain.[6] However, another study suggests that redheads--who have a non-functional melanocortin-1 receptor (MC1R) gene--are less sensitive to pain from electric shock.[7]

Gene SCN9A has been identified as a major factor in the development of the pain-perception systems within the body. A rare genetic mutation in this area causes non-functional development of certain sodium channels in the nervous system, which prevents the brain from receiving messages of physical damage. People having this disorder are completely ignorant to pain, and can perform without pain various kinds of self mutilation or damage. In the families studied, this has ranged from biting of the person's own tongue leading to damage, to death from injuries due to a failure to have learned limits on injury through experience of pain. The same gene also appears to mediate a form of hyper-sensitivity to pain, with other mutations seeming to be "at the root of paroxysmal extreme pain disorder" [8]



[1] www.mywhatever.com
[2] www.oncologychannel.com/pain/types
[3] www.oncologychannel.com/pain/types
[4] www.oncologychannel.com/pain/types
[5] www.oncologychannel.com
[6] Liem EB, Joiner TV, Tsueda K, Sessler DI. Increased sensitivity to thermal pain and reduced subcutaneous lidocaine efficacy in redheads. Anesthesiology. 2005 Mar;102(3):509-14.
[7] Mogil JS et al. [1] Journal of Medical Genetics 2005 Jul;42(7):583-7.
[8] Hopkin,M.(2006).The mutation that takes away pain. Retrieved from www.nature.com