Classification and types of acute and chronic pain

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Pain

An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage

*International Association for the Study of Pain*, 1979

(Merskey & Bogduk, 1994).
Acute pain is defined as ‘pain of recent onset and probable limited duration. It usually has an identifiable temporal and causal relationship to injury or disease (Ready & Edwards, 1992).
Pain is the body's normal response to injury. It serves an evolutionary role, warning an individual of potential injury or illness and preventing the worsening of an existing pathology.
The neural processes underlying the encoding and processing of noxious stimuli are defined as ‘nociception’

(Loeser & Treede, 2008)
Multidimensional character of pain

Nociception

Perception

Suffering

Pain behaviour
Pain mechanisms

Nociceptive pain

- Somatic
- Visceral

Referred pain

Neuropathic pain

Mixt pain

Idiopathic pain

Fibromialgia
Nociceptive pain

Ascending impulses

Spino-thalamic tracts

Dorsal horn

DRG

Peripheral nerve

Peripheral nociceptors

transduction

transmission

modulation

perception

Receptors and peripheral sensitisation

ION – CHANNELS

IONOTROPIC RECEPTORS:
TRP, AMPA, NMDA

METABOTROPIC:
GLUTAMATE
PROSTANOIDs
HISTAMINE
SEROTONINE
BRADYKININ
CANNABINOId
OPIOID

From Meyer et al.. 2006
The voltage-gated sodium-channel type IX α subunit, known as Nav1.7 and encoded by the gene SCN9A, is located in peripheral neurons and plays an important role in action potential production in these cells.


Gain-of-function missense mutations in Nav1.7 have been shown to cause primary erythermalgia and paroxysmal extreme pain disorder nonsense mutations in Nav1.7 result in loss of Nav1.7 function and a condition known as channelopathy-associated insensitivity to pain

Progressive increase in action potential output from dorsal horn neurons is present with each stimulus and rapid increase responsiveness during the course of train of inputs – temporal summation "WIND UP"

Long Term Potentiation (LTP) enhances responses outlasts the conditioning stimulus – **central sensitisation in dorsal horn neurons**

Learning and memory in Hippocamp

*Acute Pain Management: Scientific Evidence 2010*
Affective and autonomic responses

- Limbic system
- parabrachial
- Lamina I
- Lamina V
- PAG
- LC
- RVM
- Other Sensory centers
- thalamus
- Sensoric cortex
- attention

Sensoric responses

- Sensory centers
- Sensory cortex
- thalamus
- Lamina V
- Lamina I

Afferent signal

- AMPA
- NMDA
- 5HT
- NA
- LTP
- Wind-up

Adapted from Dickenson A.H
2004 IASP Press
The limbic system and cerebral cortex plays cognitive role and are responsible for recognition of pain stimulation. Here arouse fear, anxiety and anger, and pain behavior and memory are created.
Descending modulatory circuitry
Deep Noxious Inhibitory Control

Attention, expectation and the role of the limbic cortex in top-down modulation of pain
Chronic pain
There is no evolutionary role for chronic pain

It does not play warning defence role

It is chronic illness itself

It is almost invariably accompanied by a significant behavioural response and varying degrees of disability

Multidirectional management

Pain therapy
Chronic pain patient

- Drug dependency
- Decreased pain threshold
- Fatigue
- Mental retardation
- Activity aggravating pain
- Appetite changes
- Irritability, anger
- Decreased libido and sexual activity
- Low confidence in ability
- Sleep disturbances
- Decreased pain threshold
- Drug dependency
Prevalence of Chronic Pain by Country
– European Summary Based on Complete Screener Data –
(Unweighted)

<table>
<thead>
<tr>
<th>Country</th>
<th>Prevalence</th>
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<tbody>
<tr>
<td>Norway</td>
<td>30%</td>
</tr>
<tr>
<td>Poland</td>
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<tr>
<td>Italy</td>
<td>26%</td>
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<tr>
<td>Belgium</td>
<td>23%</td>
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<tr>
<td>Austria</td>
<td>21%</td>
</tr>
<tr>
<td>Finland</td>
<td>19%</td>
</tr>
<tr>
<td>Sweden</td>
<td>18%</td>
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<tr>
<td>Netherlands</td>
<td>18%</td>
</tr>
<tr>
<td>Germany</td>
<td>17%</td>
</tr>
<tr>
<td>Israel</td>
<td>17%</td>
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<tr>
<td>Denmark</td>
<td>16%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>16%</td>
</tr>
<tr>
<td>France</td>
<td>15%</td>
</tr>
<tr>
<td>Ireland</td>
<td>13%</td>
</tr>
<tr>
<td>UK</td>
<td>13%</td>
</tr>
<tr>
<td>Spain</td>
<td>11%</td>
</tr>
</tbody>
</table>

Stat testing at the 95% confidence level where: U = greater than United Kingdom, F = greater than France, G = greater than Germany, T = greater than Italy, S = greater than Spain, P = greater than Poland, W = greater than Sweden, Y = greater than Norway, D = greater than Denmark, L = greater than Finland, I = greater than Ireland, N = greater than Netherlands, B = greater than Belgium, A = greater than Austria, Z = greater than Switzerland, and E = greater than Israel

Source: All screening criteria.
III. Profile of Pain

Locations and Causes of Chronic Pain

Most Common Body Locations of Pain Reported by Chronic Pain Sufferers
– Poland –
(n=300)

- Lower back: 37%
- Head: 26%
- Leg: 14%
- Knee: 13%
- Joints (unspecified): 9%
- Abdomen: 6%
- Hip: 6%
- Hand: 6%
- Back (unspecified): 5%
- Upper back: 5%
- Neck: 3%

Most Common Causes of Pain Reported by Chronic Pain Sufferers (Unaided + Aided)
– Poland –
(n=253)

- Arthritis/osteoarthritis: 34%
- Tension Headache: 20%
- Herniated/deteriorating discs: 16%
- Traumatic injury: 16%
- Rheumatoid arthritis: 8%
- Migraine headaches: 8%
- Nerve damage: 5%
- Surgery: 4%

Note: ? indicates missing data.
Neuropathic pain – pain initiated or caused by a primary lesion, dysfunction, or transitory perturbation in the peripheral or central nervous system

Neuropathic pain – pain arising as a direct consequence of a lesion or disease affecting the somatosensory system (IASP definition 2008)

Non-nociceptive, pathological pain
- it is often experienced in parts of the body that otherwise appear normal
- it is generally chronic, severe and resistant to analgesic
- it is rarely if ever an indication of progressive damage

There is often cited that 1.5% of the general population is affected by neuropathic pain, however a UK study found that the prevalence was about 8.2% (17% of patient with chronic pain). That difference indicates the difficulty of diagnosing and estimating precisely the prevalence and incidence of neuropathic pain

Post-amputation pain
PDPN
MS
PHN
Myelopathy
Post-stroke pain
Spinal cord injury pain
Trigeminal neuralgia
CRPS
Ectopic burst discharges
ongoing pain

Pathological connection Aβ and C fibres and morphological changes in DHN allodynia

Pathological connection B and C fibres proliferation B fibres to DRG

Sympathetically maintained pain

Glial cell activation – EAA, fractalkins

- TNF α
- astrocytes

Production of IL-1β, IL-6, TNF α

Activation of p38MAPK

Chronic neuroimmune activation

Lack of agreed definitions and specific diagnostic tool for neuropathic pain - hamper epidemiological studies and grading system for neuropathic pain was proposed:

- definite
- probable
- possible neuropathic pain

Neuropathic pain scales:
- NPS
- Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) Scale
- Self-report LANSS (S-LANSS)
- DN4
- Pain DETECT
Definite neuropathic pain

Postherpetic neuralgia

71 y.o. patient with postherpetic neuralgia, C6-C7 dermatomes

Edema, changes in skin blood flow, abnormal sudomotor activity in the region of pain (PHN + CRPS)
In one patients may coexist more than one mechanism of pain.
Definite peripheral neuropathic pain

- Diabethic neuropathy
- Trigeminal neuralgia
- Postamputation pain
  - Phantom limb pain
  - Stump pain
- Postsurgical/posttraumatic neuropathic pain
- Nerve compression neuropathies, e.g. CTS, meralgia paresthetica
- CRPS II
- CRPS I (?)
- Radiculopathy
- Radicular pain
Probable neuropathic pain

- Hereditary neuropathies
- Guillain-Barre syndrome
- Toxic neuropathies
- Hypothyroid neuropathy
- Temporomandibular disorder pain
Possible neuropathic pain

- Mixed pain
- Cancer pain
- Failed back surgery syndrome
- Transient radicular pain
- Posterior ramus and medial branch neuropathy (?)
Central neuropathic pain

- Central post-stroke pain
- Multiple sclerosis pain
- Spinal cord injury pain
Causes and patomechanisms of pain in spinal diseases
Neuropathic: Definite ? Probable ? Possible ?

- Discogenic pain
- Radicular pain/ Radiculopathy
- FBSS
- Referred pain
- Spinal stenosis
- Musculoskeletal pain
- Nonspecific LBP

Fractures
Infections
Neoplasms
The aim of the study was to determine occurrence of selected kinds of neuropathic pain in the general population in Poland, in which pathophysiology of the somatosensory nervous system lesion was obvious.

Polish Pain Society asked Polish National Health Fund to provide data concerning diagnosis of neuropathic pain syndromes among out-patients on the basis of ICD-10 between 1 June 2008- 31 May 2009. Data provided by NHF revealed, that in 2008-2009 different neuropathic pain syndromes were diagnosed and treated in 111 041 patients (0,3% of general Polish population and 1,46% of chronic pain patients).
The most common neuropathic pain syndromes diagnosed by primary care physicians and other specialists were:

- mononeuropathy of upper extremity (G56) - 63 433 patients (57% of all neuropathic pain patients),
- mononeuropathy of lower extremity (G57) - 22 225 patients (20%)
- trigeminal neuralgia (G50) - 18 092 patients (16.3%)
- painful polineuropathy (G63) - 7 291 patients (6.6%)
Acute pain states that may progress to chronic pain:

- postoperative
- post-traumatic pain
- acute back pain
- herpes zoster
Transition from acute to chronic pain

Progression of acute to chronic pain
Persistent post operative pain

Risk of nerves damage after surgery

- Amputation 5 – 10%
- Thoracotomy 10%
- Mastectomy 5 – 10%
- Cholecystectomy 2%
- Herniotomy 2 – 4%
- (Coronary Aortic Bypass Graft) 5 – 10%
Risk factors for chronic postsurgical pain

Preoperative factors

• Pain, moderate to severe, lasting more than 1 month
• Repeat surgery
• Psychologic vulnerability (eg catastrophising)
• Preoperative anxiety
• Female gender
• Younger age (adults)
• Workers’ compensation
• Genetic predisposition
• Inefficient diffuse noxious inhibitory control (DNIC)

(Kehlet et al, 2006)
(Macrae, 2008)
(Schug 2010)
Risk factors for chronic postsurgical pain

Intraoperative factors - Surgical approach with risk of nerve damage

Postoperative factors

• Pain (acute, moderate to severe)
• Radiation therapy to area
• Neurotoxic chemotherapy
• Depression
• Psychological vulnerability
• Neuroticism
• Anxiety

(Kehlet et al, 2006)  
(Macrae, 2008)  
(Schug 2010)
Transition from acute to chronic pain

Chronic pain:

Radicular pain
Discogenic pain
Nonspecific LBP
Failed back surgery syndrome

Karpinen J. New Perspectives in sciatica
In: Immune and Glial Regulation of Pain
IASPPress 2007
Thank you for your attention