

Peripheral receptors

1. Discriminative touch

- There are **three different categories** (modalities) of the somatosensory system. The first, **discriminative touch**, is the perception of pressure, vibration, and texture. This system relies on four different receptors in the skin. They are:
 - 1) Meissner's corpuscles
 - 2) Pacinian corpuscles
 - 3) Merkel's disks
 - 4) Ruffini endings

Peripheral receptors

2. Pain and temperature

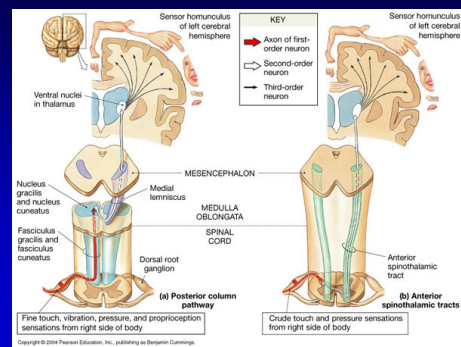
- They do not have specialized receptor organs. Instead, it uses **free nerve endings** throughout skin, muscle, bone, and connective tissue to perceive changes in temperature and pain peptides.
- STIMULUS
 - damage to a free nerve ending
 - release of substances which damage tissues: **prostaglandins, histamine, and substance P**

Peripheral receptors

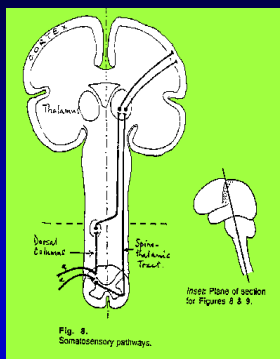
3. Proprioceptive sensation

- The third modality, **proprioceptive sensation**, relies on receptors in muscles and joints

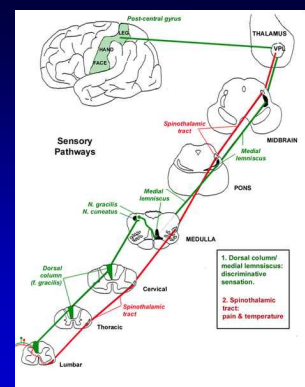
Sensitive pathways



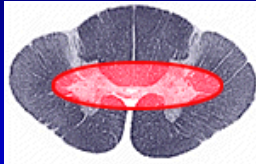
Sensitive pathways



Sensitive pathways

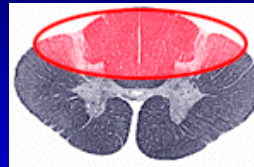


comissura anterior alba



- **Pain, term sensitivity – syringomyelic dyssociation**
- **Syringomyelia**
- **Intramedul tumors**

Dorsal columns



- **Hypotonia, ↓ - 0 reflexes**
- **Spinal ataxia**
- **Tabic dyssociation**
- **Tabes dorsalis**
- **Extramedul tumors**

BROWN-SEQUARD SYNDROME

Brown-Sequard Syndrome is commonly caused by blunt trauma to the anterior (front) portion of the spinal cord.

CHARACTERISTICS OF BROWN-SEQUARD SYNDROME

1. Hemiparesis of corticospinal tracts
2. Bilateral spastic paralysis
3. Babinski-Babinski's sign
4. Bilateral loss of deep-tendon reflexes
5. Hemiparesis of posterior horn cell
6. Bilateral loss of touch, sense of vibration and position
7. Hemiparesis of lateral spinothalamic tracts

Fiber Tracts of Spinal Cord

Ascending Pathways (red)
Descending Pathways (blue)

- **Ipsilateral – deep sensitivity**
- **Contralateral – pain, term sensitivity**
- **Bilateral – touch sensitivity**

Transversal lesion



- **Anesthesia below lesion**

The discriminative touch system

- The posterior columns
- **The primary** afferents ascend all the way to the medulla, on the **ipsilateral** side of the cord, in the posterior columns. **The secondary** afferents cross in the medulla and ascend as the medial lemniscus. In the **thalamus** they synapse in the VPL (the ventroposterior lateral nucleus) and finally ascend to cortex.

Patological sensations

- **Hypesthesia**
- **Anesthesia**
- **Hyperesthesia**
- **Dyzeesthesia**

Syndromes – Periferal nerves

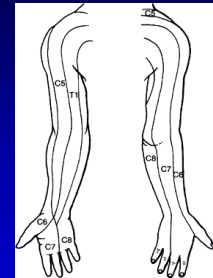
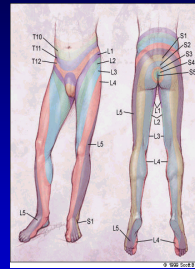


Fig. 7
Receptive fields of individual sensory units. These are smallest in areas such as the fingers.



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Roots



Decreased reflexes

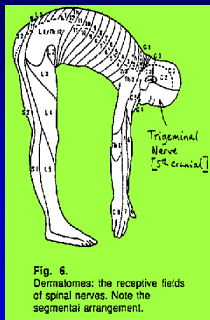
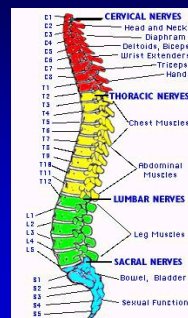


Fig. 6.
Dermatomes: the receptive fields of spinal nerves. Note the segmental arrangement.

Vertebromedullary topography



- C-part. + 1 segment
- Upper Th + 2 segments
- Lower Th + 3 segments

sy cauda equina

- Pain and hypesthesia S3 – S5
- **Perianal and perigenital localisation**
- ↓ reflexes
- Periferal paresis

Brain

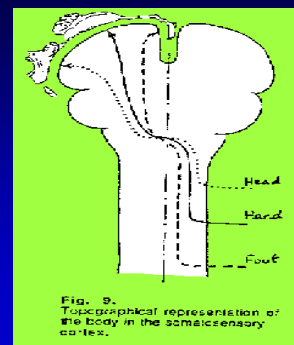


Fig. 8.
Topographical representation of the body in the somatosensory cortex.

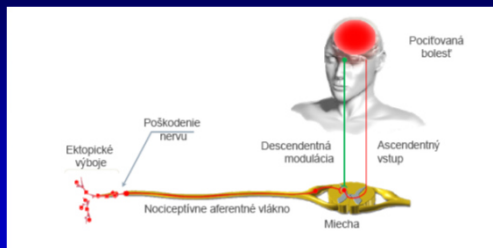
Zacharjin-head areas

- Pain projection from internal organs to skin thanks to common origin of innervation
- Heart Th 1-3, lungs Th 1-4
- Liver, gall-bladder – Th 7-10, stomach Th 7-10
- Small intestine Th 9-12, colon – L
- Kidney Th 11-L1, testis, ovarium Th 10
- Urinary bladder, uterus Th 11-S4

Pain

- Nociceptive – stimulation of $A\delta$ a C fibers protective
 - Neuropathic
 - Primary or secondary lesion or dysfunction of the nervous system
 - Common analgetics does not work
- Therapy - anticonvulsants

Mechanisms of neuropathic pain

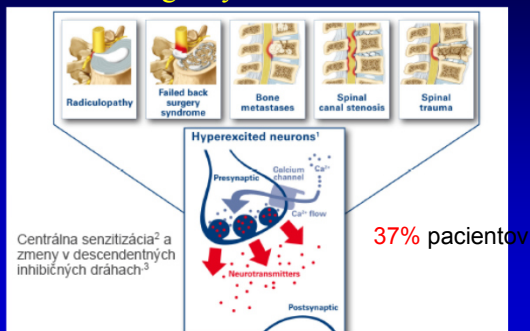


Neuropathic pain

Charakteristické črty neuropatickej bolesti sú:

- **Hyperpathy** – increased response for painful stimuli
- **Hyperalgezia** – increased sensitivity for painful stimuli
- **Dysetézia** – unpleasant sensations
- **Allodynia** – pain after nonpainful stimulus

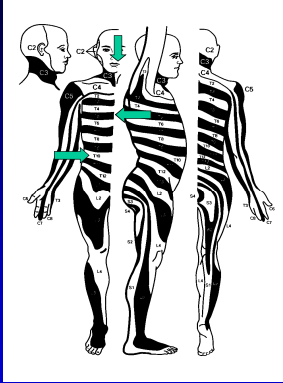
Neuropatická bolesť pri vertebrogénnych ochoreniach



Postherpetic neuralgia

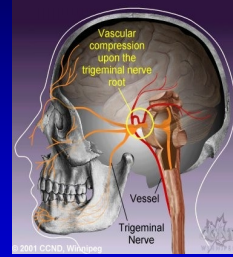


Credit: NIAID



Th3 – Th12
(Th 5, 6)
L1 - L2
n. V.

Trigeminal neuralgia



Jonas: Mosby's Dictionary of Complementary and Alternative Medicine. (c) 2005, Elsevier.