

Physiology of Pain

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Editorial

We give different characters to the pain. If a child is injured, he will cry and say, "I have a wound". The mother will ask: where does my love hurt? Consider that these are two different approaches to pain: 1. The emotional element of pain, which is phylogenetically primitive and deals with pain as something unpleasant, which must be avoided and the most recent: 2. the distinct element of pain, which is the ability to perceive exactly where the pain is and to respond appropriately.

Pain in the cortex: It was commonly said that the structures of the cortex only superficially deal with the perception of pain, if not at all. This is wrong, as a multitude of connections link higher structures of the cortex to centers of pain in the chamber and the brainstem. Important structures of the cortex are:

The primary aesthetic cortex (sensory cortex)

The secondary aesthetic cortex

The anterior part of the central lobe of the cerebral hemispheres (insula)

The adductor propeller

The primary cosmetic cortex is responsible for detecting pain.

The adductor helix is related to the emotional element of pain.

The chamber is the central transmission station of pain.

Several of its nuclei deal with pain. The lateral nuclei deal with the aesthetic / discrete element of pain and the inner nuclei deal with the emotional element of pain.

Cerebellum: There are a number of structures associated with

midbrain pain. Most of this circuit is related to the emotional component of pain, with extensive connections to the reticular formation of the brainstem. Important elements are the following:

The peripheral gray matter

The red nucleus

The core of Darkschewitsch

The intermediate nucleus of Cajal

The wedge-shaped nucleus and the Edinger - Westphal nucleus

The brain stem

The most important center of pain in the bridge is the locus coeruleus (subcutaneous site). It contains noradrenaline and neurons that regulate pain through pathways that descend to the spinal cord.

The medulla oblongata

It also participates in the emotional element of pain. The giant cell nucleus and the lateral reticular nucleus are important.

The spinal cord

Traditionally it has been thought that most pain fibers (AD and C) enter the gray matter of the hind horns of the spinal cord. They are then connected via the ascending pathway with the spinal canal. In fact, anything over 40% of the aesthetic fibers enters the abdominal root.

There was a lot of excitement when gate theory was first described. Although the mechanism is now well documented and has a clinical use, it is known to be a simplification.



The basic idea is that the incoming pain stimulus can be interrupted by other stimuli, because many nerve cells communicate with each other in the posterior horn. The most important fibers that enter from the periphery to the dorsal horn are:

Cranial fibers that are important carriers of the long-lasting pain caused by surgical trauma.

Thin myelinated A fibers associated with a more localized pain.

Fibers that carry information about the perception of position from the periphery to the spinal cord.

Unpleasant stimuli entering through the C-fibers can be suppressed by simultaneous stimulation of the A-fibers (stimulus of high intensity and low frequency, such as acupuncture) or by stimuli passing through the A-fibers. For example, TENS: percutaneous electrical nerve stimulation and the simple rubbing of the skin, which is very well known by mothers, that reduces the perception of pain.

Ascending street

Spinal-network-cerebral pathway: has few to no opioid receptors. It has little to do with the perception of pain as a painful stimulus.

Downhill street

Equally important are the fibers, which descend from the brainstem to the spinal cord to modify incoming stimuli. Neurotransmitters are noradrenaline specifically in the subnucleus locus (locus coeruleus) and serotonin in raphe nuclei. Opioid receptors are particularly evident here.

Pain in the periphery

Most tissues contain specific pain receptors, called nociceptors. In the past, it was believed that the painful

stimulus was perceived by overstimulating the receptors. This is wrong. The quality of the pain seems to depend on the area of stimulation and the nature of the fibers that transmit the sensation of pain. Even in the periphery, there is a distinction between acute immediate pain ("the first pain") transmitted by the A fibers and prolonged unpleasant burning pain, transmitted by smaller medullary C fibers.

Pain receptors have many different receptors on their surface, which shape their sensitivity to stimulation. These include GABA, bradykinin, histamine, serotonin, capsaicin receptors, opiates, but the various roles of these receptors are scarce. Most striking, in terms of perception of pain in the periphery, is that most pain receptors remain inactive. Inflammation sensitizes the vast majority of pain receptors and leads them to a greater sensitivity to stimulation (hyperalgesia). remote area from the primary trauma and possibly related to NMDA "wind up" mediation.

Neurotransmitters

A number of neurotransmitters mediate the transmission of pain sensation, both to the brain and to the spinal cord. The number of neurotransmitters is increasing daily. We can classify them into the following categories:

Stimulants: glutamate and tachykinins

Inhibitors: There are many inhibitory neurotransmitters, but in the CNS, GABA (γ -aminobutyric acid) appears to predominate.

The neurotransmitters involved in the centrifugal regulation of pain. The α -2 stimulatory effects of noradrenaline and the effects of serotonin are evident. Opioids relieve pain by activating the μ - and δ -receptors.