History of Pain: From Avicenna to Melzack and the Future: Review

Ağrının Tarihçesi: Avicenna'dan Melzack'a ve Gelecek

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ABSTRACT The concept of pain has remained a topic of long debate since its emergence in ancient times. The history of pain problems is as long as that of human beings; however, the understanding of pain mechanisms is still far from sufficient. Avicenna who was a Muslim philosopher and physician noted that, in disease, pain can dissociate from touch or temperature recognition, and proposed pain to be an independent sensation so that Avicenna was first to recognize pain as a discrete and separate sense. By the mid twentieth century, the biased methodology of researching pain mechanisms left many questions unanswered when it came to pain conditions occurring in the absence of seemingly inappropriate stimulus. As such, Melzack and Wall developed the Gate Control theory (GCT) of pain in the 1965 which combined aspects of previous theories. This theory offered a physiological explanation for the previously observed effect of psychology on pain perception. In the early 2000s, the mystery of association of psychological or physical stres with chronic pain syndromes, attracted the attention. Then the neuromatrix theory of pain proposed by Melzack provides a new conceptual frame work to examine these problems. The explanation of Ibn Sina as "nerves carry nociceptive pain sensations to the brain which itself acts as the organisational centre and subsequent source of the painful feeling experienced by the patient" in the year 1000 is similar to the explanation of Melzack as "brain has a very important dynamic role in the formation of pain" in the year 2000.

Key Words: History; chronic pain

ÖZET Ağrı insanoğlu var olduğundan beri hep tartışma konusu olmuştur ve ağrı mekanizmaları hala günümüzde anlaşılamamıştır. Ağrının dokunma ve ısı gibi duyulardan farklı ve bağımsız olduğunu yani ağrının ayrı bir duyu olduğunu ilk iddia eden müslüman bir hekim ve filozof olan Avicenna'dır. 20'nci yüzyılın ortalarında ağrının mekanizması ile ilgili yapılan çalışmaların metodolojisindeki önyargılı tutum özellikle ağrılı uyaran yokluğunda da ağrı oluşması konusunda birçok cevaplanmamış soruların ortaya çıkmasına neden olmuştur. Bunun üzerine 1965 yılında Melzack ve Wall daha önceki teorilerin ışığında Kapı Kontrol Teorisini (KKT) geliştirmiştir. Bu teori ağrı algısında psikolojik etkinin fizyolojik açıklamasını ileri sürmüştür. 2000'li yılların başında kronik ağrı sendromları ile psikolojik veya fiziksel stresin ilişkisinin gizemi dikkatleri çekmeye başlamıştır. Daha sonrasında Melzack'ın öne sürdüğü nöromatriks teorisi bu konu ile ilgili çalışmalar için kavramsal bir çerçeve çizmiştir. 1000 yıl önce İbni Sina'nın "sinirlerin ağrı bilgisini taşıdığı beynin kendisinin ağrı yaşantısında organizasyonel bir görevi vardır" açıklaması 2000 yılında Melzack'ın "ağrı oluşumunda beyin önemli dinamik bir rol oynamaktadır" açıklaması ile benzerdir.

Anahtar Kelimeler: Tarih; kronik ağrı

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The concept of pain has remained a topic of long debate since its emergence in ancient times. The initial ideas of pain were formulated in both the East and the West before 1800. Since 1800, due to the

development of experimental sciences, different theories of pain have emerged and become central topics of debate.[1] However, the existing theories of pain may be appropriate for the interpretation of some aspects of pain, but are not yet comprehensive. The history of pain problems is as long as that of human beings; however, the understanding of pain mechanisms is still far from sufficient.

FROM AVICENNA

Avicenna (980-1037 AD) a renowned Muslim philosopher and physician wrote noted that, in disease, pain can dissociate from touch or temperature recognition, and proposed pain to be an independent sensation so that Avicenna was first to recognize pain as a discrete and separate sense.[2]

Avicenna's work, The Canon is a 1,000,000 word book that is considered the first pharmacopoeia and among other things, the book is known for the introduction of systematic experimentation and quantification into the study of physiology, the discovery of the contagious nature of infectious diseases, the introduction of quarantine to limit the spread of contagious diseases, and the introduction of evidence-based medicine, experimental medicine, clinical trials, randomized controlled trials, efficacy tests, clinical pharmacology, neuropsychiatry, physiological psychology, risk factor analysis, and the idea of a syndrome in the diagnosis of specific diseases.[3]

Avicenna wrote in the early eleventh century that "Nerves are one of the simple members as homogeneous, indivisible and the elementary tissues". He could exactly noticed that nerves were different from other tissues including the bone, cartilage, tendons, ligaments, arteries, veins, membranes. He also rendered an accurate physical description of nerves as white, soft, pliant, difficult to tear. He and his contemporaries began to describe the complex and varied arrangements of nerves throughout the body, attempting to differentiate further their functions. In the Canon of Medicine, he observed: "Dryness in the nerves is the state which follows anger" suggesting he believed the nerves to be entangled with and responsive to the emotions, yet another sign of their strong connections to the brain.[3]

As well as alluding to the now well-established theory of pain desensitisation to a persistent stimulus, Ibn Sina explains that nerves carry nociceptive pain sensations to the brain which itself acts as the organisational centre and subsequent source of the painful feeling experienced by the patient.[4]

TO MELZACK

In1664, **Rene Descartes** theorized that the body was more similar to a machine, and that pain was a disturbance that passed down along nerve fibers until the disturbance reached the brain.[1,5] This theory transformed the perception of pain from a spiritual, mystical experience to a physical, mechanical sensation meaning that a cure for such pain could be found by researching and locating pain fibers within the bodies rather than searching for an appeasement for God like during the Renaissance. This also moved the center of pain sensation and perception from the heart to the brain. Researchers began to pursue physical treatments such as cutting specific pain fibers to prevent the painful signal from cascading to the brain.

By the mid twentieth century, the biased methodology of researching pain mechanisms left many questions unanswered when it came to pain conditions occurring in the absence of seemingly inappropriate stimulus. As such, Melzack and Wall developed the Gate Control theory (GCT) of pain in the 1965 which combined aspects of previous theories.[6] So that, GCT ended a century-old debate about whether pain is represented by specific neural elements (specificity theory) or by patterned activity (pattern theory) within a convergent somatosensory subsystem.[6-8] Although it is now considered to be oversimplified with flaws in the presentation of neural architecture, the gate control theory spurred many studies in pain research and significantly advanced our understanding of pain. The GCT is based on the

idea that pain sensations are modulated by the spinal cord. The gate, in the dorsal horn of the spinal cord, modulates pain in two ways: the gate is controlled by ascending signals from the peripheral nervous system, and from descending signals from the brain which are influenced by cognition and emotion which either open the gate and increase the pain sensation or close it in which case the pain eventually subsides.[8] So, the theory offered a physiological explanation for the previously observed effect of psychology on pain perception.

In the early 2000s, the mystery of association of psychological or physical stress with chronic pain syndromes, attracted the attention. Then the neuromatrix theory of pain proposed by Melzack provides a new conceptual framework to examine these problems.[9] According to this theory, pain is a multidimensional experience produced by characteristic "neurosignature" patterns of nerve impulses generated by a widely distributed neural network the "body-self neuromatrix"- in the brain. It proposes that the output patterns of the body-selfneuromatrix activate perceptual, homeostatic, and behavioral programs after injury, pathology, or chronic stress. Pain, then, is produced by the output of a widely distributed neural network in the brain rather than directly by sensory input evoked by injury, inflammation, or other pathology. The neuromatrix, which is genetically determined and modified by sensory experience, is the primary mechanism that generates the neural pattern that produces pain.[10,11]

AND THE FUTURE

The explanation of Ibn Sina as "nerves carry nociceptive pain sensations to the brain which itself acts as the organisational centre and subsequent source of the painful feeling experienced by the patient" in the year 1000 is similar to the explanation of Melzack as "brain has a very important dynamic role in the formation of pain" in the year 2000.

Despite starting from Avicenna and maturing by Melzack get some understanding of the role of the brain in pain processing, there are questions still not answered today:

- How does the pain occur without lesion?
- How little damage causes complex regional pain syndrome-1 (reflex sympathetic dystrophy) as extreme pain syndrome?
- Why the same nerve damage cause painful neuropathies in every patient?
- Why does depression lay the groundwork for pain?
- Why does acute pain become chronic in only some patients
- What is the reason for the high possibility of pain in the female population and also in adult elderly patients? Is it a coincidence that pain syndrome like fibromyalgia, headaches, colitis, etc. are seen in the same patient together? Is there a single mechanism that created them?
- What is the reason for that opioid analgesics don't cause addiction in the presence of pain?

In conclusion, despite extensive research over centuries, understanding of pain mechanisms is still far from optimal. Especially the role of the brain is not fully understood in chronic pain exactly plays a major role in this obscurity. Unless it can be fully explained what was happening in the brain of chronic pain patients, pain treatment efforts will be in vain.

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