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Original Research

The Pain in the Canon of Medicine: Types, Causes, and Treatment

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ABSTRACT

Objective: Avicenna (980–1037 AD) was a renowned physician and philosopher. This study aimed to elaborate on the presented information in The Canon of Medicine about pain, its causes, types, and treatment methods in the pain-related specific chapters and compare it with today's information.

Methods: The information in the pain-related chapters in The Canon of Medicine was examined. This information was compared with the information in the English translation of the book. The information obtained by the correlation between the two works was compared with the current knowledge.

Results: The pain was defined as abnormal condition seen in an animal's body. The causes of pain were examined as sudden and irregular abnormalities in temperament and interruption of continuity. Avicenna categorized pain and developed hypotheses about the cause of each type of pain. The application of Avicenna's pain treatment is based on the use of methods that act in opposition to the elements that cause loss of temperament and continuity. He prescribed analgesic agents, anesthetics, and antispasmodics for the pain relief.

Conclusion: Although the effect of the pain-related theories of Hippocrates and Galen are also visible in The Canon of Medicine, his work contains much more detailed information about the definition, types, causes, and treatment methods of pain. The definitions he made in The Canon of Medicine about the classification of pain are found in many of the pain assessment scales used today. His descriptions of drug and dose selection are similar to those of modern pharmaceutical principles.

Keywords: Avicenna, canon of medicine, pain

INTRODUCTION

Avicenna (980–1037 AD) was a renowned physician and philosopher. He wrote many works in the field of medicine. The most important work of Avicenna is The Canon of Medicine (known as El-Kânûn Fi't-Tibb in Turkish, al-Qānūn fī al-Ṭibb in Arabic) that consists of five volumes. In the first of these volumes, general medical topics and human anatomy are explained. In the second, basic drugs and their preparation are explained. In the third volume, which is the most comprehensive volume, organs and medical ethics are discussed. The fourth volume deals with some infectious disease (such as leprosy, plague, and smallpox), skin diseases, animals, and poisonous plants. The fifth volume lists all known medicines at that time and information on their dosage. The Canon of Medicine was used as a textbook for many years in the Eastern and Western world and translated into languages such as Latin, Persian, English, Hindi, Spanish, Portuguese, German, and French (1). The first volume of the work was translated into contemporary Turkish by Kahya E. (2) in 1995, and the translation of the other volumes was completed and published in 2015 (3). The influence of the teachings of Hippocrates (469–399 BC), Aristotle (384–322 BC), and Galen (131–200 AD) on medicine can be seen in The Canon of Medicine in a systematic order (4).

Pain has been a fact in the life of human beings for more than 50,000 years. It is described as an unpleasant, sensory, and emotional experience that can be attributed to present or possible tissue damage (5). There have been theories about the formation of pain and its pathophysiology since the time of Hippocrates (6). The examination of pain-related doctrines in the book, The Canon of Medicine, provides a clearer understanding of pain-re-

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lated hypotheses and definitions. Avicenna separately examined the definition of pain, its causes, types, treatments, and effects on body under specific chapters in the first volume in The Canon of Medicine.

This study aimed to elaborate on the presented information in The Canon of Medicine about pain, its causes, types, and treatment methods in the pain-related specific chapters in first volume and compare it with today's information.

METHODS

In this context, information in the pain-related chapters (Chapters 19–22) in second subsection (specific reasons subsection) in the second part (Etiology) of the Health and Disease section in Turkish translation of the first volume of The Canon of Medicine was examined. The Turkish translation was based on Beyrut printed edition (1st book) and Süleymaniye Library, Turhan Sultan 265, handwritten editions by Kahya E. (7). This information was compared with the information in the English translation of The Canon of Medicine. The English translation was based on the Latin editions published at Venice in 1595 and 1608, and supported by Arabic edition printed at Rome in 1593 and the Bulaq edition (8). The information obtained by the correlation between the two works was compared with the current knowledge. Because this study was evaluated as a historical medicine study, there was no need to take any ethics report or patient approval form.

RESULTS

Definition of Pain

The definition of pain, its causes, types, treatment modalities, and effects on body were separately examined under four chapters in the first volume. The definition of pain was explained in the "General Reason of Pain" section. He defined pain as "[a]n abnormal condition seen in an animal's body", and stated that discomforts in the body are perceived as pain (7).

Causes of Pain

The causes of pain were examined under two headings: sudden and irregular abnormalities in temperament; and interruption of continuity.

Sudden and Irregular Abnormalities in Temperament

According to Avicenna, pain is caused by the transformation of a present temperament to an exact opposite temperament (e.g., the sudden transformation of hot temperament to cold temperament) by the disruption of the balance between the temperaments. He stated that the sudden imbalance between hot and cold temperaments directly creates pain, that dry temperament indirectly brings pain, and that wet temperament never causes pain (7).

Interruption of Continuity

In this heading, Avicenna refers to Galen's theory of "loss of continuity" with regard to pain formation. Avicenna criticizes Galen's theory and argues that the change in present temperaments of organs causes pain (7). In addition, Avicenna presented a pain-temperature mechanism. According to Avicenna, temperature increases with pain; and with the increase in temperature, more blood flows in the blood vessels. The increase in the blood flow leads to edema, and the tension of the tissues further increases the pain (7).

Pain Types and Causes

Avicenna categorized pain and developed hypotheses about the cause of each type of pain. It was determined that the number and sequence of pain types differ between the English and Turkish translations of the work. A total of 14 different types of pain were explained in Turkish translation (7), while 15 types of pain were defined in its English translation (8). Tashani and Johnson (9) also identified 15 different types of pain in their work on the basis of the Arabic text of The Canon of Medicine (Table 1). The Arabic text of Tashani and Johnson's (9) used was based on Kitāb al-Qānūn fī al-.-tibb printed at Rome in 1593. The types and explanations of pain in Canon of Medicine were showed in Table 1.

The Relief of Pain

The application of Avicenna's pain treatment is based on the use of methods that act in opposition to the elements that cause loss of temperament and continuity. Removal of unnecessary fluids from the body, narcotics that make patients feel sleepy, and anesthetics that give the feeling of cold to the body are used to relieve pain.

Clinical information about analgesic agents, anesthetics, and antispasmodics is described in detail in the Pain Relief section (7).

Analgesic agents are pain relievers that show their effects by changing temperament. As an example of analgesic agents, opium, mandrake seeds and roots, seeds of black and white poppy, hyoscyamus, hemlock, oleander, and cucumber seeds are prescribed. In the English translation of the work, in addition to these items, there are also deadly nightshades and lettuce seeds. Ice and cold are also exemplified as substances with analgesic properties (7, 8).

Anesthetics are defined as substances that relieve pain by disrupting the activity of the affected organ with their toxic properties or causing extreme cold on it. It is suggested that a piece of sweet smelling moss or agar wood should be put in wine to make someone lose consciousness (7).

Antispasmodics are described as pain relief substances by dissolving and scattering matters that accumulate in an organ. Dill, linseed, melilot, chamomile seed, celery seed, and bitter almond are shown as examples of these substances (7).

Drug Selection

According to Avicenna, the pain-relieving drug may exert its effect mildly and slowly, or in some cases it may also be dangerous. For this reason, he gave detailed information about the drug's dosage and side effects. He emphasized the difficulty of choosing drugs and dosages for each disease. It was recommended to select the appropriate drug by observing the patient's pain tolerance level. The relationship between pain level and medication should be carefully controlled. He indicated that sometimes an untreated pain may result in death (7).

Table 1. The comparison of the number, sequence, and causes of each pain types in English translation (8), Tashani & Johnson's (9) study and Turkish translation (7)

	Type of the pain		
No.	**Gruner et al. (8) (English translation)**	***Tashani and Johnson (9)**	**Kâhya E. (7) (Turkish translation)**
1	Boring -Retention of gross matter or gas between the tunics of a hard and gross member	Itching -Exposure to irritating substance or salt	Itching The pain caused by cold-burning or acrid humors
2	Compressing -Confining of fluid or gas in a too small space	Coarse -Coarse substance	Burning -The pain caused by unprocessed blood
3	Corrosive -Presence of material between the muscle fibers and their sheets	Pricking -Something stretches membranes	Stabbing -The transverse tension of membrane interrupted of continuity by a humor
4	Dull -Too cold temperament -Occlusion of the pores -Overfulness of the cavities	Compressing	Tension - A humor or gas stretching to nerve or muscle fibers
5	Fatigue pain -Unnecessary effort -A humor producing tension -A gaseous substance producing inflative weakness -Ulcerative	Stretching -Bloat or muscle or nerve stretch	Compressing -The pain caused by pressure of humor on the organ
6	Heavy pain -Inflammatory process in insensitive organs like lung, kidney, or spleen	Disintegrating -A substance disintegrate inside the muscle and membranes	Corrosive -The humor accumulating between the muscle and membrane
7	Incisive -A humor of sour quality	Breaking -Bone change	Tearing -The fluid or gas accumulating between bone and periost
8	Irritant -A certain type of change in the humors	Soft -Muscle change	Blunt -The muscle stretched by the accumulating gas type materials in the muscle belly
9	Itching -A humor is acrid, sharp, or salt	Penetrating -A thick substance or bloat trapped in colon	Boring -The pain caused by the humor or gas in the organ
10	Pricking -The material retaining to organ	Stabbing -A substance trapped inside an organ	Pricking - The pain caused by the humor or gas in the organ, but it's harmless
11	Relaxing -The matter accumulating in and stretching the belly of muscle	Numbing -Extreme cold or vessels obstruction	Numbing -The pain caused by too cold temperament
12	Stabbing -A humor transverse stretching to membrane	Pulsating -A tumor or swelling close to arteries	Throbbing -The pain caused by hot inflammation
13	Tearing -A humor or gas between bone and periosteum	Heavy -A tumor or a swelling in lungs, kidney, or spleen	Heavy -The pain caused by inflammation in the insensible organs like lung, spleen, and kidney
14	Tension - A humor or gas stretching to nerve or muscle fibers	Tiredness	Fatigue -A humor cause to tension -It is derived from the humors like ulcers damage to tissues
15	Throbbing -The hot inflammatory process	Bitter -Ulcers	_

No.: Number of pain type; *:the authors declared using Arabic manuscript in their study

Table 2 . The similarities of Avicenna's pain definitions in Kâhya E.'s Turkish translation (7) between multidimensional pain scales widely used at the present day

	McGill Pain Questionnaire (16)			
Avicenna's pain definition (7)	**Our comments toward Avicenna's pain definitions in McGill Pain Questionnaire**	**Tashani and Johnson's (9) comments toward Avicenna's pain definitions in McGill Pain Questionnaire**	**Tursky Pain Perception profile (17)**	**Pain quality assessment scale (18)**
Itching	Itchy	Itchy, Pricking, Stinging	Itching	Itchy
Burning	Splitting, Burning	Rasping	Burning	Burning
Stabbing	Stabbing, Pricking, Stinging	Pricking, Stinging, Itchy	Stabbing, Stinging	Tingling
Tension	Tender, Taut	Tugging, Cramping, Taut	Cramping	Tender, Cramping
Compressing	Pressing, Squeezing	Squeezing, Pinching, Crushing	Squeezing, Pressure	Squeezing, Tight
Corrosive	Tearing, Cramping	_	Cramping	Cramping, Squeezing, Tight
Tearing	Sharp, Tearing, Cutting	Splitting, Tearing, Cutting	_	Sharp
Blunt	Taut	Tender	_	Dull
Boring	Boring, Stabbing	Stabbing, Lancinating, Cutting	Stabbing	_
Pricking	Pricking, Drilling Stabbing, Penetrating	Pricking, Stinging, Itchy	Stabbing	Tingling
Numbing	Numb, Drawing	Numb	Numbing	Numb
Throbbing	Pulsing, Throbbing Beating	Pulsing, Throbbing, Beating	Throbbing	Throbbing
Heavy	Heavy, Aching	Heavy, Dull, Aching	Aching	Aching, Heavy
Fatigue	Tiring, Exhausting	Tiring, Exhausting	_	_

DISCUSSION

Definition of Pain

Avicenna defined pain as an abnormal condition in an animal's body. He also expressed the discomforts in the body (7). Today, it is known that there are four stages of pain: transduction, transmission, perception, and modulation (10, 11). Avicenna's expression of discomfort as pain is consistent with the notion of perception. On the other hand, in Avicenna's medical definition, while the health and treatment phases are treated as subjects specific to humans, it is challenging to understand why he explained pain as an abnormality seen in an animal's body.

Causes of Pain

According to Avicenna, the transformation of a present temperament to an exact opposite temperament creates pain. Avicenna furthered Hippocrates and Galen's temperament and humoral theories. According to temperament theory, there are four temperaments in the nature that are balanced with each other and are the basis of nature: hot, cold, dry, and wet. In the body, there are four groups of organs as hot, cold, dry, and wet in accordance with these temperaments. According to humoral theory, humor is the main product of digested foods, and there are four basic humors in the body. These are blood, phlegm, black bile, and yellow bile. The excessiveness or insufficiency of these fluids leads to illness (12, 13). Avicenna was affected from ancient humoral theories while explaining causes of pain.

Avicenna refers to Galen's theory of "loss of continuity" with regard to pain formation. According to Galen, the real cause of pain is the loss of continuity. According to Galen's theory, particles in tissues get together depending on hot or cold temperature and are separated from their surrounding structures. The feeling that emerges as particles are separated from the surrounding structures is defined as pain. However, Avicenna criticizes Galen's theory and argues that the change in present temperaments of organs causes pain.

The temperature, blood flow and pain relation was stated by Avicenna. Roman physician Celsus first described inflammation findings (1st century BC) as rubor et tumor cum calore et dolore (redness, edema, heat, pain) (14). Avicenna appears to be influenced by Celsus in terms of the pain-temperature mechanism. Today's knowledge about the acute inflammatory process is similar to the information provided by Avicenna many centuries ago.

Pain Types and Causes

It was determined that the number and sequence of pain types differ between the English and Turkish translations of the work. The descriptions about the sequence of pain types and causes of pain in the Turkish translation (7) and Tashani and Johnson's (9)

study showed similarities. In the study of Tashani and Johnson (9), the pain caused by ulcers was called "bitter" while the pain caused by ulcers in Turkish translation was defined as "fatigue" (Table 1). We think that the differences in number, sequence, and reasons of pain types may be due to translations or may arise from differences in the versions from which the translations were made.

Today, unidimensional and multidimensional scales are used in the assessment of pain. Unidimensional pain scales are scales that determine the amount of pain intensity experienced by an individual (e.g. numeric rating scale, visual analog scale). In the assessment of complex and persistent pain, it is recommended to use multidimensional scales that assess the character of pain and its effect on daily life (15). The McGill-Melzack pain questionnaire (16), Tursky pain perception profile (17), and the pain quality assessment scale (18) are multidimensional scales based on patients' self-reports and are frequently used today. There are serious similarities between Avicenna's definitions of pain types and the definitions contained in these scales (Table 2). Because there was no definition in Tursky pain perception profile meeting the meaning of "tearing", "blunt", "boring", and "fatigue" and in pain quality assessment scale meeting the meaning of "boring" and "fatigue", no comment had been made in Table 2.

It is also apparent that Avicenna was influenced by Galen while explaining types of pain, brain anatomy, and physiology. Galen defined pain types as pulsating, lancinating, weighty, and stretching (19). Avicenna, like Galen, also stated that senses are carried to the brain and that the brain is a center receiving the senses. In addition to the sensory function of the brain, Avicenna emphasized that the brain is a cold organ and the center of movement (7). Avicenna laid the basis of the theory to be called the specificity theory after the 1800s (20). Avicenna's causal explanation for each type of pain is called physiopathological mechanism in the modern medicine. Definitions made about the types of pain in The Canon of Medicine may have emerged because of different subjective pain descriptions made by the patients.

The Relief of Pain and Drug Selection

The analgesic, anesthetics, and antispasmodics terms is described in detail in the work (7, 8). Today, analgesic drugs are defined as drugs that relieve pain without causing loss of consciousness. Medicines used for anesthesia are defined as substances that cause general sensory loss by suppressing all of the sensory functions of the central nervous system. Antispasmodics are drugs that usually have a relaxing effect on smooth and striated muscles (21, 22). Avicenna did not have separate descriptions of analgesics, anesthetics, and antispasmodics and said that all of them were painkillers. Nowadays, it is known that the definitions and mechanisms of action of analgesics, anesthetics, and antispasmodics in modern pharmacology are different from each other.

In addition, Avicenna stated that analgesic applications should be diligently done, in necessary situations and by considering their side effects. Analgesics should not be used if not necessary, and if used, the ones with the least side effects should be preferred. He talked about local or oral use of analgesics depending on the disease (7). Today, information such as indications, pharmaceutical effect, side effect, usage, and proper dose are routinely given in drug prescriptions; nevertheless, it is seen that Avicenna observed the modern pharmaceutical principles about a thousand years ago.

CONCLUSION

Although the effect of the pain-related theories of Hippocrates and Galen are also visible in The Canon of Medicine, his work contains much more detailed information about the definition, types, causes, and treatment methods of pain. The definitions he made in The Canon of Medicine about the classification of pain are found in many of the pain assessment scales used today. His descriptions of drug and dose selection are similar to those of modern pharmaceutical principles. We think that the awareness of researchers interested in the science of pain should be more aware about the teachings in The Canon of Medicine.

Ethics Committee Approval: Due to this study being a historical medicine study, the ethics report was not received.

Informed Consent: N/A.

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