



Hippocrates – The Father of Modern Medicine

Hipokrat – otac moderne medicine

Ljiljana Suvajdžić*, Aleksandra Djendić†, Vladimir Sakač‡, Grozdana Čanak§, Dragan Dankuc||

*Department of Pharmacy, Faculty of Medicine, University of Novi Sad, Novi Sad, Serbia; †Faculty of Medicine, University of Novi Sad, Novi Sad, Serbia; ‡Clinic of Nephrology and Clinical Immunology, §Clinic of Infectious Diseases, ||Clinic of Otorhinolaryngology, Clinical Center of Vojvodina, Faculty of Medicine, University of Novi Sad, Novi Sad, Serbia

Key words:
history of medicine; history, ancient; physicians;
greece; therapeutics.

Ključne reči:
istorija medicine; istorija, drevna; lekari;
grčka; lečenje.

Introduction

There is hardly any area of medicine, preventive or clinical, and personality psychology, basic or developmental, unmarked by Hippocrates. Modern ethic principles are also based on the guidelines left behind by this great physician more than two and a half millenniums ago. With his extensive work, he built the foundations of modern medicine and medical ethics. Hippocrates' era was the time of general enlightenment and individualism¹. Critical analysis, being the imperative in those times, created a new prospective on the world based on empirical cognition. Hippocrates synthesized previous knowledge and his own observations creating his own biology-medical theory and a system of treatment (hippocratism). Hippocrates' medicine is clinical and individualistic. He became renown during his lifetime and his fame further grew to the status of a legend. For Plato, he represents a prototype of a physician in the same way Phidias is a prototype of a sculptor. Aristotle calls him the "great" and Galen the "divine". He remains, to this very day, known as "the Father of Medicine"^{1,2}.

Biographical information

The Father of Modern Medicine was born on the island of Cos in the family of the Asclepiads, physicians and priests, followers of the god Asclepius. He learned medicine in his family which was a common practice in those times. His ancestor Apollonides was a personal physician of the Persian

king Artaxerxes. His other ancestor Nebrus, born around 580 BC, had two sons Gnosidicus and Krizos. According to the available resources, name Hippocrates appears for the first time around 500 BC with the birth of Krizos' son. He was known as Hippocrates I and he was the grandfather of Hippocrates II, the founder of modern medicine. The sons of Hippocrates II, Thessalus and Draco, were physicians too, as well as his son-in-law Polybus. This tradition continued for generations to come. The physicians of the island Cos created an agreeable professional Asclepian community where they shared their knowledge and skills with each other and kept that knowledge within their Cosian community. Even his first biographer Soranus of Ephesus, renown obstetrician, pediatrician and writer who lived during the second century BC, belonged to the 20th generation of Cosian Asclepiad. Besides the learned knowledge which was based on observations of a sick organism as a whole, he strived to determine the principles of pathological processes in order to determine the diagnosis. He further expended his knowledge by travelling as a traveling physician, periodeut. His biographers have determined that he was practicing in Egypt, Libya, Asia Minor, but primarily in his home country Hellas, especially Athens. At the time, Athens was at the peak of its political power and cultural creativity (the golden age of Pericles) during which Plato, Phidias, Aeschylus, Euripides, Sophocles, Aristophanes and Socrates were also active. There are written records which indicate that he was travelling around Abdera, Thasos, Thrace, and Larissa in Thessaly where he died in 377 BC³⁻⁶.

There are little descriptions of his appearance. According to Aristotle, he was small in height, and depicted on coins as a bald man with preserved ring of hair, thin beard and sizable nose. It is believed that the statue dated from the fourth century, discovered on Cos, and the bust with encryption of Markios Demetrios, discovered in Ostia, represents Hippocrates.

According to the legend, he was buried near Larissa and, until the second century, his gravesite was visited by many. The grave was inhabited by bees whose honey had healing properties. There is a spring and an ancient plane tree on Cos. According to the legend, it was under this tree where Hippocrates used to lecture his students and followers^{5,7}.

Hippocrates' work

Collective medical knowledge of his times, Hippocrates encyclopedically documented in the first ever written textbook of western medicine titled "Corpus Hippocraticum" (Hippocratic Corpus). This work consists of 72 books divided in 53 chapters. It is believed that the first 28 books contain his original work and that the remaining books were added by other authors. Approximately 100 years later, in the 3rd century BC, these works were entrusted to the Alexandrian library by the Egyptian diadochi (heirs of Alexander the Great). The oldest preserved transcripts of these works, dated from the 10th and 11th century, are located in the libraries in Paris, Vienna, Vatican⁵. Additions to the Hippocratic Corpus, contributed by his students, still cause controversies. Many scholars analyzed the style and contents of the collection. They determined that the collection is heterogeneous, and thus not written by one person since styles and opinions vary. The majority of those authors are from the Asclepiad of Cos. Their views are: the wholeness of the organism, the importance of the diagnosis, and introduction of general roborant therapy. Certain parts are marked by the opposing opinions of the Cnidian school which emphasizes the importance of locating the illness and local therapy. Parts of the collection are focused on the Sicilian school which stresses the importance of pneuma in the etiology of illness. Even though the entire collection was written using the Ionic dialect of Greek language, there are minor differences within the collection. Differences are present even in regard to the audience of the writings: scientific circles and colleagues, students and broader audience. There are parts which served as personal notes to various authors of the collection^{1,3,5}.

Hippocrates' beliefs

There are only fractions of the written records about Hippocrates' beliefs which originate in the pre-Alexandrian period. According to one such record, contained in Plato's "Phaedrus", Hippocrates believes that the temper (nature) of the body and the temper of the soul cannot be understood without understanding the temper of the wholeness. Everything needs to be regarded as a part of a unique cosmos which renders his approach holistic and which is documented with the following thoughts:

"Everything is divine and everything is human. Everything is one and one is everything. Everything is similar and everything is different." He believes that the same principles govern organism and cosmos. "Nothing vanishes entirely and not-

hing is being created that hasn't existed before." He talks of life which is everywhere and if there is life then death is impossible, unless that contradicts the wholeness of things. "To be born and to die is the same, to mix and to separate is the same, to grow and to decline is the same"⁸.

In Hippocrates's times it was implied that nothing takes place without divine intervention. That is exemplified with his words: "I also believe that those illnesses are divine in nature, as all others are, none of them being more divine or human in nature than the other, but that all are similar and come from God. Each one having unique nature and none appear without natural cause"⁸.

Maturing as a physician, Hippocrates managed to "separate wheat from the chaff" and not to look for the causes of illness on a whim or in capriciousness of gods but strictly in natural causes. In such way, he separated medicine from magic and occultism and established scientific foundations what is his greatest achievement¹. Denouncement of the divine is exemplified in the following words:

"...wealthy, with their significant wealth, offer gods great sacrifices and many sworn gifts, showing thereby their respect, which poor due to poverty do to the lesser extent. Aside from that the poor curse them for not giving them wealth, so the punishment for such sins should be expiated by the poor rather than the wealthy"⁸.

Hippocrates' school was founded on the principles of Empedocles and Pythagoras¹. Teachings of Empedocles are concerned with four elements (water, fire, earth, air) and four body qualities (cold, hot, dry, wet)⁹. He believes that the organism naturally strives to establish balance and to heal. Pythagoras principal of illness is based on imbalance of the harmony of constituting parts of organism. According to Hippocrates, body consists of four essential fluids ("humors"): blood – *sanguis*, phlegm – *flegma*, yellow bile – *hole*, black bile – *melaina*. One of these fluids dominates in the organism and thereby determines the constitution of the organism. Health is the result of harmony of these fluids and illness is the sign of occurring imbalance. This is the so-called humoral approach or humoral medicine⁶. A parallel with the modern approach, in terms of imbalance of the organism's homeostasis which causes the illness, can be recognized.

Based on this belief, he developed the first known classification of kinds and types of temperaments. Depending on the kind of the fluid that dominates in the organism, there are four types of temperament. In choleric type yellow bile is predominant. Their feelings are strong and expressed easily. They confront others readily. In sanguine type blood is predominant, and they are generally cheerful and optimistic. When black bile is predominant, the temperament is melancholic, and the person is gloomy and introverted. Phlegm is predominant in phlegmatic type, and individuals are optimistic and cheerful, but have suppressed emotions and rarely react emotionally^{10,11}.

Hippocrates' medicine in aphorisms and on airs, waters and places

Physicians of that era did not dissect humans, but did so with animals. This was the only way to become acquainted with anatomy. Treating the wounded provided opportunity to

learn about the human body. Descriptions of skeleton and muscular system, heart, liver and spleen are good, but descriptions of bloodstream, nerves, brain and internal reproductive organs are confusing. Bone and muscle surgery was practiced, but internal organ surgery was not performed⁴. It was believed they were not important because gases and fluids were the cause of internal illnesses⁷. The knowledge of anatomy and pathology were limited, as expected of the times in which he lived¹. As mentioned above, pathology was based on the humors principles, *ie* in the harmony of the four body fluids (“humors”). Beside these fluids, there were solid components and those were bones, membranes, blood vessel walls and flesh.

Hippocrates’ teachings were dialectic and in accordance with Heraclitus’ * views: This world is an ever-living fire, in measures being kindled and in measures going out*.

His dialectic is evident in his thoughts that the nature is a matter which is continually moving and constantly mixing. It is without beginning and end and it strives to endless and perfect eurythmic harmony. This natural flow encompasses the health of every organism and it is based on the unison of the opposites.

Functioning of living beings is based on nature (*physis*) and life force (*dinamis*). “Vital heat” which lies in the heart supports life. This warmth is created by the supply of air and blood. It allows transformation of food to body fluids and organ tissue. The center of thoughts, emotions and desires is in the brain, feelings and movement commands are carried out *via* pneuma.

It can be concluded that “*physis*” and “*dinamis*” represent wholeness and that human nature belongs to nature’s wholeness. Body and soul are closely related and the sickness of one dictates the sickness of the other. Causes of illnesses are different and they can be internal or external, and they cause the imbalance. Disease is a biological occurrence and it proceeds according to the laws of nature, and opposite to the laws of harmony. Disease is essentially *dyscrasia*, the imbalance of body fluids¹. Hippocrates believes that diseases are caused by atmospheric influences, improper nutrition, poisoning, prevented elimination of body excrements, mental excitement and hereditary factors. When *dyscrasia* occurs, the organism tends to establish appropriate balance and in order for that to happen the nature uses a unique process of cooking which transforms unhealthy matter into harmless state and excretes it from the organism. Cooking is manifested as fever of inflammation. Excretion is performed on specific days of the illness and if any harmful parts are retained they cause chronic disease, local build-up and periodic disease re-occurrence^{1, 12, 13}. Analogy with modern understandings is obvious. Physician’s craft is based in assisting nature:

Natura sanat, medicus curat – Physician treats, nature heals.

Quo natura vergit, eo ducendum – Where nature intends, there where it will act⁸.

Basic principals are exemplified in the following versus:

Ne quid nimis – Nothing in excess.

Primum non nocere – Firstly, do no harm⁸.

Contraria contrariis curantur – Opposite is treated with opposite⁹.

”For the most difficult disease prompt and conscious treatment is the best“⁸.

Clinical practice

Hippocrates was the first to develop a plan of examination, determination of the diagnosis, prediction of disease progress and outcome, and treatment. It is all being performed at the bedside (*kline* – Greek language)⁶. Examination begins with gathering of information about the patient and the illness *anamnesis*. The approach to the patient was especially important:

”Physicians must readily perform not only what the profession dictates but to care about the approach to the patient, assisting the patient and so forth“⁸.

Physical examination

The examination continues with bedside examination and determination of “*status praesens*” – current condition. It is necessary to “rely on facts and conclude wisely”. He emphasized that information are gathered using eyes (*visitatio*), ears (*auscultatio*), nose (*olfato*), taste (*degustatio*), hand (*palpatio*) and other means available: observing, touching, smelling and tasting. Inspection, palpitation, succession, percussion and auscultation are the basis of every physical examination even today⁴. He determines body temperature by placing his hand on the patient’s chest. One of his well-known descriptions is still in practice, and that is “*facies Hippocratica*” description of the facial expression near the collapse and death:

”Pointy nose, indented eyes, sunken temples, ears cold and shriveled, firm, stretched and dry skin on the forehead, skin on the face yellow or dark, blue or lead-like“⁷.

Hippocrates was familiar with pulmonary murmurs, pleural friction and sounds produced by succession *ie succussio Hippocraticis*. That is how he determined the spot for incision in order to remove the empyema. Palpation was used to determine the size and consistency of the spleen which was important since malaria was very common^{4,7}.

Excrement examination

Beside patient examination, attention was also given to excrement examination. In this way, he was able to diagnose albuminuria:

”Thick, oily foam on the surface of urine indicates sever kidney disease“⁸.

He experimented with the behavior of saliva in salt water and what it smells like when thrown on the hot coal. In the modern sense of the term diagnosis, symptom analysis was not aimed at determining the disease diagnosis. He treated the patient, not the disease. The disease prognosis was equally important for each case individually⁷.

Disease prognosis

Some examples of disease diagnosis and prognosis can be found in the Canon of medicine in the 5th chapter, aphorism 61, 37, 31, 13, and in the 5th chapter of Aphorisms, aphorisms 8, 2:

*Heraclitus (535–475 BC), Greek pre-Socrates philosopher.

“If a woman is not menstruating and in the meantime there are no tremors or fever, but she is nauseous, you can hope she is pregnant”⁸.

“When an expecting woman’s breasts suddenly weaken, she will miscarry”⁸.

“When an expecting woman bleeds, she is miscarrying, the older the embryo, the greater the risk”⁸.

“When a sick person expectorates foamy blood, that blood originates in the lungs”⁵.

“If the chest of individuals suffering from pleuritis are not cleansed by expectoration, within fourteen days, abscess is being formed”⁵.

“Spasms which occur after an injury indicate a fatal outcome”⁵.

He provided remarkable descriptions of an abnormal respiration pattern known today as Cheyne-Stokes respiration, and nail clubbing associated with chronic heart and lungs diseases – *digiti Hippocratici*.

Most often mentioned are fevers due to pneumonia, pleuritis, malaria, typhus, tuberculosis, puerperal sepsis. There are good descriptions of ileus, tetanus, apoplexy, joints diseases, sciatica, epilepsy, cystitis, kidney disease¹.

The biological nature of illness determines the therapy, *ie* “nature is the healer”. His methods of treatment were based on natural processes and in accordance with the aforementioned principle “*Primum non nocere*”⁷.

Conservative therapy

Conservative therapy is primarily based on hygienic-dietary methods and traditional symptomatic treatments using ointments and herbs, mixtures and dressings and suppositories¹. Mixtures are herbal and they can be infusers, decoctions and powders⁷.

Healthy lifestyle based on moderation is often advocated:

“When limits are exceeded, both sleep and insomnia are a bad sign”⁵.

“It is not good to overindulge, nor to starve, nor anything else that is unnatural”⁸.

“It is better to consume smaller and more tasteful amounts of food and fluids than bigger and tasteless”⁸.

He respected moderation even in physician’s involvement in the treatment of the illness and was therefore criticized by the Roman physicians four centuries later. They regarded his therapy as a mere observation of death since it was not an active participation. Hippocrates relied on moderation, gradualness and gradation in his therapeutic involvement in the following manner:

“Excessive purging or indulging in food, sudden temperature change, as well as any other change in the body is dangerous, as is any other excessiveness. It is wiser to gradually move from one state to the other”⁵.

Cleansing and bloodletting

Often used therapy was cleansing which was believed to have the ability to restore the balance in the organism:

“During purging remove everything that organism will benefit from their excretion, and retain the matter with opposite properties”⁸.

“If that what is supposed to be eliminated was removed properly, it will be beneficial to the patient and easy for patient to cope with. If that is not performed, the effect is opposite”⁸.

Bloodletting was also a common treatment:

“Bloodletting alleviates the difficulties associated with urination, internal vein should be let”⁸.

“Individuals who benefit from bloodletting and purging, should cleanse and let blood in the spring”⁸.

Implementation of warming and cooling

Another method of treatment was the use of water to cool and warm up[†]:

“Inflammation and painful joints, without wounds, whether caused by gout or sprain, in most cases are relieved with copious amounts of cold water which reduces the inflammation and alleviates the pain”⁸.

“Aromatic bath induces menstruation, and it would be even more beneficial if it was not causing headache, dizziness”⁸.

“Individuals with vision difficulties should consume copious amounts of wine, wash their eyes with plenty of warm water and let blood”⁵.

“Temperature which does not originate in the liver should be reduced using warm dressings”⁵.

However, even in this form of therapy he does not deviate from moderation and attention to harmful effects:

“Cold is harmful to bones, teeth, nerves, brain, spine, while heat is beneficial”⁸.

“Often and plentiful use of heat produces following negative effects: flabby skin, deterioration of nerves, dizziness, hemorrhaging, unconsciousness, and all these can cause death”⁵.

The use of wine

Wine holds a special place in Hippocrates’s medicine and therapy. It had healing properties, *ie* it was considered a medicine, not food or beverage:

“Restlessness, yawning and fear disappear when one drinks natural wine mixed with equal amount of water”⁸.

“Stranguria and dysuria are treated with copious amounts of wine and bloodletting, and it is the veins of the inner side of the arm that should be let”⁵.

Surgery

Surgery was already significantly developed and routinely performed procedures were: skull trepanning (*trepanation*), amputation of gangrenous extremities, *paracentesis thoracis* for empyema and draining of kidney and liver abscess.

Especially efficient was the surgery of external illnesses and injuries (fractures and dislocations). Reposition of dislocated shoulder, hip and jaws are still carried out in the same

[†]Today still we cool recent injury and warm chronic injury.

manner. In case of fractures extension and immobilization were employed.

Hemorrhoids and polyps were successfully operated, while in case of more advanced tumors they were not able to stop bleeding.

They insisted on good hygiene and some of the bandages were very similar to the modern, thus one of the most commonly used nowadays is called *mitra Hippocratis*.

Significant attention was given to psychotherapy where they employed knowledge from Asclepiad temples. The therapy algorithm is summarized in the aphorism:

"Illnesses untreatable with medications are treated with surgery. The ones untreatable by surgery are treated with burning. The ones untreatable with burning are considered incurable"⁵.

His faith in the power of the nature was without reservation and it is summarized in the following words:

"*Natura sanat, medicus curat*" – Nature heals, physician treats^{‡ 1, 5, 7, 13}.

Medical geography: quotes from descriptions of *De aere, aquis et locis* – On airs, water and places

It represents the earliest example of medical geography, it covers two topics. One of them is the influence of environment on medical conditions, and the other deals with the influence of environment on anthropological and ethnic characteristics of the people of Europe and Asia. The first part covers the importance of physician's knowledge of local climate factors, quality of water, air, food, and winds required for successful treatment:

"One who strives to truly investigate science, is required to proceed in the following manner: Firstly, attention should be given to effects seasons can produce... Then there is the question of warm and cold winds, especially the ones present everywhere, as well as those present only in certain parts. Aside from that, one should think about the properties of water... One is required to pay attention to whether the ground is bare and dry, or covered with trees and damp... Attention should be given to which way of life is pleasant to the natives, whether they are drunks, overeaters and idle, or are they devoted to exercises, hard work and small amounts of alcohol"⁸.

Ars medica versus scientia medica

In Hippocrates' time there were no technique, technology, laboratory and other auxiliary diagnostic services, yet the treat-

ment could be successful. Even the skill of curing was developed as an art. The question is – in spite or because of it? One could get the impression that the computerized diagnostics and already prepared algorithms of the differential diagnosis blur the essence. Sometimes the problem in today's organization of health services is that medical specialists and subspecialists cure or only exclude the diseases of their domain. The general practice is overloaded, tertiary services do their "exclusion" work and thus report "which diseases are not present" is not rare. Medical consideration about patient and his individuality is somewhat lacking. Are these controversies inevitable price of civilization and technical-technological advancement, as for example the alienation? Or is it possible to join *scientia medica* with *ars medica*? The answer lies in the return to the essence of the relationship between the doctor and a patient. The postulates of Hippocrates could be successfully implemented into modern scientific achievements and for the common good of man and mankind in general. This is the only way to avoid conversion of modern technologically strong medicine into frozen (inhuman) relationship between the doctor and a patient. Man is not just a live organic machine, he has something sublime and majestic – emotions and soul, he has personality.

Conclusion

There is almost no area of medicine, psychology and ethics on which Hippocrates did not leave his trace. He laid the foundations of what we now call the individualistic and holistic medicine. Around the world, medical students take the Hippocratic oath upon graduation.

Corpus Hippocraticum contains principles that are becoming more actual with the development of holistic medicine, the individual patient approach and medical geography. The greatest contribution of Hippocrates to medicine is separation from demonic, magical and religious medicine. He is the founder of anamnesis and physical examination, which are the basis of modern propedeutics. Today's clinicians use the procedures, concepts and terms introduced by Hippocrates. Psychology of personality today also studies the temperament based on the division made by Hippocrates'. One might say that the ethics of modern human society is based on the Hippocratic Oath. Although the works of Hippocrates originate two and a half millennia ago, they are still relevant because human remained the same.

The pace of modern life and functions of society lead to general neglect of the human wholeness. If we would adhere to the basic principles of Hippocrates we inherited, the world would be a much nicer and safer place to live in.

[‡]It is still considered that medicine assists nature when we are young and fights it in the older age.

R E F E R E N C E S

1. *Cekić D, Cekić B.* Hippocrates (460–377. BC). Apollinem medicum et aesculapium. Podružnica Srpskog lekarskog društva (Leskovac) 2002; 1(1): 1–6. (Serbian)
2. *Stanojević V.* Istorija medicine: Period Greek Roman culture. Belgrade-Zagreb: Medicinska knjiga; 1962.
3. *Damjanović A, Milovanović S, Crnobarčić C.* Hipocrates and psychiatry. Srp Arh Celok Lek 2008; 136(1–2): 68–72. (Serbian)
4. Works of Hippocrates. Athens: Department of Neurology University of Athens; 2005.
5. Hippocrates. Aphorisms collection of works fourth part. Novi Sad: Savez društava Vojvodine za borbu protiv raka; 1992. (Serbian)
6. *Maksimović J.* Introduction to medicine with theory of medicine. Novi Sad: Faculty of Medicine, University of Novi Sad; 2001. (Serbian)
7. Hippocrates. In: *Šerzer A*, editor. Medical encyclopedia. 4. Zagreb: Leksikografski zavod FNRJ; 1960. p. 705–9. (Croatian)
8. Hippocrates. Canon of medicine; Air, water, places. Podgorica: Oktoih; 2000. (Serbian)
9. *Maksimović J.* In memory of Galen: on the 1800th anniversary of his death. Med Pregl 2000; 53(5–6): 313–7. (Croatian)
10. *Havelka N.* Psychology. Beograd: Zavod za udžbenike i naučna sredstva; 2002. (Serbian)
11. *Pot N.* General Psychology. Belgrade: Zavod za udžbenike i naučna sredstva; 1985. (Serbian)
12. *Thaller L.* Hippocrates and Hippocratism. Liječnički vjesnik 1932; 54: 562–7. (Croatian)
13. *Mibailović V.* Hippocrates and his teachings. Srp Arh Celok Lek 1934; 36: 305. (Serbian)

Received on February 12, 2015.

Revised on July 24, 2015.

Accepted on August 3, 2015.

Online First May, 2016.