

PART I

EARLY RECOGNITION

CHAPTER ONE

HIPPOCRATES AND EARLY GREEK MEDICAL PRACTICE

Hippocrates is generally acknowledged to be the “Father of Medicine.” He is usually portrayed in pictures and sculptures as a grandfatherly, bald man with a serious expression and a small well-trimmed beard. Much about him is unknown and much is myth.

Many schoolchildren have read Homer, the famous Greek poet, and his *Iliad* and *Odyssey*, which relate the tales of the ancient Greek gods. In the period after Homer, approximately 800–400 BCE, disease and illness were attributed to the gods, mostly a minor deity, Asclepius. Shrines to this god were erected; priests offered prayers at these shrines for restoration of health.

Around 400 BCE, a medical culture arose on the island of Cos, in the Aegean Sea within the Greek archipelago, that greatly departed from the supernaturally based precepts of the Aesculapian shrines. We know about this culture from a series of books, often dubbed the Hippocratic corpus [1–4]. The corpus of writings consisted of about 70 variegated texts written in the Ionic (Greek, meaning from Ionia) dialect using a wide variety of styles [3]. These are often collected as *The Genuine Works of Hippocrates* [5], *The Aphorisms of Hippocrates* [6], and *The Book of Prognostics* [7]. Although all are often attributed to one man, Hippocrates, much was certainly contributed by others. Hippocrates and his medical colleagues lived in a time of great intellectual activity and ferment in Greece. Hippocrates’s life spanned those of Sophocles and Plato and intersected with Aristotle’s. He was a contemporary of the

statesmen Pericles and Cimon; of the playwrights Aeschylus, Sophocles, Euripides, and Aristophanes; and of the historians Herodotus and Thucydides [4].

Hippocrates and his followers taught that nature and natural causes explained health, illness, and diseases. Deviations from health were not the result of the action of gods. Natural causes could be discovered by careful observation. The task was difficult as emphasized in the most cited aphorism, “Life is short, the Art is long, opportunity fleeting, experience delusive, judgement difficult” [6]. The *modus operandi* of a physician was to observe the patient at the bedside. Hippocrates observed the patient carefully, wrote down a description of the symptoms, and taught his disciples at the bedside. Most importantly, the physician followed the course of the illness. A major focus was prognosis, for example, “in every disease it is a good sign when the patient’s intellect is sound” [6]. Hippocrates emphasized professionalism. Physicians should interact with patients in a highly responsible and moral professional manner. We still revere this aspect by having students recite the Hippocratic oath at the beginning of medical school or when donning “white coats.”

The writings of Hippocrates probably contain the first clear descriptions of stroke, and the first use of the term *apoplexy* [8,9]. Although “apoplexy” is not defined, its use within cases describes a very sudden loss of neurological function [9]. Hippocrates and his followers emphasized clinical observation and prognostic indicators. Hippocrates was a keen observer and urged careful observation and recording of phenomenology. The corpus contains many clear descriptions of cases. Hippocrates and his followers were mostly interested in predicting for the patient and family the outcome of an illness. In his aphorisms on apoplexy, Hippocrates wrote that apoplexy was most common between 40 and 60 years of age, and attacks of numbness might reflect “impending apoplexy” [8,10]: “To get over a strong attack of apoplexy is impossible, over a weak one, not easy.” He astutely noted that “when persons in good health are suddenly seized with pains in the head and straightaway are laid down speechless and breathe with stertor, they die in seven days when fever comes on” [8,10]. This description of subarachnoid hemorrhage shows the Hippocratic emphasis on observation and prognosis. One of his descriptions was probably the first clinical description of aphasia. “A woman who lived on the sea-front was seized with a fever while in the third month of pregnancy. . . . On the third day, pain in the head, neck, and around the right clavicle. Very shortly, the tongue became unable to articulate and the right arm was paralyzed following a convulsion. . . . Her speech was delirious. . . . Fourth day speech was indistinct” [8].

In a case that described a wound to one side of the head, Hippocrates noted that paralysis affected the opposite side of the body [1]. Hippocrates observed

that there were many blood vessels that were connected to the brain, most of which were thin, but two (the carotid arteries) were thick. The Greeks in the time of Hippocrates knew that interruption of these blood vessels could cause loss of consciousness, so they called these thick arteries *carotid* from the Greek word *karos* meaning deep sleep.

Hippocrates and his followers left a blueprint on how to practice medicine and how to interact with patients. That is their main legacy.

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CHAPTER TWO

EARLY GRECO-ROMAN CONTRIBUTIONS

During the centuries after Hippocrates and before Galen, there were very few contributions concerning stroke. Most concerned observations that reflected on anatomy.

Aurelius Cornelius Celsus (25 BCE–50 CE) was a Roman writer who lived during the realms of Augustus and Tiberius. He was not a physician but was called an encyclopedist who accumulated and recorded vast quantities of information in *De medicina* [1–3]. This tome was divided into eight books, mostly consisting of long lists of various medications, weights, measures, and symbols. Management of injuries, skin conditions, and bone lesions predominated. Advice for management mostly referred to the writings and prescriptions of the Hippocratic corpus. Celsus classified “lesions harmful to the body” into five groups: (1) when something from without causes the lesion, e.g., a wound; (2) when some internal part becomes corrupted (diseased); (3) when some new formation has developed (he used the term *carcinoma*); (4) when something has grown bigger; and (5) when there is some defect [2]. Celsus commented on mydriasis and abnormalities of eye movement after an injury: “the eyeball cannot be directed at any object or be held at all steady but with no reason turns now this way now that and so does not afford a view of objects.” Celsus uses the term *apoplexy* and indicated that paralysis could be limited to some body parts and need not be complete. He recognized bleeding under the skull and depressed skull fractures as affecting brain function. He is probably best known for describing the four characteristics of inflammation: “*rubor et tumor cum calor et dolor*” (redness, swelling, warmth, and pain) [2,4].

Rufus of Ephesus (110–180 CE) was a Greek physician and respected practitioner who wrote treatises on pathology, anatomy, and patient care [1,4–6]. He has been described as the medical link between Hippocrates and Galen. The description of the plague by Rufus includes the environment in which it flourished, the symptoms and physical signs, and the symptomatic treatments applied. At one time Ephesus had a population of 150,000 people. Medical care and public health were quite advanced. In Roman times, Ephesus contained temples that also functioned as hospitals, doctors who practiced according to the teachings of Asclepius, medical schools, and even public toilets. Although a follower of Hippocrates, Rufus often departed from that author's teachings. His writings dealt with the elderly, a topic neglected by prior writers. His teachings emphasized the importance of anatomy. He showed that nerves proceeded from the brain. He accurately described the optic nerves and their crossing, the optic chiasm. He divided the nerves that emanated from the brain into two classes, those of the senses and those of motion. He considered the heart to be the seat of life and responsible for the pulse felt in the limbs. He noted that the left ventricle was thicker than the right. Two of his books, *On the Names of the Parts of the Human Body* and *Case Histories*, are still available today.

Areteus of Cappadocia (120–180 CE) wrote a textbook on the practice of medicine [1,7–9]. The best-known book written by this Greek physician was *Of the Causes and Signs of Acute and Chronic Disease*. Like Hippocrates, he emphasized careful observation and recording of symptoms and signs. He noted the temperature, pulse, breathing rate, and the state of the pupils of each patient; he palpated the abdomen and internal organs. Areteus is credited with introducing the term *diabetes* into medicine. “Diabetes” is derived from the Greek word for “siphon,” indicating the sufferer's intense thirst and excessive emission of fluids. He rendered the earliest clear account of this condition [10].

He described and separated apoplexy from paraplegia and paralysis. *Apoplexy* affected a number of functions, including a defect of understanding, motion, and sensation, while *paraplegia* was a localized disturbance of motion and touch in the arms or legs, and *paralysis* or *paresis* referred only to loss of motion. Loss of touch was anesthesia. He also wrote about the pupil and enlargement and constriction. He wrote that “should the apoplexy be severe, the patient is as good as dead, especially in the aged for they cannot survive the greatness of the illness combined with the misery of advanced life” [8,9]. Areteus noted that paralysis develops on the side opposite a head lesion but on the same side in a spinal lesion:

If, therefore the commencement of the affection be below the head such as the membrane of the spinal marrow, the parts which are homonymous and connected with it are paralyzed: the right on the right side, the left on the left side. But if the head be primarily affected on the right side, the left side of the body will be paralyzed; and the right, if on the left side.

Areteus further explained: “The cause of this is the interchange in the origin of the nerves, for they do not pass along on the same side, the right on the right side, until their termination; but each of them passes over to the other side from that of its origin, decussating each other in the form of the letter X.”

Paul of Aegenia (625–690) was a Byzantine Greek physician who wrote the *Medical Compendium in Seven Books* [11,12]. The intent was to contain all Western medical knowledge. The work was published in Venice, Italy, in 1528, and another edition appeared in Basel, Switzerland, in 1538. An English translation was published by Francis Adams in 1834 [5,6]. Paul commented on apoplexy without mention of the brain. His writings further stated: “Apoplectics lie speechless, motionless, and insensible, without fever. The precursors of this affection are sudden and acute pain of the head, distention of the jugular veins, vertigo, flashes as it were of light in the eyes, an inordinate coldness of the extremities, palpitation and difficult motion of the whole body” [12].

Greco-Roman physicians and writers thought of disease as an aberration of nature and natural forces and causes. Clinical observation was a method of diagnosis and prognosticating. Their reflections on brain anatomy and function came from carefully observing patients and their functioning. A major topic and concern was the physician-patient relationship.

These early writings contained mostly definitions of terms and observations concerning patients who developed apoplexy. They did not further knowledge concerning the causes or pathology of apoplexy, or the physiology of brain function.

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CHAPTER THREE

ISLAMIC AND MIDDLE EASTERN CONTRIBUTIONS

Quran (the holy book), prophetic traditions (sunnah) and Prophet Muhammad Peace Be Upon Him (PBUH) sayings (hadith) are the cornerstone of Islamic knowledge. Jurists and scholars later expanded on these foundations to build Islamic literature, not only about matters of prayers and submission, but also on day-to-day life affairs. Countless traditions and hadith deal with ailments and healing. Books that became a science of their own known as *Tibbul-Nabbi*; the Medicine of Prophet (PBUH), are based on these writings.

In the early days of Islamic medicine, work of at least seven different writers were titled as *Tibbul-Nabbi* describing the views of the Prophet (PBUH) on various aspects of medicine [1]. Among the most famous and detailed of these works is that by Ibn Qayyam Al-Juzziya. The work contains 277 chapters and discusses medications, various ailments, and other aspects of medicine such as medicolegal matters and hallmarks of competent doctors [1]. In addition to these works titled as *Tibbul-Nabbi*, later physicians and scientists wrote many treatises on medicine, some of which are preserved and translated into various languages. Others have perished with time, particularly after the destruction of large libraries by invaders. Several verses from the Quran and hadith deal with heart, blood vessels (the cardiovascular system), and blood [2].

Abu Ali Al-Hossein Ibn Sina (Avicenna) is the most well-known and recognized early Muslim philosopher, physician, and author. He wrote one of the most famous books in the history of Islamic medicine in 1025 CE.

Avicenna was born around 980 in Afshana, a village near Bukhara in present-day Uzbekistan. His father, Abdullāh, was a respected scholar. Avicenna had memorized the entire Quran by the age of 10. While still very young, he also studied Indian arithmetic, Islamic jurisprudence, and philosophy. The story is told that, as a teenager, he was greatly troubled by the *Metaphysics* of Aristotle, which he could not understand. During moments of baffled inquiry, he would leave his books, perform the requisite ablutions, and then go to a mosque and pray until he got some light or understanding. He used to study late into the night and at times would find solutions to his queries in dreams. He read through the *Metaphysics* of Aristotle 40 times, until the words were imprinted on his memory, but their meaning remained obscure. He rejoiced when a brief commentary by al-Farabi in a book that he bought from a bookstall for only three dirhams clarified Aristotle's text for him. He got involved in medicine at age 16, and not only learned medical theory, but also attended the sick, discovering new methods of treatment. He achieved full status as a qualified physician at age 18. He found medicine not to be a hard and thorny science, like mathematics and metaphysics, and he made great progress in medicine [3].

His major work, *al-Qanun fi'l tibb*, is commonly known as *The Canon of Medicine*. In this five-volume encyclopedia of medicine, Ibn Sina described vascular anatomy, including the role of the carotid arteries in supplying blood to the brain [4]. He also described major parts of the central and peripheral nervous systems, including the two cerebral hemispheres, their connection to the posterior regions of the brain, and extension into the spinal cord that gave rise to peripheral nerves [5].

One of the most cited and quoted early Muslim physicians was Abu Bakr Muhammed Ibn Zakria AlRazi (Rhazes) [6]. He was a Persian scholar, researcher, physician, and alchemist. He was probably the first to write separately on the diseases of children [6,7]. Rhazes preceded and was a major influence on Avicenna. He was born in the ancient city of Rey, near Tehran. A musician during his youth, he later became an alchemist. He classified and categorized various substances. He also identified medical components of substances derived from plants, animals, and minerals [7]. He began to study medicine at age 30. Because of his expertise and reputation, he was appointed chief of the main hospital in Baghdad and became court physician. As a teacher of medicine, Rhazes attracted students of all backgrounds and interests and was said to be compassionate and devoted to the service of his patients, whether rich or poor. His medical works were translated and became known among medieval European practitioners. Some sections of his publications were used in the medical curriculum of Western universities for centuries. Rhazes wrote over 200 books and treatises on medicine, alchemy, philosophy, and religion. The best-known were *Liber almansoris*, a short