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REVIEW ARTICLE

Avicenna's contribution to cardiology

Mohammed A.R. Chamsi-Pasha, Hassan Chamsi-Pasha[1]

Department of Cardiovascular Medicine, University of Nebraska Medical Center, Omaha, Nebraska, USA, [1]King Fahd Armed Forces Hospital, Jeddah, Saudi Arabia

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ABSTRACT

Ibn Sina, known in the West as Avicenna, was the most famous and influential of all the Islamic philosopher-scientists. His most important medical works are the Canon of Medicine medical encyclopedia and a treatise on cardiac drugs. His Canon of Medicine remained the standard text in both the East and West until the 16th century. Avicenna's description of cardiac diseases was logically presented perhaps for the first time in the history of medicine. Avicenna was the first to describe carotid sinus hypersensitivity, which presents with vasovagal syncope. He was a pioneer in pulsology and the first correct explanation of pulsation was given by Avicenna, after he refined Galen's theory of the pulse. Besides, he discussed the action of available drugs on the heart in details and mentioned their indications and contraindications. In conclusion, Avicenna made important contributions to cardiology. This article describes some of his contributions in this field.

Key words: Avicenna, cardiology, drugs, heart disease, Ibn Sina

INTRODUCTION

Islamic civilization once extended from India in the east to the Atlantic Ocean in the west. Buildings such as the Alhambra in Granada and the Giralda in Seville are reminders of the architectural imprint this civilization left on Western Europe. Less well remembered, however, is the impact of Islamic civilization on Western science, technology, and medicine between the years 800 and 1450.[1,2] Before the Islamic era, medical care was largely provided by priests in sanatoriums and annexes to temples.[2]

Avicenna (Ibn Sina; 980-1037) was known in the West as "the prince of physicians". His synthesis of Islamic medicine, al-Qanun fi'l tibb (The Canon of Medicine), was the final authority on medical matters in Europe for several centuries. George Sarton, the father of the history of science, wrote in the "Introduction to the History of Science": One of the most famous exponents of Muslim universalism and an eminent figure in Islamic learning was Avicenna. For 1000 years he has retained his original renown as one of the greatest thinkers and medical scholars in history. His most important medical works are the Qanun (Canon) and a treatise on cardiac drugs".[3]

Although Avicenna made advances in pharmacology and in clinical practice, his greatest contribution was probably in the philosophy of medicine. He created a system of medicine that today we would call "holistic" and in which physical and psychological factors, drugs, and diet were combined in treating patients.[4] Despite such glorious tributes to his work, Avicenna is rarely remembered in the West today and his fundamental contributions to Medicine go largely unrecognized.

CANON OF MEDICINE

The Canon of Medicine (Qanun: Law of Medicine) by Avicenna is one of the most famous books in the history of medicine. This book is a five-volume medical encyclopedia that was completed in 1025. The Arabic text of the Canon was translated into Latin by Gerard of Cremona in the 12th century and into Hebrew in 1279. This masterpiece has served as an essential medical encyclopedia for scholars in the Islamic territories and Europe for more than six centuries and, in the words of Dr. William Osler, it has remained "a medical Bible for a longer time than any other work".[5]

Address for correspondence: Dr. Mohammed A.R. Chamsi-Pasha, Department of Cardiovascular Medicine, University of Nebraska Medical Center, 982265 Nebraska Medical Center, Omaha, Nebraska 68198, USA. E-mail: drpasha.moh@gmail.com

He pulled together his own experiences and compiled the teachings of his predecessors, Aristotle, Hippocrates, and Galen, in order to write his Canon. However, one should realize that ancient principles of medicine are quite different in comparison with modern medicine and the description of diseases which Avicenna discussed their managements may be different today. The eleventh section of the third book principally deals with various kinds of heart diseases, their effects, and treatment.[6]

Pulsology

Avicenna was a pioneer in pulsology. In the words of Avicenna every beat of the pulse comprises two movements and two pauses. Thus, expansion: pause: contraction: pause. In ancient times, Galen as well as Chinese physicians erroneously believed that there was a unique type of pulse for every organ of the body and for every disease.[7]

The first correct explanation of pulsation was given by Avicenna, after he refined Galen's theory of the pulse. Avicenna was also the pioneer of the modern approach of examining the pulse using the wrist which is still practiced in the current time.[8]

Palpitation

The symptoms, effects, and treatment of palpitation are explained in detail by Avicenna. He mentioned that palpitation is a physiological affliction of the heart caused by injuries to the heart, to its outer covering or the anatomical organs close to the heart. All kinds of weaknesses of the heart result in palpitation on account of disharmony in its temperament.

Avicenna repeats the statement that when palpitation becomes acute it may lead to fainting and when the latter becomes acute and constant it may cause death.[9]

He was a pioneer in psychophysiology and psychosomatic medicine, developing a system for associating changes in the pulse rate with inner feelings. This idea was in anticipation of the word-association test attributed to Carl Jung.[10]

Avicenna was the first person to diagnose love sickness when he was treating a very ill patient by "feeling the patient's pulse and reciting aloud to him the name of provinces, districts, towns, streets and people". He noticed the changes in patient's pulse and decided that the patient was in love with a girl whose home Avicenna was able to locate by the examination of patient's pulse.[3]

Carotid sinus hypersensitivity and vasovagal syncope

In Article 5 of Book III of the Canon of Medicine Avicenna described drop attacks following compression of the carotid artery, and associated with yawning, fatigue, and flushing, which together resemble neurogenic syncope. Such a description is most likely the first mention of carotid sinus hypersensitivity and vasovagal syncope.[11]

He wrote of patients who had been subjected to pressure on the carotid artery by "hammam" (traditional public bath) staffs or masseurs resulting in unconsciousness and falling.[6] Avicenna rebuked such actions and wrote that these drop attacks revealed disturbances of the ascending spirit of the brain. He called this condition "al-Lawa" in Arabic, translated as "Torsion" in English. He noted that such patients are generally fatigued, and have excessive yawning, muscle strain, and flushing.[6]

Flushing is a common finding in neurogenic syncope. Yawning can be one of the first manifestations of the vasovagal reflex.[12] In a recent study, fatigue was also found to be a prominent feature in patients with vasovagal syncope.[13]

Atherosclerosis

In the Canon of Medicine there is no concept of Atherosclerosis as such. However, he states that localized accumulation of abnormal humors in vessels or other spaces may result in obstruction. Generalized accumulation may fill vessels or spaces and constrict them without any obstruction. Avicenna says that the worst obstruction is the obstruction of arteries of chief organs: Heart, brain, and liver.[14]

He also mentioned that the blood that is pure and thin flows smoothly, but the blood that is impure and thick causes choking of vessels and obstruction. He has suggested that this may result in injury to the vital faculties, and may be due to excessive eating and drinking. According to Canon of Avicenna, vascular calcification is deposition of abnormal "black bile" in the artery.[15]

Pericardial disease

Avicenna states that the heart may be affected by an inflammation of its outer covering or any other organ close to it. Moreover, this inflammation is the cause of palpitation and fainting and may lead to instant death".[16] He clearly described pericardial effusion when he says: "In the case of the accumulation of toxic matter, the matter may be deposited in the space between the cardiac muscle and the membrane that covers it", i.e., pericardium.[17]

Prevention of cardiac diseases

Avicenna described in detail the subject of health preservation, and thus promoting disease prevention. One

of the most important factors to attain this goal is "Exercise". According to his viewpoint, if exercise is used correctly, intermediately and in an appropriate time, it can prevent physical illnesses as well as diseases.[18] He was also particular about the healthy diet of patients with heart disease. He states that the preservation of our health is by proper diet that is moderate in quantity and quality. Residual amount from every digestion is left over in the body. By repetition of this cycle, there is an accumulation of waste that is harmful to the body from several aspects.[19]

The book on drugs for cardiac diseases

Avicenna has a special book entitled "Kitab al-Adviyt-al-Qalbiye" that means "The book on drugs for cardiac diseases".

This book is a separate and independent work which is medico-philosophical in character. Owing to its wide acceptance and importance, this treatise was translated to Latin in the early 14th century by Arnaldo de Villanova (d. 1310 or 1313 A.D.) under the title "De Medicines Cordialibus" and it was translated for the second time to Latin by Alpagus in 1520 A.D.[19]

Among the diseases of the heart mentioned in this treatise are: Difficulty in breathing, palpitation, and syncope. Moreover he has described the effects of some psychological diseases like depression, stress, and anxiety on cardiovascular function. He adds that: "Because the heart is the chief and noble organ, it is necessary that the physician should treat it after careful consideration and with a firm will. It is necessary that he should have faith in the success of his course of treatment. The temperament of the patient is considered of fundamental importance in the treatment of heart diseases and if there is any disharmony or imbalance of any kind, it should be treated".

In the second chapter, he described simple and compound drug remedies of heart diseases, but before that, he divided the drugs into several categories. These categories consist of stimulants, diuretics, and cooling agents. In this book, 83 simple and 17 compound drugs in the form of electuaries, crushed medicaments, pills, tonic and syrups derived from the vegetable, mineral and animal kingdoms are discussed explaining how they act on the heart. Furthermore, he described the dosage and strength of each drug and application techniques.[20]

In this treatment, the Galenic concept of the four humors (blood, phlegm, yellow bile, and black bile) predominates. Although the terminology employed by Avicenna is basically Greco-Arab, the concept has been presented very lucidly.[17]

One of the drugs mentioned in this book is 'zarnab'. He wrote that 'zarnab' (Taxus baccata L.) sets the heart at ease. It is recently demonstrated that this drug possessed calcium channel blocking activity.[21] One may say that Avicenna used a drug with calcium channel blocking activity much earlier than the arrival of synthetic drugs belonging to the same pharmacological group.[21] However, it is difficult to find out in which cardiac disturbance did Avicenna use this plant.[22]

CRITIQUE

The section of the Canon on heart disease contains merits as well as demerits but it cannot be judged from the point of view of the advanced and scientific knowledge of heart diseases and their treatment available in modern times.

What actually strikes the reader of this section of the Canon is the absence of a discussion of chest pain which may have been quite common in the days of Avicenna. He mentioned it only once and did not discuss it at all as a heart disease.

In the Canon as well as in the book of cardiac drugs he puts forward the traditional statement about the anatomy and physiology of the heart and the circulation of blood based mainly on the writings of Galen. He ignored the pulmonary circulation, which was later described by an Arab physician, Ibn al-Nafis, in the 13th century AD.[23]

Interestingly, in describing cardiac morphology, he essentially followed the teachings of Aristotle, rather than Galen, on the 3-chambered nature of the heart.[24,25] It may be worth mentioning a quotation from Michelangelo, an Italian sculptor who also studied anatomy[26]: "It is better to be mistaken following Avicenna than to be true following others".[27]

CONCLUSIONS

It is true that Avicenna did not know about elevated cholesterol levels and high blood pressure. Yet, it should be remembered that the Canon of Avicenna was written in early 11th century and it should be reviewed in the light of the state of knowledge concerning heart diseases and their treatment attained at that time.

Research today has the advantage of highly sophisticated instruments which were not available to Avicenna 1000 years ago. That he wrote this section of the Canon in such detail and compiled a separate treatise on heart drugs are enough to prove that he had a clear understanding of the fatal character of heart diseases. He was an astute scientific observer and medical practitioner.

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