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Original Research

Is the Text of Ibn Lūqā "A New Evidence" on Pulmonary Circulation Discovery?

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ABSTRACT

Objective: The discovery of the pulmonary circulation is one of the most important issues in the history of medicine. Recently, an article appeared comprising an assertion that this discovery may have been made before Ibn al-Nafīs by Qusṭā b. Lūqā. The purpose of our study is to examine the text of Qusṭā b. Lūqā to ascertain whether it offers "new evidence" on the discovery of pulmonary circulation.

Methods: A comprehensive analysis of the text Qusṭā b. Lūqā and its different copies referenced for the discovery made by Qusṭā b. Lūqā has been made regarding the history of medicine.

Results: While Qusṭā b. Lūqā's text contains detailed descriptions of cardiovascular anatomy, the terminologies and concepts employed were consistent with the prevailing medical knowledge of his time. From the perspective of the history of medicine, it can be said that Qusṭā b. Lūqā's text does not sufficiently differentiate from those of his predecessors' regarding the issue of pulmonary circulation. In addition, Qusṭā b. Lūqā mentions the sources he used in his text and does not explicitly claim that he made a discovery different from them.

Conclusion: With the available findings, it is difficult for now to say that Qusṭā b. Lūqā discovered the pulmonary circulation in the referenced text.

Keywords: Pulmonary circulation, lesser circulation, history of medicine, history of cardiovascular system

INTRODUCTION

The history and discovery of pulmonary circulation has been a very important topic in the history of medicine and science and continues to be a topic of interest today [1]. Galen (129–200) has been an authority on cardiovascular anatomy and physiology for a long time, as with many other subjects. However, over time, the flaws of the system that Galen theorised have been observed, and today's anatomical and physiological information has been obtained with the contributions of important physicians and scientists. It is known that one of the most important developments in the history of the circulatory system, which contradicts Galen's system, is the work of Ibn al-Nafīs (1213–1288) [2]. Ibn al-Nafīs was a physician who challenged the long-held belief of the Galen School that blood could pass through the cardiac interventricular septum and proposed that all blood that reached the left ventricle passed through the lung [3,4]. He also predicted the existence of small communications or pores between the pulmonary artery and vein, which was later

confirmed by the discovery of pulmonary capillaries by Marcello Malpighi (1628–1694) 400 years later [4]. However, recently, some authors in an article have expressed quite interestingly that the discovery of pulmonary circulation may have occurred before Ibn al-Nafīs by referring to the work of Qusṭā b. Lūqā (860-912) [5]. In this study, we evaluate and discuss such a groundbreaking discourse by considering the sources cited by the authors of the article, which contains important claims about the pulmonary circulation history and is also very interestingly constructed.

MATERIALS AND METHODS

Depending on the importance of the assertions, as a result of our detailed research on this article's sources, we have reached a text of Qusṭā b. Lūqā's *Kitāb al-farq bayn al-rūḥ wa l-nafs* edited by Hilmi Ziya Ülken [6] using a facsimile, which is in İstanbul, Topkapı Palace Library, III. Ahmed Collection, nr. 3483 [6], and a different Arabic print of the same work in the literature [7], and an Italian translation [8] published together with the Arabic version [8], as well as two Turkish translations [9,10]. We also had the opportunity to examine a Latin translation of Qusṭā b. Lūqā's aforementioned work by John of Seville [11] and a thesis on the work written by Judith Wilcox [12]. After examination of the aforementioned sources, we saw that in the authors' articles, the English translations, which quoted from the mentioned work, were different from our English translations of the different copies of the Arabic texts of the work in the literature.

RESULTS AND DISCUSSION

In the Arabic texts [6-8], also in the Italian [8] and Turkish translations [9,10], Qusṭā b. Lūqā [6-10] does not mention the pulmonary artery and vena cava emerging from the heart's right cavity, as the authors of the article claim, but on the contrary, two vessels emerge from the heart's left cavity, one goes to the lung, which is called the *al-shiryānī al-warīdī,* and the other vessel is called the *al-abhar* (the aorta), which is divided into two branches at the place of origin. Also, the vessel that Qusṭā b. Lūqā calls *al-shiryānī al-warīdī* is not the today's pulmonary artery, as claimed by the article's authors, but the pulmonary vein, because, as Qusṭā b. Lūqā also reported, this vessel is vein-like, but its function is the artery's function. According to the Galenic understanding of that period, this vessel brings something from the air to the heart, in other words, it carries the spirit:

> "Statement about the spirit – The spirit is a subtle matter, which emanates from the heart (al-qalb) into the arteries (al-shiryānāt), that activates the vitality (al-hayāt), breathing (al-tanaffus) and pulse (al-nabḍ), and that emanates from the brain (al-dimāgh) into the nerves (al-aʿṣāb) and activates movement (al-ḥaraka) and sense (al-ḥiss) in the body. Physicians and philosophers, who are praised for vivisection practice, claimed that there are two cavities (tajwīfān) in the heart, one of them on the right side (jānib al-ayman) and the other on the left side (jānib al-aysar). In these two cavities, there are blood (dam) and spirit (rūḥ), and in the right cavity, the blood is more than spirit, and in the left cavity, the spirit is more than blood. **Two vessels emerge from the cavity, which is on the left side, one of these two vessels ends in the lung (al-riʾa)**, and the heart breathes through it, because the heart contracts and dilates, and with its dilatation and contraction, the pulse (al-nabḍ) occurs in the rest of the body. Therefore, the pulse is indicative of natural conditions of the heart, which are regular, uniform, and different, which differs for a reason that affects the heart in itself or from some of its neighbouring organs. So, when the heart dilates, by that vessel, it draws something of the air, which arrives at the lungs by breathing, in order to fan the innate heat (al-ḥarara al-gharīziyya), which is in the heart, and it becomes a substance for the spirit, which is in its cavities, and when the heart contracts, it pushes the smoky vapours, which are generated in the heart from the heat of fire that is in it, to the lungs through this [vessel], and the lungs drive them out of the body, and **this vessel is known as the venous artery (al-shiryānī al-warīdī) and is called by this name because its shape is a vein and its action is an artery. The other vessel is called the aortic vessel (al-ʿirq al-abhar)**, and it is divided into two parts at its origin from the heart, one of them rises to the top of the body, and branches come out of it from the chest to the ends of the head, and through these branches, life arises in the human body. And the other one descends to the bottom of the body to the ends of the feet, and branches come out it, through these branches, life arises in the lower

Main Points;

- Is the text of Qusṭā b. Lūqā "a new evidence" on pulmonary circulation discovery?
- Qusṭā b. Lūqā's view is not different from his predecessors' views regarding the vascular relation between the heart and lungs.
- With the available findings, it is difficult for now to say that Qusṭā b. Lūqā discovered the pulmonary circulation in the referenced text.

part of the human body. And the divisional branches of these vessels, which are scattered throughout the rest of the body, are called arteries (al-shiryānāt), and they are the proximate cause of the life in the human body **when it conveys to each member of the body from the spirit that is in the cavity of the heart, which is on its left side** [6]."

In the light of the obtained information, we thought that the reason for this difference between the claims of the article's authors and the information in the Arabic texts we reached may be the author's translation error or a Persian translation error used by the authors. For this reason, we have reached the book used as a source by the authors, which was published by Bahrām Zāhdī [13] after being analysed and translated. There is a Persian translation of Qusṭā b. Lūqā's work along with its Arabic in the aforementioned book. Although the information in the book's Arabic text is the same as in the other Arabic texts, we noticed that the Persian text translation was different from the Arabic text, and it was an incorrect translation:

"A Word About the Spirit – The spirit is a subtle body, and spreads from the heart to the arteries (shiryānāt) in the human body, and life, breathing and pulse are affected by it. The part of the spirit that spreads from the brain to the nerves provides movement and sensation. Physicians and philosophers who are competent in the dissection of living things have said (claimed): There are two cavities (khufra) in the heart. One of them is on the right side and the other is on the left side, and blood (dam) and spirit (rūḥ) are in these two cavities. In the right cavity, there is more blood than the spirit, and in the left ventricle, the spirit is more than blood, **and from the right ventricle, two vessels emerge (originate). One of them goes to the lungs**, through which the heart breathes, and so heart contracts and expands, and as it expands and contracts, the pulse (nabż) occurs in other parts of the body, and therefore, in its best natural state, the heart is usually in a stationary state (sobriety, uniformity) and differentiation occurs due to damage to the heart and its adjacent organs. So when the heart expands, it absorbs something from the air through that vessel connected to the lungs [and] by breathing, [the air] returns to the lungs to cool (fanning) the innate heat (ḥararat-i gharīzī). For the spirit that is [in the heart]... (The text is disconnected-Persian translator's note). When the heart contracts, [because of this contraction], the heart rises a little towards the lungs, thus the lungs remove the smoky vapours caused by the intense heat in the heart from the body. This vessel [which is a tool for the lung to perform this process] is known as the venous artery (shiryān-i warīdī) and is called by this name, because its shape is the shape of the vein, its action is the action of the artery. **The other vessel is called the aortic vessel (shāh-rag/ʿırq al-abhar)** and is divided into two parts from the very beginning in the heart. One of them moves to the upper parts of the body, and from it, some branches depart from the chest to the upper part of the head, so that life occurs in that part of the human body. The other part descends towards the lower part of the body, and this vessel is divided into branches and provides life to the lower part of the human body. The various branches of these kinds of vessels, which are scattered in various parts of the body, are also called arteries (shiryānāt). This is the proximate cause of the vitality of the human body. **In this way, it provides the spirit, which is in the left cavity of the heart, for all organs of the body (….)** [13]"

In the Latin translation of John of Seville, a similar mistranslation is found, among the works we studied. Judith Wilcox, who prepared a thesis on the work based on the aforementioned Latin text, also states that this translation is incorrect and makes her explanation of the English translation in her thesis in the 7th footnote:

"Spiritus is a certain subtle body which in the human body arises from the heart and is borne in assuirenet, that is, in the pulsing veins, for the vivification of the body, and it effects life, the breath and the pulse; and similarly it arises from the brain into the nerves and effects sense and motion. And some praiseworthy physicians and natural philosophers who were experienced in performing surgery on living bodies thought regarding this that there are two ventricles or cavities in the heart, one in its right part and the other in the left; and in these two ventricles are contained blood and spiritus, but in the right ventricle there is more blood than spirit, and in the left there is more spirit than blood. **And two veins grow out from the right[7] ventricle, one of which leads to the lung**, and the breath of the heart is made by it. For the heart is contracted and extended, and by its extension and contraction the pulse is created throughout the whole body and therefore the pulse shows the state of the heart, that is, its own passions, regular as well as irregular, and foreign which occur on account of various difficulties of the heart which happens to it in itself or through some member near it. So when the heart extends, it draws in from the lung through the aforementioned vein part of the air which has been taken into the lung by breathing to cool the natural heat which is in it,

to be the nutriment or sustenance of that same spiritus which is contained in its ventricles. When the heart is contracted, it drives through that vein to the lung whatever is produced in it of smoky vapors and it expels them from the fiery heat which is in it, and the lung sends them out of the body, and this vein is called the "pulsing" one. **The other vein is called by the Arabs alabhar**, and this vein, at the very place from which it arises from the heart, is divided into two parts, one of which ascends upwards in the body; out of it from the chest to the top of the head proceed branches from which this part of the body is vivified; and the other part, leading downwards in the body, descends to the farthest extremities of the body to the feet, and from it proceed branches by which the lower part of the human body is vivified. And branches from each part of the aforesaid veins which are distributed throughout the rest of the body are called surienet, that is "pulsing", and this is the immediate cause of life in the human body, **because through this it carries to each member some of the spirit which is in the left ventricle of the heart** [12]."

"[7]This is an error. The Arabic has "left" ventricle, as the context further on clearly verifies [12]."

On the other hand, in the introduction to the treatise, Qusṭā b. Lūqā clearly states the sources he used for this treatise, which he wrote to explain the difference between spirit and soul. When we consider the writers from whom Qusṭā b. Lūqā has benefited, for on the soul, he cites Plato's *Phaedo [Bādan]* and *Timaeus [Ṭīmāūs]*, and Aristotle's and Theophrastus's *On the Soul [Fī al-nafs]*, and on the spirit, he cites Galen's *On the Doctrines of Hippocrates and Plato [Fī ittifāq ārāʾ Buqrāṭ wa Falāṭūn], On Anatomical Procedures [ʿAmal al-tashrīḥ],* and *On the Usefulness of the Parts of the Body [Fī manafiʿ al-aʿḍāʾ]* [6,13]:

"You inquired, may God honor you, about the difference between the spirit and the soul, and what the ancients said about it. I have drawn for you sentences on this that I extracted from Plato's book called *Phaedo [Bādan]*, from his book called *Timaeus [Ṭīmāūs]*, from Aristotle's and Theophrastus's book *On the Soul [Fī al-nafs]*, from Galen's book *On the Doctrines of Hippocrates and Plato [Fī ittifāq ārāʾ Buqrāṭ wa Falāṭūn]*, and from his book *On Anatomical Procedures [ʿAmal al-tashrīḥ]* and *On the Usefulness of the Parts of the Body [Fī manafiʿ al-aʿḍāʾ]* [6]."

Indeed, explanations about the issues reported by Qusṭā b. Lūqā are found in detail in the mentioned works of Galenus [14-16]. Regarding the pulmonary artery and pulmonary vein, an example of these is given below:

"I follow what I take to be the better view of those who call the vessel springing from the left ventricle of the heart 'venous artery' [pulmonary vein] and that springing from the right ventricle 'arterial vein' [pulmonary artery]. I think it preferable (since we cannot distinguish them clearly by the pulse) to call the vessel containing pneuma an 'artery' but, since it has the covering of a vein, to add 'venous.' So to the other I give the name of 'vein' from its function, but since its substance is that of an artery, I add 'arterial' [14]."

CONCLUSION

In his work, Qusṭā b. Lūqā did not give any information about pulmonary circulation, as claimed by the authors. Also, taking into consideration the sources he used, it seems difficult to say that Qusṭā b. Lūqā might have benefited from Persian sources. It is seen that while Qusṭā b. Lūqā was writing his article, he carried into his work the accepted Galenic views of that period and shared them openly. In this respect, based on the sources we have used, it is possible to consider the interpretations made by article's authors regarding the pulmonary circulation, without mentioning the sources used by Qusṭā b. Lūqā, as extreme interpretations.

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