

The Missing Link in the History of Circulation

Concerning the Article by M. Obladen: History of the Ductus Arteriosus:

1. Anatomy and Spontaneous Closure [Neonatology 2011;99:83–89]

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Dear Sir,

I read with interest Prof. Obladen's article entitled History of the Ductus Arteriosus: 1. Anatomy and Spontaneous Closure [1]. He deserves to be congratulated on this comprehensive review. However, additional clarification is needed in relation to the progress of knowledge and understanding of the circulation during the Middle Ages.

Like his predecessors in the Islamic era, Ibn Al-Nafis (1210–1288 CE) critically appraised the views of those who came before him in the light of his own experience, experimentation and direct observations. Accordingly, in his book 'Sharh Tashreeh Al-Qanun' (A Commentary on the Anatomy of the Canon of Medicine), we find one of the great discoveries in the history of physiology, namely the first correct description of the pulmonary circulation with the firm denial of the Galenic concept of the existence of invisible pores in the septum between the right and left ventricles of the heart [2, 3 (pp. v–viii, 38–42)].

Furthermore, 'Sharh Tashreeh Al-Qanun' furnished evidence that Ibn Al-Nafis discovered the capillary circulation that connects the pulmonary artery branches to the tributaries of the pulmonary vein in the lung substance [2]. The book also contains the first

ever description of the coronary vessels and together with other works of Ibn Al-Nafis, laid the seeds of the correct description of the systemic greater blood circulation [2].

Those findings of Ibn Al-Nafis in relation to the circulation, and the coronary vessels together with his other anatomical and physiological discoveries, were accepted by scholars who came after him and were included in their works as well as added as marginal notes to the widely spread copies of Ibn Sina's Canon of Medicine and its commentaries [3 (p. 50), 4–6].

Andrea Alpagus (1450?–1522), a professor of medicine at Padua University who spent 30 years in Syria studying and translating Arabic Medical manuscripts, translated sections of Ibn Al-Nafis' book 'Sharh Tashreeh Al-Qanun' into Latin including his views on the pulmonary circulation [3 (p. 50), 4, 6]. This translation, printed in Venice in the year 1547, helped to spread Ibn Nafis' description of pulmonary circulation to Medieval European scholars and, thus, raise their doubts about Galen's anatomy. Six years later, Ibn Al-Nafis' description of pulmonary circulation was accepted by Michel Servetus (1511–1553) who included it in his book Christianismi Res-

tituto [4–6]. This is in agreement with Ullman [7] who after comparing the texts of both authors together, stated that 'Servetus's presentation of the lung circulation resembled Ibn Al-Nafis's so strongly that one can hardly reject a direct influence'.

Then, in 1555, Andreas Vesalius (1514–1564), another Padua University professor, described the pulmonary circulation in a manner similar to Ibn Nafis' description, in the second edition of the 'De Fabrica Humani Corporis' [5, 6]. Another similar description was given by Juan Valverde in 1554 and Realdus Columbus (1510–1553) in 1559 [5, 6] and in 1571 by Andrea Cesalpino (1519–1603) [5].

Finally, William Harvey (1578–1657) who got his doctorate from Padua University in 1602 gave the full description of the blood circulation in his lectures in 1616 then in his 'Exercitatio anatomica de motu cordis et sanguinis in animalibus', printed in 1628 [5, 6]. According to Jaleely [6], the description given for the coronary vessels in Harvey's book is similar to that given by Ibn Al-Nafis.

It is also significant, in this evolution chain, that Alpagus, Servetus and Vesalius were all fluent in the Arabic language [2, 6].

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