

MINIREVIEW

THE ITALIAN ANATOMIST REALDO COLOMBO (1516-1559) AND HIS CONTRIBUTION TO THE DISCOVERY OF PULMONARY CIRCULATION

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ABSTRACT

In our article we present the anatomical work of the distinguished Renaissance anatomist Realdo Colombo, as well as, his contribution to the discovery of pulmonary circulation. Colombo was not the first to describe the pulmonary circulation, but he backed up this hypothesis with evidence after extensive dissection and vivisection. He paved the way for his successors and particularly William Harvey (1578-1657) to the establishment of anatomy and physiology of blood circulation.

Key words: history of cardiology, pulmonary circulation, Colombo, anatomy.

RÉSUMÉ

L'anatomiste Italien Realdo Colombo (1516-1559) et sa contribution à la découverte de la circulation pulmonaire

Dans notre article, on présente l'œuvre de l'éminent anatomiste de la Renaissance Realdo Colombo, ainsi que sa contribution à la découverte de la circulation pulmonaire. Colombo n'était pas le premier à décrire la circulation pulmonaire, mais il a soutenu cette hypothèse après avoir fait des dissections extensives et des vivisections. Il a ouvert la voie à ses successeurs et en particulier à William Harvey (1578-1657) pour la création de l'anatomie et de la physiologie de la circulation sanguine

Mots-clés: histoire de la cardiologie, circulation pulmonaire, Colombo, anatomie.

Realdo Colombo was born in Cremona, Italy around 1516. He was the son of an apothecary named Antonio Colombo. Little is known about his early life, although it seems that he took his first university

education in Milan, studying liberal arts. Soon afterwards, he worked as an apothecary for a short time, before he began to study surgery with Giovanni Antonio Lonigo¹. In 1538, Colombo enrolled to the famous

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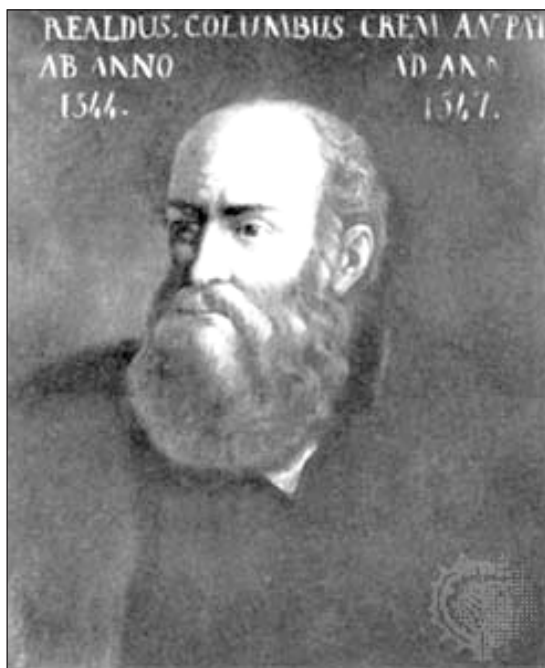


Figure 1. The distinguished anatomist Realdo Colombo



Figure 2. Frontispiece of Colombo's masterpiece „De re anatomica“

University of Padua, where a succession of anatomists made significant contributions. After three years of studies, Colombo became the assistant of Andreas Vesalius (1514-1564), the professor of anatomy and author of one of the most influential books on human anatomy entitled „De humani corporis fabrica“^{2,3}. However, his public criticism on Vesalius' work, ended their friendship and co-operation. Since, he had been proposed for the chair of anatomy twice, in 1536 and again in 1541, but deprived by the Venetian Senate, Colombo accepted a teaching position in University of Pisa from 1544-1547 and later in Rome at „La Sapienza“ University, where he spent the rest of his life² (Figure 1).

In Rome, Colombo, under the protection of Pope Paul IV (1476-1559), flourished academically and socially⁴. During Renaissance, Galen's (130-201) anatomy had just started to be corrected and criticized by many researchers and subsequently anatomical dissection grew in popularity. Colombo and his contemporaries stopped following blindly the ancient medical traditions. They performed autopsies and dissections and checked their findings and literature in order to increase and fortify the scientific knowledge⁵. Colombo prepared his anatomical findings for publication, at the time of his death, in 1559 and they were published shortly after in his masterpiece: „De re anatomica“ which among others contains criticism on Vesalius' work and it was dedicated to his protector and friend Pope Paul IV⁶ (Figure 2). Colombo hoped for Michelangelo (1475-1564), the

notable artist of the Italian Renaissance, to illustrate the publication of his work. However, the latter was not capable to do so due to his old age⁷.

Among the anatomical innovations presented in Colombo's work we may distinguish: the first description of the absence of the palmaris longus muscle of the forearm which is attributed equally to him and to Vesalius; the position of the right kidney lower than the left one; the localization of the lens in the anterior chamber of the eye; the description of placenta, as well as its biology and its role in pregnancy and the description and function of the clitoris in female sexuality although its anatomy had previously been described by others⁸.

Colombo also gained significant fame from his medical and surgical practice. He was invited to treat many famous personalities of the era, among them Michelangelo who he diagnosed and treated for nephrolithiasis in 1549 and gouty arthritis in 1555⁹. He also performed the necropsy of the theologian and founder of the Order of the Society of Jesus (Jesuits), St Ignatius Loyola (1491-1556)¹⁰.

Most important, Colombo gave an exact description of the pulmonary circulation, based on dissections and vivisections. However, Colombo was not the first to describe the pulmonary circulation. Centuries earlier, the Arab physician Ibn al-Nafis (1213-1288) and the French physician and philosopher of Spanish origin Michael Servetus (1511-1553), have been the pioneers of the new views on the circulation of the blood^{11,12}. At Colombo's time, Ibn al

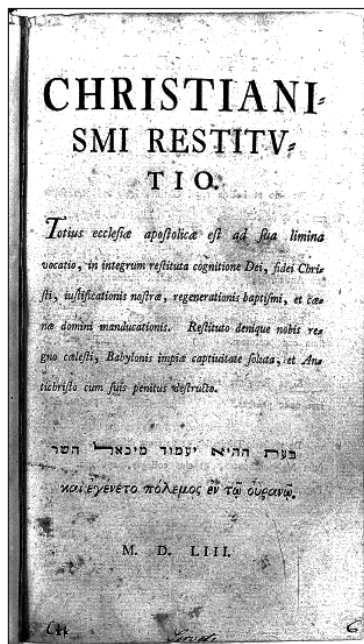


Figure 3. Frontispiece of Servetus' work on blood circulation „De Christianismi Restitutio“

Nafis's observations were partially saved in Arabic texts while „De Christianismi Restitutio“, the book of Servetus mentioning the blood circulation, was burned along with Servetus after the order of the Holy Inquisition^{11,12} (Figure 3). However, several historians believe that Colombo was aware of Servetus work but he avoids mentioning it as bibliographical source through fear of the Holy Inquisition¹². In his work Colombo provided a detailed account and elaborated description of the pulmonary circulation rejecting the Galenic model. Galen, through his dissections, supported that blood circulated from the right ventricle to the left ventricle through invisible pores in the interventricular septum and his views remained unchangeable for more than 1200 years¹³. Colombo in „De re anatomica“ mentioned: „Between these ventricles there is a septum through which, almost everyone believes, a passage from the right ventricle to the left is laid open to the blood. In order that this may be done more easily it [the blood] is rendered thin in transit on account of the generation of the vital spirits. But they go out of their way by a long road. For the blood is carried through the pulmonary artery to the lung, and there it is rendered thin. Next it is carried away, together with the air, through the pulmonary vein to the left ventricle of the heart, which [fact] no one hitherto has either observed or left recorded in writing, although it may be noticed very easily by anyone...the pulmonary vein has been made in order that it might carry the blood, mixed with air by the lungs, to the

left ventricle of the heart . . . for if you examine not only cadavers, but also live animals you will discover this vein filled with blood in all of them“^{6,14}. In his dissections, Colombo observed that the pulmonary veins and the left atrium contained blood and he proposed that blood and air were mixed in the lungs and not in the heart. Furthermore, Colombo described the cardiac valves, advancing the notion of one-way mechanism for valve function¹⁴.

Colombo's book and his clear description of the pulmonary circulation, crucial influenced Harvey, not only on the pulmonary transit but also on the difficult question of the movement of the heart. Man of Renaissance, Colombo corrected several of the Galenic anatomical errors, laying the ghost of dogma and authority through the rational interpretation of anatomy, paving thus the way for significant discoveries on blood circulation.

Compliance with Ethics Requirements:

„The authors declare no conflict of interest regarding this article“

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