Cardiovascular Pathology 25 (2016) 443–452

Contents lists available at ScienceDirect

Cardiovascular Pathology

Review Article

Cardiovascular medicine in Morgagni's *De sedibus*: dawn of cardiovascular pathology

Fabio Zampieri, Alberto Zanatta, Cristina Basso, Gaetano Thiene *

Department of Cardiac, Thoracic and Vascular Sciences, University of Padua Medical School, Padua, Italy

ARTICLE INFO

Article history:
Received 28 June 2016
Received in revised form 15 July 2016
Accepted 19 July 2016
Available online xxxx

Keywords:
Giovanni Battista Morgagni
Cardiovascular pathology
Anatomoclinical method

ABSTRACT

The most significant cardiovascular anatomoclinical observations from Morgagni's masterpiece *De sedibus et causis morborum per anatomen indagatis* (1761) are herein reported, divided into the current taxonomy according to cardiac structure: (a) aorta and pulmonary artery, (b) pericardium, (c) coronary arteries, (d) myocardium, (e) endocardium, (f) congenital heart defects, and (g) heart rhythm disorders. Morgagni's interpretations in cardiovascular pathology were strictly related with the most advanced theories of his time, such as those of blood circulation and iatromechanics; nevertheless, he remained close to the empirical description of clinical and pathological anatomy phenomena with their individual specificity. Through a systematic review of the literature, he compared the data from his own observations and experiments with those from physicians he considered reliable by applying the method of literature review which is still valid nowadays.

© 2016 Elsevier Inc. All rights reserved.

1. Introduction

The University of Padua, which was founded in 1222 and thus is one of the most ancient in the world, has been the center of scientific Renaissance, in particular thanks to seminal discoveries in cardiovascular medicine. Here, Andreas Vesalius (1514–1564) was professor of Anatomy and Surgery from 1538 to 1543 and, unlike Galen of Pergamum (129–216/217 AD), systematically carried out human dissections and challenged many of Galen's anatomical views, which represented a dogma of classic medical knowledge. With the *De humani corporis fabrica*, he founded research, teaching, and divulgation of modern human anatomy [1]. Vesalius' new anatomy would have brought not only a new morphological knowledge but also the prerequisite of a new physiology, which fully developed in the following XVII century.

The patency of the interventricular septum was one of Galen's fundamental beliefs, according to which the blood passed from the right to the left ventricle through invisible pores. Vesalius clearly denied these structures: “However much the pits may be apparent, yet none, as far as can be comprehended by sense, passes through the septum of the heart from the right ventricle into the left […]. As a result — as I shall declare more openly elsewhere — I am in no little doubt regarding the function of the heart in this part” [2]. If the blood could not pass from right to left ventricle through the interventricular septum, it was necessary to look for an alternative way; otherwise, that arteries were filled up by blood would have been inexplicable [3]. For Galen, blood and natural spirit were produced by the liver and reached the right side of the heart through the vena cava. The blood with vital spirit was produced in the left ventricle by air coming through pulmonary veins mixed with blood and natural spirit, coming from right ventricle through pores of the interventricular septum.

It is not by chance that pulmonary circulation was later discovered by Matteo Realdo Colombo (1516–1559), one of Vesalius' students, and described in his *De re anatomica* [4]. Colombo was the successor of Vesalius at the chair of Anatomy and Surgery in Padua. Doubts and suggestions of his master pushed Colombo to find a solution. In his *De re anatomica*, pulmonary circulation was clearly discovered through vivisection by opening the pulmonary veins in living dogs: “I believe […] the function of the pulmonary vein is to lead blood mixed with air from the lungs to the left ventricle of the heart […]. If you observe cadavers as well as living animals, you will always find the pulmonary vein full of blood, which is not possible if this vein was to carry only air and fumes” [4]. The discovery of pulmonary circulation, in turn, was the starting point to investigate systemic circulation, and again, this discovery was conceived in Padua, thanks to William Harvey (1578–1657), who was there a student and graduated in 1602. In his *Exercitatio anatomica de motu cordis et sanguinis in animalibus*, Harvey explicitly declared his debt to Padua Medical School [5]. One of Harvey's starting point, in fact, was the discovery of venous valves by Girolamo Fabrici d'Aquapendente (1537–1619), who was a pioneer in embryology, anatomy, and surgery. In his description of the valves observed in large veins, Fabrici misunderstood their function, explaining them as structures for slowing down and deviating the centrifugal blood stream to the tissues of the body, where it was consumed [6]. On the opposite,

* Corresponding author at: Department of Cardiac, Thoracic and Vascular Sciences, University of Padua, Via A. Gabelli, 61, 35121, Padua, Italy. Tel.: +39 049 8272288.
E-mail address: gaetano.thiene@unipd.it (G. Thiene).

http://dx.doi.org/10.1016/j.carpath.2016.07.004
1054-8807/© 2016 Elsevier Inc. All rights reserved.

Harvey, who was a student in Padua exactly in the period when Fabrici was describing these structures, understood that venous valves had an antireflux function with a centripetal rather than centrifugal flow of the venous blood.

Harvey's discovery represented the dawn of modern medicine because it obliged physicians to rewrite human physiology after a millenary period of sharing the Galenic model. Of note, Harvey estimated that the volume of blood passing through the heart in half an hour was nearly 12 kg and surmised that the liver was unable to produce such amount of blood in a short period. This plenty of blood could be explained only by a circuit. Thanks to this physiomathematical model, he paved the way to XVII and XVIII centuries iatromechanism, a system according to which the body was a hydraulic machine in which humors flowed in corpuscular agitation.

Marcello Malpighi (1628–1694), professor of medicine in Bologna, Pisa, and Messina and archiater of Pope Innocent XII (1615–1700), was one of the most important iatromechanists in Italy and Europe, developing a method followed by generations of scholars. According to Malpighi, the body was a "glandular machine," where the corpuscles of blood, pushed to circulate in a hydraulic system by a pump (the heart), were sieved by different filters (the glands), thus producing the humors necessary to the functions of the organism [7].

Giovanni Battista Morgagni (1682–1771), born in Forlì, studied medicine in Bologna, where, from 1698 to 1709, he became friend and assistant of Antonio Maria Valsalva (1666–1723), a pupil of Malpighi. Valsalva taught to the young Morgagni the characteristics and the method of Malpighi's iatromechanical approach. Morgagni was forced to leave Bologna in 1709 for his belonging to Malpighi's school, and a couple of years later, after a period in Venice, he was called at the chair of Theoretical Medicine at Padua University on October 1711. He then moved to the chair of Anatomy from 1715 until his death in 1771. During this long period, Morgagni founded the pathology lasting school of the XVIII century by combining Malpighi's heritage and the extraordinary Padua's tradition in anatomy and physiology of the previous centuries. In 1761, he published *De sedibus et causis morborum per anatomen indagatis*, by which he systematically developed the method of anatomoclinical correlations (Fig. 1) [8,9]. In about 700 cases, divided in 70 anatomoclinical letters, each one for a disease or a syndrome, and 5 books, each for a body part, from head to toe, he correlated clinical signs and symptoms observed in living patients with morphological substrates found at autopsy [10]. Many of the cases described in *De sedibus* came from Morgagni's personal clinical and pathological experience since he could make the autopsy of the patients he cured by himself. He explained symptoms as caused by lesions in the organs, which were considered to account for diseases (dawn of organ pathology). This was revolutionary because, according to the classic humoral pathology, diseases were caused by an unbalance among the four humors of the body: blood, black bile, yellow bile, and phlegm. On the opposite, Morgagni considered an organic lesion as the damage of a structure in the body-machine that caused a functional disorder, thus giving origin also to physiopathology.

Although Morgagni followed Malpighi's new method, he never completely rejected ancient knowledge and experiments. Empirical approach was also developed with attention to description of clinical phenomena and to avoid the elaboration of hypotheses without direct support of observations.

2. Cardiovascular medicine in Morgagni's works

In his academic lectures on Theoretical Medicine (1711–1715), published posthumously, Morgagni taught to his students how to understand the anatomy and physiology of the cardiovascular system according to a mechanistic model [11]. For instance, in 1714, by explaining the pulse theory of Galen, Morgagni was able to convert classical concepts into the modern iatromechanical ones. First of all, the phenomenon of "pulse" corresponded to the artery diastole due to the blood ejected by the heart. After the left ventricle's systole, the blood was pushed into the arteries, which were dilated by its passage. Blood being a fluid that cannot be compressed, the impulse from the heart

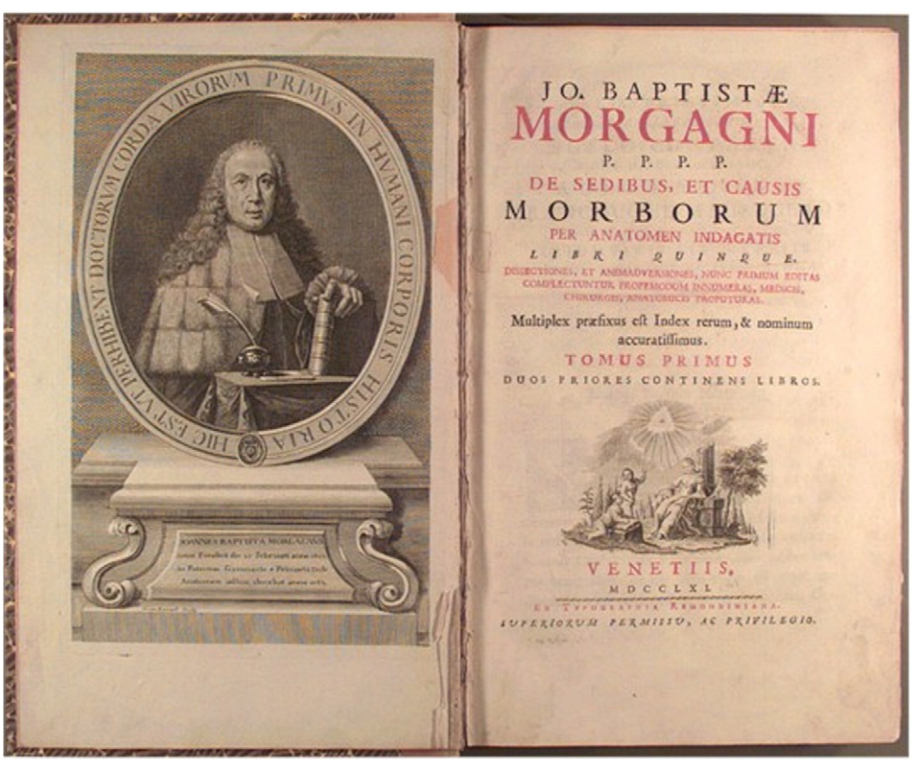

Fig. 1. Frontispiece of Morgagni's *De sedibus et causis morborum per anatomen indagatis* (1761), with a portrait of Morgagni.

Download English Version:

https://daneshyari.com/en/article/2898592

Download Persian Version:

https://daneshyari.com/article/2898592

Daneshyari.com