

Research Article - History of Anatomy and Embryology

The anatomy of vena cava in the work of Aretaeus of Cappadocia

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Abstract

Aretaeus of Cappadocia did not deal systematically with the study of anatomy, as it can be assumed from the thorough study of his remaining work, as well as the references to the topics and the fragments of his lost treatises. We could also extract useful information on anatomy through his analytical descriptions about the various diseases in his remaining work. A perfect example is the anatomy of the upper and inferior vena cava exposed in his work on acute diseases.

Key words

Aretaeus of Cappadocia, vena cava, anatomy, Galen.

Introduction

Aretaeus of Cappadocia is the most prominent and at a same time enigmatic figure in Ancient Greek Medicine, since very little is known about his life, while his remaining work is considered by contemporary medicine as outstandingly significant (Deichgräber, 1971). There is some controversy as to when he lived, as there have been guesses ranging from the 1st century B.C. to the 4th century A.D. Although the most widely accepted opinion is that he lived in the 2nd century A.D., it would be more correct to date him to the 3rd (Osler, 1969), or 4th century A.D. (Laios et. al, 2012), as a representative of the Eclectic School (Greek: Εκλεκτική Σχολή). Aretaeus wrote his manuscripts in Ionian dialect, in such a way that no medical author of the antiquity surpasses him in his vivid portrayal of various diseases and anatomical descriptions (Winslow, 1839; Maggina, 1890; Tsoucalas et. al., 2012). His only saved manuscript depicts not only the detailed description, but also the cure of acute and chronic diseases. In the lost part of his manuscripts he dealt with fever, surgery, gynaecology, pharmacology and prevention of various diseases (Deichgräber, 1971). Yet, no specific reference can be found to anatomy, neither in his saved treatise nor

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in the lost fragments of his work. That is why we need to deduct his knowledge on anatomy through his descriptions of the various diseases inside his saved work.

The anatomy of “Vena Cava”

When Aretaeus tried to describe the acute disease of the Vena Cava inside the sub-chapter with the same name of the second chapter of his book on acute diseases [Aretaeus Med. *De causis et signis acutorum morborum* 2.8.1.1-2.8.9.9 (Hude, 1958)], he found it necessary to describe the anatomy of the vein throughout its complete course inside the human body. Therefore we are able to derive from his work a descriptive, as well as a topographical lecture on anatomy for that particular vase. Through this description one may see the anatomical knowledge of Aretaeus when describing human body's organs.

His description of the vena cava started from its beginning, which was set by Aretaeus on the liver. More specifically, he mentioned that a wide vein runs through the liver, with separate beginnings from its two entries into the organ. According to his description, this vein runs through the middle of the liver and then divides into several smaller ones. The latter ones in turn divide inside the liver into even smaller ones, becoming invisible by the human eye. This cycle continues with these smaller veins anastomosed with the end edges of other veins, forming one big vessel in the middle of the liver. Following this last one in the liver one sees that it divides into two big ones, each running through the liver. One of these big veins, passing through the convex surface of the upper first lobe, continuing through the diaphragm and ending up in the heart, was named “vena cava”. The second one passes through the fifth lobe of the liver (according to Aretaeus, *i.e.* the quadrate lobe according modern anatomy) and thus alongside the vertebral column, coming close to hips; it was also called “vena cava”. Aretaeus emphasized that the name for both veins had to be the same, as according to his scientific opinion it is actually one vein having two branches both starting from the liver. To highlight the correlation of the two veins, as well as their course through the human body, he noted that if somebody wanted, he could pass a metal plate (“έλασμα”) from the upper vein reaching the heart, or one through the lower vein which runs parallel the vertebral column, or through the vertebral column up to the liver, ending up to the heart, as the route is one and the same [Aretaeus Med. *De causis et signis acutorum morborum* 2.8.1.1-2.8.3.1 (Singer, 1921; Hude, 1958)].

Discussion

From Aretaeus' description of the vena cava, we could deduct valuable information about the perceptions and the knowledge of his time about the anatomy of those veins. We may note that Aretaeus made a clear distinction between the duet of the “vena cava”, superior and inferior, and the portal vein, though he did not name it. The wide vein that passes through the gates of the liver represented actually the portal vein. It is clear enough that the vena cava which reaches the heart, represented the upper part of the inferior vena cava, while when he referred to the one that reaches

the hips, he meant the lower part of the inferior vena cava, though he didn't distinguish its branching into the iliac veins (Black and Black, 1842).

Aretaeus when recording the anastomosis of the veins inside the liver, and referring to invisible small veins, allows us to assume his huge empirical knowledge on topographical anatomy, moreover if we take under consideration the absence of microscopes in those days. Naturally, the absence of optical means of observation was the reason why Aretaeus confused the subdivisions of the portal vein with those of the hepatic veins. On the other hand he was able to distinguish the hepatic veins which were anastomosed with the inferior vena cava, when they were exiting the liver (Cordell, 1909). In a fragment of a second book about acute diseases [Aretaeus Med. *De causis et signis acutorum morborum* 2.2.6.1-5 (Hude, 1958)], Aretaeus made the distinction between arteries and veins, between the upper vena cava and aorta, showing by this way his scientific commitment to the relevant discovery of Herophilus (330-260 B.C.) (Von Staden, 1989).

Aretaeus' greatest mistake was his belief that the beginning of those veins was the liver. Probably he was influenced by the similar convictions of Galen (129-201 B.C.) who also thought that the veins begin from the liver (Harris, 1973), an opinion that Aretaeus did not doubt about.

The crucial question remains until today, did Aretaeus of Cappadocia himself perform dissection on humans? The absence of relevant testimonies leaves that unanswered. After reading Aretaeus' treatise we may presume with safety that he summarized in his work the anatomical discoveries of his predecessors, as well as their theories, while he did not seem to dispute those discoveries and theories or to offer new scientific views, as he so wonderfully did for clinical diseases (Cordell, 1909).

The use of the metallic plate as a mean of catheterization of the upper and inferior vena cava should be assumed as a hypothetical action. This is supported by the use of conditional syntax in the ancient text, adding the fact that the catheterization through the vertebral column, with a final aim to the heart through the liver, was an action unattainable in reality. Maybe his scientific exaggeration was made to stress the continuum of these vessels and their anastomosis in the human body. If actually a metal plate was used, it would have happened during an anatomic lesson on a corpse, or an animal (Parr, 1809), as a demonstration of a risky fatal surgical procedure, as this would mean the certain death of the patient.

Epilogue

Aretaeus, respecting the scientific opinions of his predecessors, he overcame them with his descriptions of various types of alterations and contributed much to the existing knowledge regarding symptomatology, differential diagnosis and therapy (London, 1952). He is considered to be the second most important Greek physician of the antiquity after Hippocrates⁴, and among his achievements there is a sophisticated, for the time, anatomical description of the inferior vena cava. Although he made some mistakes concerning veins anatomy, his work reflects the best knowledge of his epoch, alongside his medical magnitude.

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