

On the history of Caspar Bauhin's discovery of the ileocecal valve

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Abstract

The ileocecal valve is also known as Bauhin's valve, after the Swiss scientist Caspar Bauhin (1560–1624), who discovered it in 1579. This paper aims to reconstruct the chronology of Bauhin's discovery of the ileocecal valve and its circumstances, using the following works by him: his appendices to his Latin translation of *François Rousset's L'hystérotomotokie ou enfante-ment césarien* (1586), and Bauhin's *De corporis humani partibus externis* (1588), *De corporis humani fabrica: libri IIII* (1590), *Anatomica corporis virilis et muliebris historia* (1597) and *Theatrum anatomicum* (1st ed. 1605; 2nd ed. 1621). We note that Bauhin discovered the ileocecal valve in 1579, while studying at the University of Paris, during a private anatomy lesson given by Thomas Koch (while washing some intestines, pouring water into them through the jejunum and the rectum in turn). Bauhin described its structure and purpose, as well as the circumstances of the discovery, for the first time in great detail in 1586 in an appendix to his Latin translation of *L'hystérotomotokie ou enfante-ment césarien* by the French physician François Rousset (1535–1590). From the second edition of Bauhin's *Theatrum anatomicum* (1621), we know that prior to him the valve's existence was known to the Italian anatomist Costanzo Varolio (1543–1575). However, the latter's observations were not published until after his death, in his *Anatomiae, sive de resolutione corporis humani* (1591).

Keywords

history of medicine, history of anatomy, eponym, ileocecal valve, Caspar Bauhin, Costanzo Varolio

The eponymous alternative name of the ileocecal valve – “Bauhin's valve” – has become part of the vocabulary of anatomists and clinicians. This anatomical structure was named after the Swiss physician, anatomist and botanist Caspar Bauhin (1560–1624), who discovered it in 1579 (Ghosh 2016; Mudry 2014; Persaud, Loukas, Tubbs 2014; Whitteridge 2019). Unfortunately, the sources we have (Ghosh 2016; Mudry 2014; Persaud, Loukas, Tubbs 2014; Whitteridge 2019) say nothing about the circumstances of this discovery. The sole exception is Mudry (Mudry 2014), who includes a German translation of a short passage from Bauhin's *Valvula in intestino colo, anno 1579 a me reperta*, written in Latin and published in Israel Spach's *Gynaeciorum sive de mulierum tum communibus* in 1597, which says that the event took

place when Bauhin was studying in Paris, and provides a brief description of the experiment that led to the valve's discovery. Details of the circumstances of the discovery remain unknown to the wider academic community, because Bauhin's works on anatomy have not been translated into modern European languages. An apparent exception is *Mikrokosmographia: a description of the body of man* (1615), a textbook on anatomy by the British physician Helkiah Crook, or Crooke, (1576–1648). This is largely an English-language compilation of fragments of treatises on anatomy known to the author, including by Bauhin. However, we did not find the information we wanted in it.

Accordingly, we set about studying Bauhin's writings with the aim of reconstructing the circumstances of his discovery of the ileocecal valve.

Initially, we turned to his main work on anatomy, *Theatrum anatomicum* (Frankfurt, 1605),¹ thinking that it might prove helpful. In Book I (Chapter XVII, p. 121), Bauhin writes:² “Were there a constriction in the small intestine, it would constantly suffer from strain. But because of the compression of the abdomen, created by its muscles with the assistance of the diaphragm, both faeces and putrid flatus might fall back from the colon to the ileum when excreta are being expelled (whereas they are [actually] carried from the ileum to the colon) and thereby obstruct the distribution of the chyle, and cause vomiting of faecal matter, rather than exiting through the lower opening. This just what happens the case of a twisted bowel, when the small intestine enters into itself by more than a finger, and, in twisting, produces such constipation that the food does not descend and is expelled not only through the large intestine but also as malodorous liquid faecal matter with vomit. Therefore, at the start of the colon, where it meets the ileum, there is a valve, as we have explained in all our books on anatomy since 1579 to this day: * it is leathery and thick, ** and turned upwards, so that remains of the food are carried not downwards but upwards. This can easily be seen if one pours water into the intestines through the rectum: it will be retained in the colon, and one cannot force either water or flatus [further], and one will see that the water will not pass through [via the intestines], but one will find it, when the intestines are emptied, but now mixed with the bowel contents, softened in the emptying. Likewise, the contents of enemas, as Galen taught, cannot enter the small intestine naturally, although their healing power may extend even further. Thus, Andreas Laurentius [André du Laurens – *authors’ note*] in his most magnificent new work on anatomy describes this in these words: ‘at the start of the colon, we often observe a valve turned downwards and resembling a small door, as Bauhin elegantly described it (one is grateful for the honour of being mentioned), which prevents the reflux of faeces and unwanted liquid into the upper parts [of the intestines]’. *** And Archangelus [Archangelo Piccolomini – *authors’ note*] mentioned three valves in the caecum, which, as in the heart, are turned downwards, and have the effect of preventing anything – be it faecal matter or flatus – from entering the small intestine when the abdomen is compressed strongly. This is demonstrated by water introduced as an enema” (Bauhin 1605).³

This passage shows that Bauhin discovered the valve in 1579. From his other works, we have established that, prior to the publication of *Theatrum anatomicum*, he mentions it in *De corporis humani partibus externis*

(Basel, 1588), *De corporis humani fabrica: libri IIII* (Basel, 1590) and *Anatomica corporis virilis et muliebris historia* (Leiden, 1597). Bauhin’s earliest mention of the valve in print dates from 1586, when he published a Latin translation of *L’hystérotomotokie ou enfantement césarien*,⁴ by the Parisian physician François Rousset (1535–1590), in an appendix to which he includes a number of his own writings, including a short work with a highly detailed description of the circumstances of the discovery of the valve, and of its structure and purpose.

Bauhin writes: “This took place in 1579, when I was studying in Paris and, among other activities, attended a private anatomy lesson given by my well-known compatriot Thoma Coccio [Thomas Koch – *authors’ note*]: during one dissection, I, among other things, studied the structure of the intestines more precisely, fully separated them from the mesentery and, the better to examine their fibres and membranes, washed them with water, which I poured through the jejunum and the rectum in turn. At the same time, I observed that the water poured through the small intestine seeped out from it easily and quickly, but that poured through the rectum did not pass through the large intestine even when the intestine was lightly compressed. I therefore decided to investigate what obstacle lay in its path. Thus, I discovered in the large intestine, where the small intestine ends and the vermiform appendix attaches to what is known as the caecum, i.e. at the start of the colon, a perceptible valve the size of a thumbnail, thick, leathery, and so on. I showed it as something new, not previously described anywhere, to my most erudite tutor, the very well-known professor of medicine Guilielmo Capello [Guillaume Cappel – *authors’ note*].

And so far at our academy, of which I am now in my eighth year as a member, I have mentioned this valve in at least two public dissections, which I led in 1586. After my assistant, Daniele Pynusio, washed the intestines, I, before a high-level audience, subjected them to a visual and tactile examination, pouring water through both the upper and lower section. I measured the length of these bowels (which was 24 of our cubits) and tried to inflate them during the dissection with a bag but even this could not overcome the valve.

I was in doubt as to whether this valve would be found in animal intestines. In that year, specifically on 18 July, I described this in a letter of gratitude to students of medicine. And five days later, I dissected a dog and other parts of other animals, publicly, as before, teaching the method of sections and presented that which I mentioned earlier for those present to see: I found the same valve when dissecting the dog.

Of the many most learned and most erudite spectators at the dissection, Doctor Antonius Boucardus Lotharingus [Antoine Bouchard de Lotharingie – *authors’*

¹ See https://books.google.ru/books?id=ICXSYjR_U64C&printsec=frontcover&hl=ru#v=onepage&q&f=false.

² Here and below, the translations from the Latin are the authors’.

³ *, ** and *** indicate the locations of insertions made in the 1621 edition of the translation.

⁴ See <https://books.google.ru/books?id=eqVb2QcUNHEC&printsec=frontcover&hl=ru#v=onepage&q&f=false>.

note], whose studies and herbaria greatly impress me, took on the task of washing the dog's intestines, filling them with water through both the upper and lower sections and turning them over, and I showed everyone that same valve, which, however, was similar to a ring rather than a human valve. Such was the discovery of the valve and the method of its discovery, which was in fact more protracted, and I write this by no means because of its name, so as to flaunt my being its discoverer, but so that the reader may understand when and how the valve was discovered, since I am aware that some very well-known men deny it and cannot find it even now.

As for the function of this valve, I believe it exists so that excreta carried from the small to the large intestine cannot be flung back. Many people have objected to me that the so-called ileal disease shows the contrary, and have tried thereby to show that this valve does not block the whole path completely. But that which requires evidence an autopsy will resolve. I do not deny the cases of the ileal disease. This disease falls with such violence that this valve not only weakens but also may easily rupture, and then excreta return to the pylorus, something that the ring should by nature have prevented. But I intend, with God's help, to discuss this and similar matters in more detail in my books on anatomy" (Rousset 1586).

The question of priority regarding the discovery made by Bauhin as a student (Kutia et al. 2018) was disputed by his contemporaries. In the second edition of his *Theatrum anatomicum*,⁵ published in 1621, three years before his death, he made some minor amendments to the text and added comments in the margins. The changes are: "<...our books on anatomy> (and we have spoken about this previously, if anyone remembers this):..."; "<...it is leathery and thick>, circular and annular..."; "<...into the upper parts [of the intestines]>, so Varolus [Costanzo Varolio – *authors' note*] called it a covering of the colon, ["operculum ilei" – *authors' note*], while Piccolominius [Archangelo Piccolomini – *authors' note*] referred to valves of the caecum (he wrote that there were three of them)."⁶

Bauhin's comments showing that he made his discovery independently are of great interest: "The existence of this valve has been denied by certain prominent figures, including the Leiden anatomist Pauvius [Pieter Pauw – *authors' note*]; others have suggested that it was first discovered by someone other than me; a third group – such as the members of the renowned Paduan school of anatomy Aquapendens [Hieronymus Fabricius ab Aquapendente – *authors' note*] and Placentius

[Giulio Casserio – *authors' note*] (may what I have written not provoke ill feeling) have tended to give me the credit for its discovery in their anatomical descriptions. Others say that it was discovered by Andernacus [Johann Winter von Andernach – *authors' note*], but I would like to stress that not a word is said about this in his work *Medicine through dialogues*. Riolanus [Jean Riolan the Younger – *authors' note*] said that Varolius described it (very briefly), even before Bauhin was born, as did Salomon Alberti later (I will mention them in brief now, and in more detail later). I admit that I did not know that Varolius discovered [it]; I shall add to this that his works [Anatomiae, sive de resolutione corporis humani – *authors' note*] were provided to me for the first time in around 1591 by Io. Baptista Cortesio [Giovanni Battista Cortesi – *authors' note*], now a professor of medicine in Palermo, Sicily, who printed them, when I had 11 years' experience in anatomy; and I found his description of the valve in them. But this was not before Bauhin was born, when he [Varolio] lived in Bologna, while [Bauhin] went to Padua to study" (Bauhin 1621).

This indicates that in stating that he had read Costanzo Varolio's work, Bauhin recognised that he was not the first person to become aware of the existence of the ileocecal valve. Jean Riolan, whom Bauhin mentions, states in his *Anthropographia* (1608) that Varolio's discovery took place before Bauhin was born, i.e. before 1560, but provides no evidence of this. Bauhin himself errs in stating that Varolio's discovery was made when he (Bauhin) was studying in Padua, which he came to in 1577, since Varolio was no longer alive by then (having died in Rome in 1575).

From our research, we can conclude that Caspar Bauhin discovered the ileocecal valve in 1579 while studying at the University of Paris, when he attended private anatomy lessons given by Thomas Koch. During a dissection, while washing some intestines (pouring water through the jejunum and the rectum in turn), he discovered an obstruction at the junction between the ileum and the caecum. Bauhin described its structure and purpose, as well as the circumstances of the discovery, for the first time in great detail in 1586 in his appendix to François Rousset's *L'hystérotomotokie ou enfantement césarien*. Prior to Bauhin, the valve's existence was known to the Italian anatomist Costanzo Varolio, who called this anatomical structure "a covering of the ileum", but the latter's observations were not published until after his death in his *Anatomiae, sive de resolutione corporis humani* (1591).

In addition, the information we have that at least five anatomists apart from Varolio knew about this anatomical structure prior to Bauhin (Kutia et al. 2018; von Haller 1774; Hyrtl 1880) is a reason for further research into the history of the discovery of the ileocecal valve.

⁵ See https://books.google.ru/books?id=_omyy7Z7WcgC&printsec=frontcover&hl=ru#v=onepage&q&f=false.

⁶ We have marked the locations of these insertions with *, ** and *** respectively in the passage above from 1605 edition of the translation.

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