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The nervous system in colours: the *tabulae pictae* of G.F. d'Acquapendente (ca. 1533–1619)

Section Editor note

The appearance in The Journal of Headache and Pain of this paper on an important document of the history of brain anatomy could seem of marginal interest for a journal devoted to clinical and basic research on headache and pain. On the contrary, the knowledge of the remote development of our understanding of the nervous system can throw light on the development which followed in all the fields of neurologic interest [1–3]. In other terms, and just to give an example, modern neurology, and particularly neurophysiopathology and neuropharmacology, would be simply inconceivable without the notion of the neuron and of the synapses, and, before those, of the macroscopic morphology of the nervous system. To rationally modify the software, in this case a clinical condition such as headache, in the favourable terms we desire, would not be possible without a scientific knowledge of the structure of the hardware, the nervous system, which today we are able to manipulate at a very subtle cellular, or even molecular, level. Therefore, a glimpse into this fascinating moment of the Renaissance in which an outstanding advancement of neurological knowledge took place, documented by a pictorial representation – actually a true brain imaging – of exceptional beauty and scientific value, will not only please our eyes, but will also stimulate our interest in a better understanding of the present through the path of the past.

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Abstract Girolamo Fabrici d'Acquapendente (ca.1533–1619), in his olograph will donated to the Signoria of Venice a rich collection of anatomical paintings, which are today preserved in the Marciana Library. The third volume of these *tabulae pictae*, entitled *De Anatomia Capitis Cerebri Nervorum*, deals with the nervous system and contains the only known illustrations by Fabrici regarding neuroanatomy. Despite the realisation of this splendid collection of 21 coloured paintings,

neither a systematic description nor an iconographic record regarding nervous structures were found to be published by Fabrici. For this reason, a thorough study of these plates is pivotal to a better understanding of the contribution made by d'Acquapendente to the knowledge of the nervous system. Besides their aesthetic quality, Fabrici's *tabulae pictae* appear as a unique document of exceptional scientific value, thanks to the unprecedented realism given to the anatomical structures by the innov-

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ative use of colours. These pictures represent the highest point reached by the 16th-century Paduan Medical School well demonstrating its aim for a sound naturalistic approach.

Keywords Neuroscience anatomy • Anatomy in colour • Fabrici • Renaissance • Padua

Fabrici and his *tabulae pictae*

Born around 1533 in Acquapendente, a village in the countryside of Viterbo, Girolamo Fabrici d'Acquapendente [1] was educated in Padua under the protection of the powerful Venetian family of Lippomano. In the same town he received his medical degree in 1559. He was called to the chair of Surgery, with the “obbligo” (i.e., with the charge of the additional teaching) of Anatomy in 1565. Fabrici retired in 1613 for health reasons, ending a career that lasted almost 50 years. He died six years later, in 1619, and was buried in S. Francesco's church in Padua.

d'Acquapendente was the first one to realise a permanent anatomical theatre (1594), on which others were later modelled [2]; this theatre is still well preserved inside the “Bo”, the ancient palace of Padua University.

His life was devoted to research, teaching and clinical practice. His continuous commitment to research allowed him to write many works; unfortunately some of them – among which are, as we will see further on, those dealing with the nervous system – were never printed and are considered lost.

Apart from the *Pentateuchos Cheirurgicum*, printed in Frankfurt in 1592 without the author's permission, Fabrici's works began to be published only in 1600. To remember just a few of them, in that year *De formato foetu* appeared and *De visione, voce, auditu*; followed in 1602 by *De locutione et eius instrumentis*; and a year later by *De venarum ostioliis* and *De brutorum loquela*. Among his accomplishments, he pioneered modern embryology and precisely described the valves of the veins, giving his pupil William Harvey (1578–1657) a strong anatomical argument to demonstrate the circular movement of the blood [3].

Fabrici planned an ambitious, comprehensive anatomical treatise, encompassing an atlas containing more than

300 hand-painted pictures representing in natural colour both human and animal structures. This *Theatrum totius animalis fabricae*, begun in 1591, and which should include his other publications as well (he refers to this project in *De visione, voce, auditu* [4]), was never completed. The anatomical paintings themselves were considered lost [5]. In 1910, an anatomist with a strong interest in the history of medicine, Giuseppe Sterzi, rediscovered the tables [6]. Curiously, these had always been part of the collection of the Marciana Library, where they were stored following their gift to the Serenissima Repubblica by d'Acquapendente, as we read in his will [7].

In the *Catalogus librorum Bibliothecae Venetae*, edited by Giovanni Sozomeno at the beginning of the 17th century [8], Fabrici's *tabulae pictae* are under the title *Ab Aquapendente Hieronymus Fabricius Volumina VIII Icones ad Anatomiam, seu Zootomiam pertinentes continentia, curante eodem Auctore*. The entire collection of 167 pictures is divided into eight volumes, accordingly to the anatomical subject:

- *De Anatomia Venarum Figure Varie*, “Marciana, Rari 110”
- *De Anatomia Ossium Figure Varie*, “Marciana, Rari 111”
- *De Anatomia Capitis Cerebri Nervorum Figure Varie*, “Marciana, Rari 112”
- *De Anatomia Animalium Figure Varie*, “Marciana, Rari 113”
- *De Partibus externis Figure*, “Marciana, Rari 114”
- *De Anathomia Thoracis et Parcium in Thorace Contentarum*, “Marciana, Rari 115”
- *De Anatomia Musculorum Totius Corporis. Figure varie*, “Marciana, Rari 116”
- *De Anatomia Abdominis et Parcium in Eo Contentarum F.*, “Marciana, Rari 117”.

We find 44 more pictures bound within three volumes, which are also part of the d'Acquapendente's heritage: *De*

locutione et eius instrumentis, De venarum ostiolis and *De larynge voce instrumento*. As a whole, in the Marciana Library there are 211 pictures. About 40 more have been identified elsewhere.

They are painted with oil and tempera, unfortunately on relatively fragile paperboard instead of canvas [9]. The realisation is clearly by different hands, as there are evident differences in style. Some artists have been proposed, among

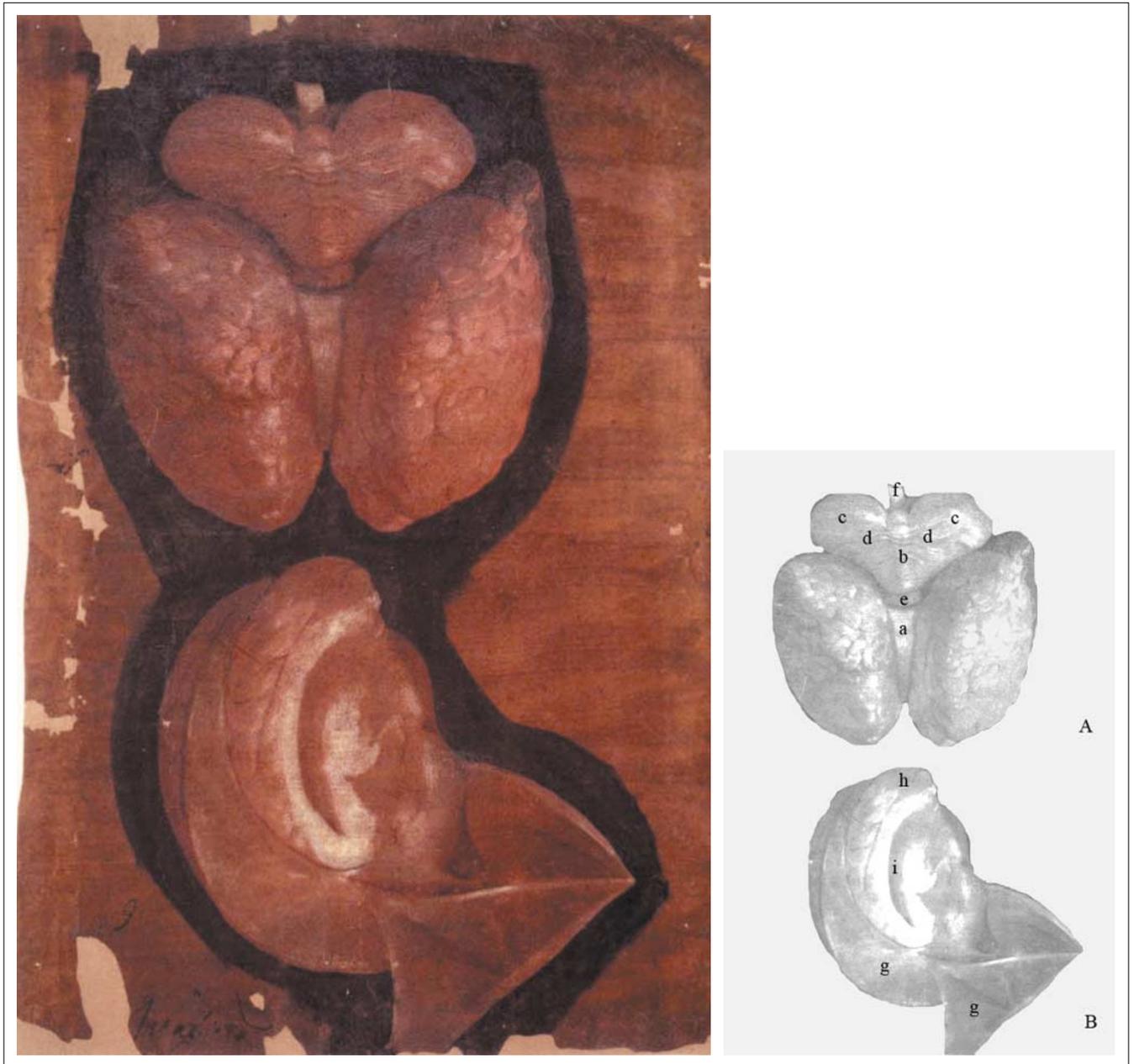


Fig. 1 **A** Dorsal view of the brain with mild opening of the longitudinal cerebral fissure and downward pulling of the cerebellum, in order to show the corpus callosum (a) and the superior surface of the cerebellum, with depiction of the cerebellar vermis (b) and hemispheres (c). Cerebellar folia are clearly delineated. At the level of the superior surface of the cerebellum, a major transverse sulcus (d) seems visible, which could correspond to the fissura prima, separating the anterior and posterior lobes. The dorsal aspect of the rostral mesencephalon (e) and caudal medulla oblongata (f) are also recognizable. Notice that the original painting is faithfully reproduced with its upside-down position of the encephalon. **B** Right view of the brain, sampled together with the dura mater (g), which has been cut from the medial aspect of the frontal lobe (h) to the lateral aspect of the temporo-parietal region and pulled posteriorly. A right sagittal section of the brain has been performed in order to show the right lateral ventricle (i). [Marciana, Rari. Table 112.3. Size 480x286 mm. Courtesy of the S. Marco's Library, Venice]

them the Varotaris, father and son, but this is still an open debate. Girolamo Fabrici d'Acquapendente wanted this as a sort of "reference book" of anatomical coloured preparations, depicted with great naturalism as a support to his

teaching, to be placed alongside the anatomically dissected part or to be used temporarily when this was not available.

At the end of the 16th century, in a period in which the monochrome xylographies of Vesalius remained an

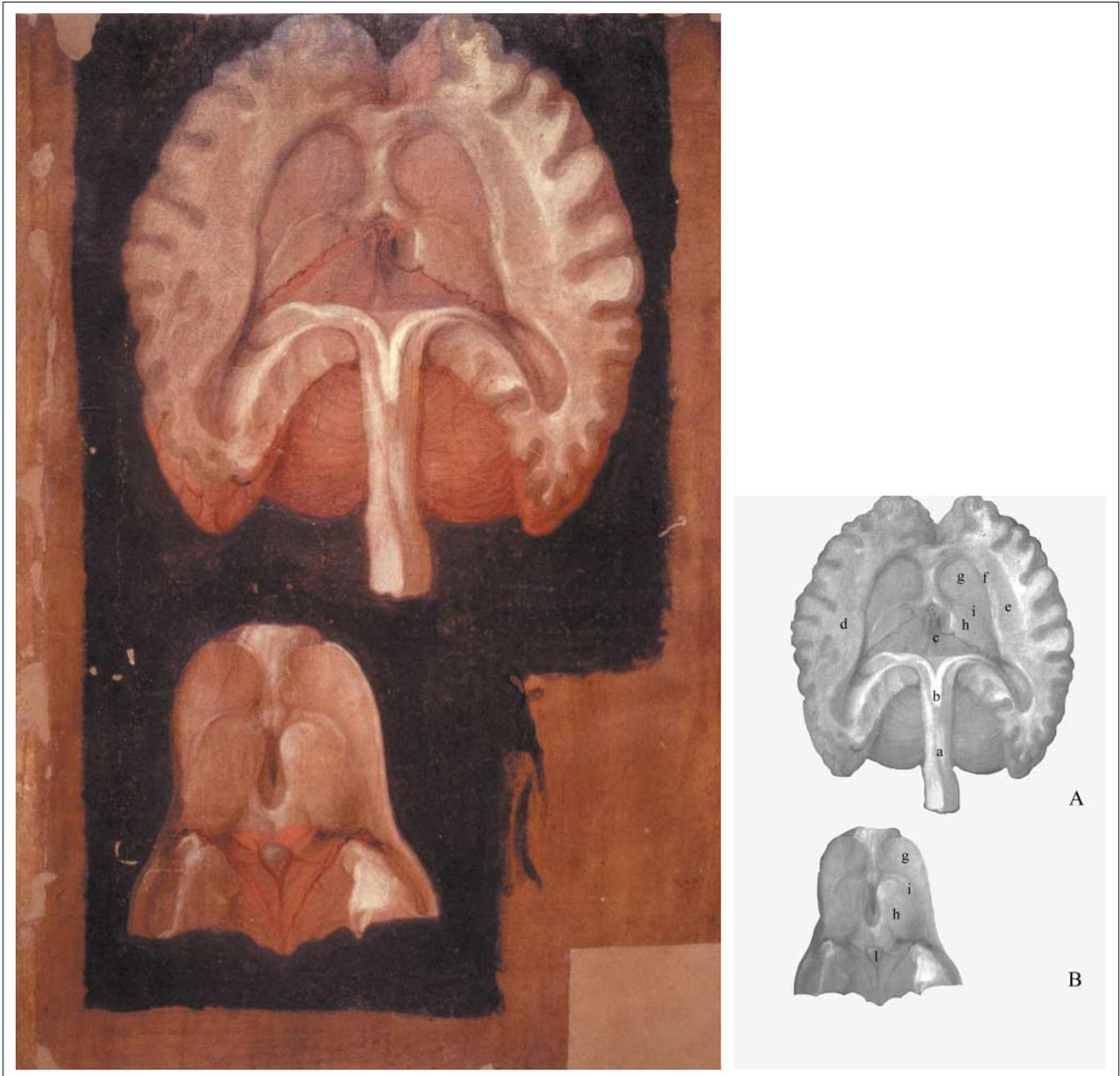


Fig. 2. **A** Further phase of the section represented on the superior part of the table 112.5 [13]. After the section of corpus callosum (**a**), here also the fornix (**b**) has been cut on its anterior aspect and folded dorsally, whereas the tela choroidea (**c**) of the third ventricle has been left on site. On the right, the cerebral hemisphere has been sectioned rostrally and therefore the white matter (**d**) is clearly shown; on the left, a deeper section puts in evidence the nucleus lenticularis (**e**) and the capsula interna (**f**). Clearly visible are the nucleus caudatus (**g**), the thalamus (**h**) and the sulcus terminalis (**i**). This picture is utmostly natural, particularly where it represents the chromatic features of the grey matter and of the white matter and its lucency. **B** A close-up detail of the basal nuclei after the corpus callosum has been completely cut away. The epiphysis can be recognized (**l**). The nucleus caudatus (**g**), the thalamus (**h**) and the sulcus terminalis (**i**) are well represented and their morphology is faithful. [Marciana, Rari. Table 112.8. Size 410x290 mm. Courtesy of the S. Marco's Library, Venice]

example of unsurpassed beauty and naturalism, Fabrici deserves merit for having first established with his collection the outstanding relevance of the use of colour in anatomical images. We believe that this important prece-

dent, realised in the only possible way then available, that is by painting, stimulated the transition, over a few years, to the pioneering attempts to print coloured engravings.

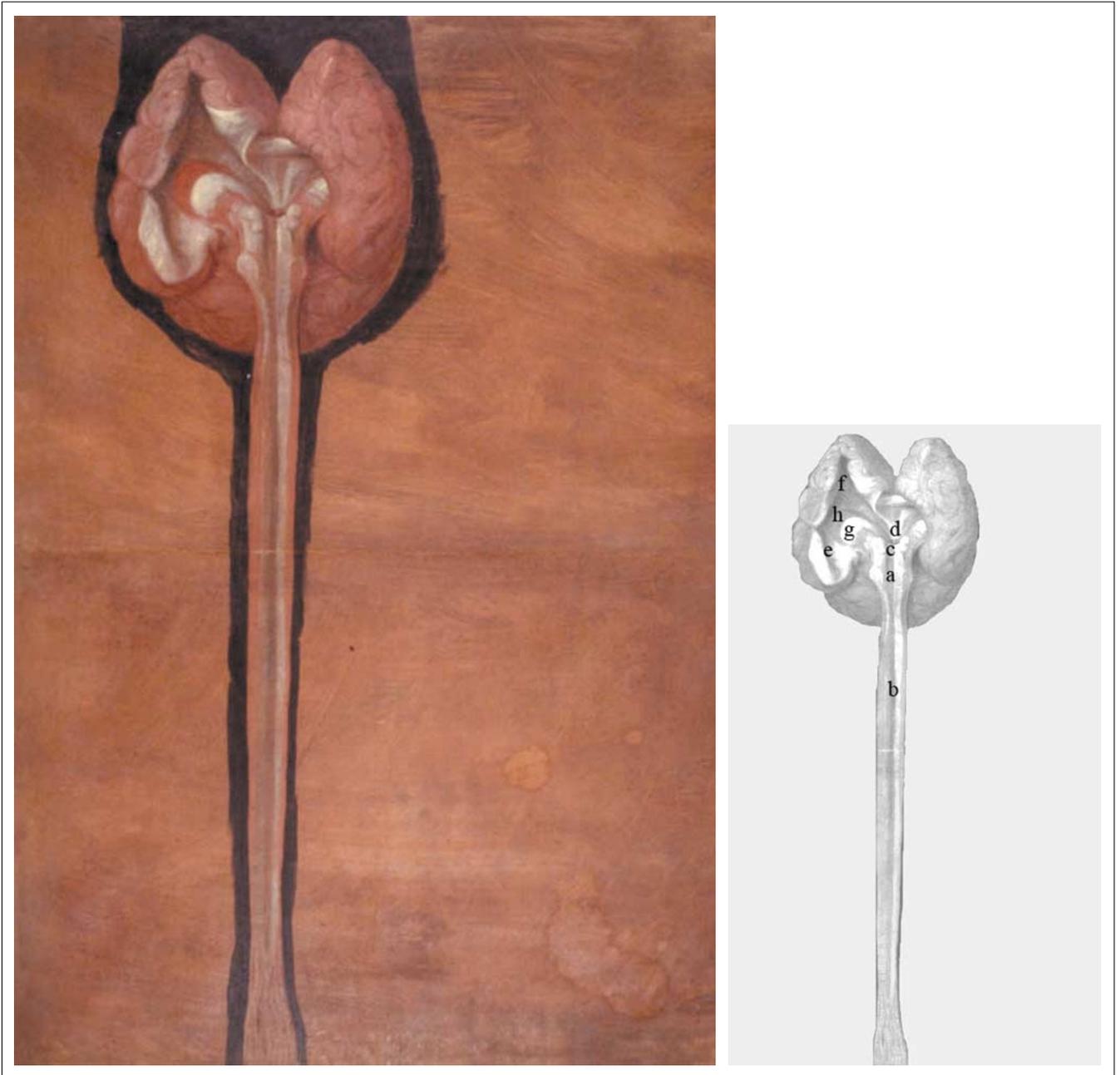


Fig. 3 Demonstration of the cavities of the central nervous system. This preparation is original for its unusual point of view, and really daring. Indeed, in order to obtain a preparation of the whole central nervous system, the removal of the posterior aspect of the spine and of the skull had to be performed. After complete removal of the cerebellum, the fourth ventricle has been opened (**a**), as well, downward, the spinal cord, exhibiting the central channel (**b**). Upward, the posterior aspect of the mesencephalon has been cut, between the left and the right colliculi, to show the aqueduct (**c**). The dissection continues further upward: the floor of the third ventricle (**d**) is made visible after removal of the commissura posterior. On the right of the picture, a T shaped cut demonstrates the temporal (**e**) and the occipital (**f**) horns of the left lateral ventricle. The thalamus (**g**) is well represented together with the plexus choroideus (**h**) in the correspondance of the sulcus terminalis. [Marciana, Rari. Table 112.13. Size 432x580 mm. Courtesy of the S. Marco's Library, Venice]

The first effort in this sense was that of Gaspare Aselli (1581–1626), who in 1627 published the first coloured xylographies, contained in the book *De lactibus sive lacteis venis* [10], where the discovery of lymphatics is reported. Current colour printing, however, would become possible only centuries later.

The *tabulae pictae* on the nervous system

The third volume of the *tabulae pictae*, entitled *De Anatomia Capitis Cerebri Nervorum Figure Variæ*, deals with the nervous system and contains the only known illustrations by Fabrici regarding neuroanatomy. It consists of 21 tables (“Marciana, Rari 112, 1–21”) representing the meninges, the brain, the spinal cord, the cranial nerves, the spinal plexuses and the nerves of the limbs with their blood vessels and muscles.

Despite the realisation of this splendid collection of 21 coloured paintings, neither a systematic description nor an iconographic record regarding nervous structures were found to be published by Fabrici. According to our research [11], the only works in which d’Acquapendente refers to the nervous system are the *Pentateuchum Chirurgicum* [12] and the *Operationes chirurgicae*, where he deals with clinical problems, head injuries and brain surgery respectively; and the treatise *De visione voce auditu*, in which the author limits his description to the nerves of the visual, phonatory and auditory apparatus; within its engravings, we find just the representation of the terminal portion of optic and oculomotor nerves, along with laryngeal nerves.

However, that Fabrici had composed neurological works is demonstrated by two lists of manuscripts, contained in the testament of 1615 and in a letter of 1622 written by the *Rettori* to the *Riformatori dello Studio di Padova* respectively. In the first list, three manuscripts that deal with neurological subjects are cited: *De Capitis facultatibus, earumdemque actionibus, et proprio ac praecipuo actionum organo*; *De communibus Instrumentis, ut*

puta Venis, Arteriis, et Nervis in totum corpus discurrentibus; and *De instrumento Odoratus*. In the last one, five are cited: *De Cerebro, et Anatomia Cerebri*; *De fantasia*; *De Intellectu*; *De memoria*; and *De nervis*. But, until now, these works have to be considered lost.

For this reason, a thorough study of these *tabulae pictae* is pivotal to better understanding the contribution made by d’Acquapendente to the knowledge of the nervous system.

This work was realised by Fabrici as a document of high scientific value and of notable practical use: however, it should be noted that, until now, compared to aesthetic evaluations, paradoxically, neither descriptions of the morphological aspects nor analysis of the research contents of the *tabulae pictae* have ever been carried out. We already proposed, elsewhere [13], a detailed analysis of the anatomical structures of four tables of this neurologic collection (112–1; 112–2; 112–5; 112–10 of the volume *De Anatomia Capitis Cerebri Nervorum Figure Variæ*). Here we present a further three tables (Figs. 1–3). A conclusive report on the entire neurological series is being completed.

Besides their aesthetic quality, Fabrici’s *tabulae pictae* appear as a unique document of exceptional scientific value, which will remain unsurpassed for centuries. Some representations of the topographical relationship between different parts of the nervous system are truly on the cutting edge, even today. Furthermore, thanks to the unprecedented realism given to the anatomical structures by the innovative use of colours, these pictures represent the highest iconographic achievement attained by the 16th-century Paduan Medical School, well demonstrating its aim for a sound naturalistic approach.

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