Alexander Monro

Alexander Monro of Craiglockhart and Cockburn FRSE FRCPE (22 May 1733 – 2 October 1817) was a Scottish anatomist, physician and medical educator. To distinguish him as the second of three generations of physicians of the same name, he is known as secundus.

He was educated first at James Mundell's private school, Edinburgh, and then at the University of Edinburgh. His name appears in his father's account book for his anatomy class in 1744, when he was only eleven years of age. In the following year he matriculated in the Faculty of Arts and studied Latin, Greek, philosophy, mathematics, physics, and history. Like the majority of arts students in the university at that time, he did not graduate, individual professors' certificates being then more highly valued than the official diploma. In 1750 he began the serious study of medicine under Andre Plummer (died 1756) (chemistry), Charles Alston (1683-1760) (botany), John Rutherford (1695-1779) (practice of physic), Robert Whytt (1714-1766), (institutes of medicine), and Robert Smith (midwifery).

He applied some of the principles of physics to the intracranial contents and for the first time hypothesized that the blood circulating in the cranium was of constant volume at all times. This hypothesis was supported by experiments by Kellie. In its original form, the hypothesis had shortcomings that prompted modification by others. What finally came to be known as the Monro-Kellie hypothesis, is that the sum of volumes of brain, CSF, and intracranial blood is constant. An increase in one should cause a decrease in one or both of the remaining two. This hypothesis has substantial theoretical implications in increased intracranial pressure and in decreased CSF volume.

In 1783, Alexander Monro published in Edinburgh 'Observations on the Structure and Functions of the Nervous System,' dedicated to the Right Hon ¹⁾ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5545466/

He described definitively (1783) the interventricular foramen between the lateral ventricles of the brain (known as Monro's foramen; the passage between the lateral and third cavities of the brain)

The opening now always spoken of as the 'foramen of Monro' is very small in the healthy brain, but when abnormal accumulation of CSF on the brain is present (known as hydrocephalus) may be as large as a sixpence. It was this morbid condition that drew Monro's attention to the foramen, and he first described it in a paper read before the Philosophical Society of Edinburgh in 1764, but gives a



fuller account in this work on the nervous system.

A further important observation in this paper was that the healthy cranial cavity is rigid and of constant volume and, he argued, that since the brain 'is nearly incompressible, the quantity of blood within the head must remain the same.' This was taken up by his former student George Kellie who set out the hypothesis that the contents of the skull (blood, CSF, and brain tissue) are a state of volume equilibrium, so that any increase in volume of one of the cranial constituents must be compensated by a decrease in volume of another.

This has since been validated and is known as the Monro-Kellie doctrine.

Monro secundus was a kindly man in family and social life but perhaps overjealous of his professional reputation. He used his powerful influence, for instance, to prevent until almost the end of his teaching career the establishment of a separate chair of surgery, a clear necessity as Monro, although officially professor of anatomy and surgery, was not himself a practicing surgeon.

Publications

Monro A. Description of a Human Male Monster, with Remarks: From the Transactions of the Royal Society of Edinburgh. Med Facts Obs. 1797;7:170-190. PubMed PMID: 29106240; PubMed Central PMCID: PMC5111157²⁾.

Monro A Junior. Three Cases of Hydrocephalus Chronicus; with Some Remarks on That Disease. Ann Med (Edinb). 1804;3:364-387. PubMed PMID: 30299819; PubMed Central PMCID: PMC5112376 ³⁾

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5112376/pdf/annmededinb75124-0380.pdf

1)

Observations on the Structure and Functions of the Nervous System, Illustrated with Tables $^{\scriptscriptstyle 2)}$

Monro A. Description of a Human Male Monster, with Remarks: From the Transactions of the Royal Society of Edinburgh. Med Facts Obs. 1797;7:170-190. PubMed PMID: 29106240; PubMed Central PMCID: PMC5111157.

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