

A PORTAL CIRCULATION FROM THE PITUITARY TO THE HYPOTHALAMIC REGION

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THIS communication is of the nature of a preliminary note upon a peculiar and important arrangement of the vessels connecting the pituitary gland to the hypothalamus.

We have observed in the stalk (S) of the human pituitary a system of vessels arranged after the manner of a portal system, which we propose to call the hypophyseal-portal veins (1).

Although we have not been able to demonstrate the presence of any muscular tissue in the walls of these vessels, we refer to them as veins because they carry the blood away from the blood vessels distributed to the pituitary.*

Inferiorly, these vessels collect blood from the pars anterior (A), pars intermedia (I), pars tuberalis and pars posterior (P) of the pituitary. Then they ascend in the stalk (S) as parallel veins (1), which after a short course acquire thick neuroglial sheaths (14). Sometimes one glial sleeve contains several such vessels. There is no surrounding capillary net served by the vessels while they are thus ensheathed, and the tissues of the stalk between the glial cylinders appear to be without blood vessels of any sort.

Superiorly, beneath the infundibular recess of the third ventricle (III) these vessels of the portal system lose their heavy neuroglial wrapping and open out into a network of very fine channels (15). This may be called the secondary distributing net. Long processes from the ependymal cells lining the ventricle contribute to the supporting tissue of these fine vessels. This secondary net is not haphazard in its distribution in the hypothalamic region. Its connection with certain nuclear groups is at present under investigation.

The voluminous blood content of the anterior lobe of the human pituitary is brought to it by arteries (3), one on either side (in some cases more than one) springing from the internal carotid (2). As this bilateral arterial supply approaches the gland the two arteries approximate and supply the posterior lobe. Then each passes in between the glandular and nervous portions. It penetrates into the substance of the anterior lobe on its own side, carrying with it an appreciable amount of connective tissue, and then gives out its blood in all directions to the sinusoids (13).

* Since this paper was written examples of portal vessels with plain muscle in their walls have been found.

In addition to this bilateral supply from the carotids there are some fine arteries from the circle of Willis which pass along the outside of the stalk and open into the sinusoids of the pars tuberalis. There are some small venous channels corresponding to these arteries.

From the sinusoids of the pars anterior and pars intermedia some blood is returned on either side towards the place of entry of the main arterial stem, and venous channels are formed which drain out by a vein (10) following the course of the entering artery and opening into the cavernous sinus.

The whole of the blood, however, is not taken away by these bilateral venous channels (10) and the small veins of the pars tuberalis mentioned above—as has been stated already, sinusoids of the pars anterior (13), pars intermedia and pars tuberalis help in feeding the portal vessels of the stalk and so deliver blood to the secondary distribution net in the hypothalamus.

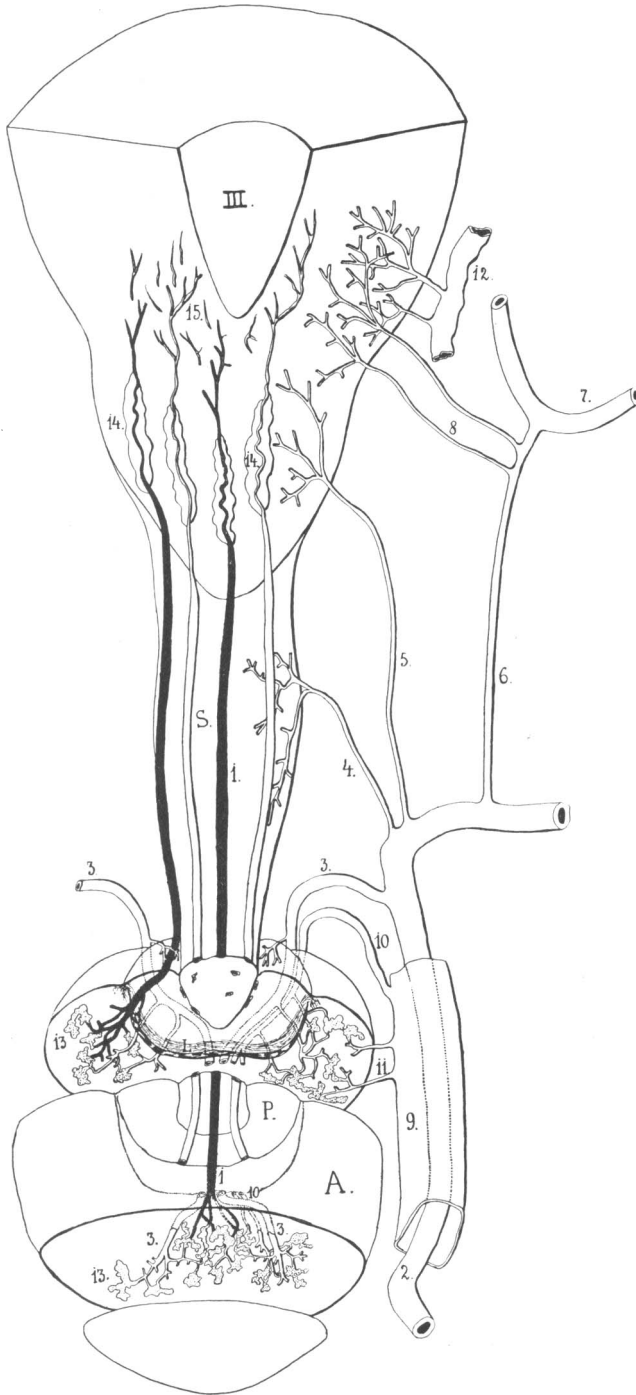
The blood which is sent into the posterior lobe by branches from the bilateral arterial supply for the glandular portion, is conveyed away in part by the hypophyseal-portal vessels (1) and in part by the systemic veins (10) following the course of the arterial branches. The accompanying table summarises the results of our observations to date upon the pituitary circulation.

Part of pituitary	Arterial supply	Systemic venous return	Portal system return
Pars anterior and pars intermedia	From carotids: a bilateral supply, usually one on each side, sometimes more than one	Systemic veins to cavernous sinus following the course of the bilateral arteries	Contribute blood to portal vessels
Pars tuberalis	From circle of Willis by small branches around the outside of the stalk	Small systemic veins corresponding to the arteries	Contributes blood to the portal vessels
Pars posterior	By branches from the bilateral supply from the carotids	By small systemic venous branches following the course of the arterial twigs	Contributes blood to the portal vessels by fine channels opening into them below their heavy glial sleeves

Colloid material is found in association with the vessels of this portal system. Sometimes it is found within the vessels (1) and sometimes in the perivascular sleeves (14). It can also be detected among the cells of certain hypothalamic nuclei. The staining reaction of the colloid varies at different levels of the same section; i.e. in the glandular portion it is different in colour from that in the hypothalamic region. These contrasts are being investigated. In the matter of colloid distribution in the hypothalamus our observations so far are confirmatory of those of Remy Collin (see *Archives de Morphologie*, 1928, No. 28). As they pass upward in the stalk the vessels of this portal system do not appear to have plain muscle in their walls,* but their lumina appear to be actively and precisely controlled.

In some hypophyses the contraction is so extreme that there are no patent

* See footnote, page 88.



- (1) Hypophyseal-portal vessel
- (2) Carotid artery
- (3) Hypophyseal artery
- (4) Small artery for pars tuberalis
- (5) Small artery for tuber cinereum
- (6) Posterior communicating artery
- (7) Posterior cerebral artery
- (8) Small arteries for infundibulum
- (9) Cavernous sinus
- (10) Hypophyseal vein
- (11) Small hypophyseal veins
- (12) Basal vein
- (13) Sinusoids
- (14) Heavy glial sheaths of the hypophyseal-portal veins
- (15) Secondary distribution net
- (A) Pars anterior of pituitary
- (P) Pars posterior of pituitary
- (I) Pars intermedia of pituitary
- (S) Stalk

lumina. In these cases the tissue mass of the posterior lobe and stalk appears almost avascular.

Sometimes it happens that the lowest parts of these channels are widely open, where they communicate with the sinusoids, while the upper parts are constricted to a thread or absolutely closed.

In other hypophyses the hypophyseo-portal vessels are seen through their course as leashes of dilated and engorged channels which spread out superiorly into the very much finer secondary distribution net.

Work is in progress to discover how the lumina of the vessels is regulated.

Our observations indicate that the secondary distribution net is richer beneath the infundibular recess anteriorly than it is posteriorly.

A full statement of the details of our observations, with accompanying microphotographs, is being prepared.

We hope before our next publication to be able to reproduce experimentally the various conditions of the lumina of the portal vessels described above.

The observations here recorded are the result of dissection and the study of serial sections.