A REPORT ON THE CIRCULATION OF THE LOBAR GANGLIA

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649317691

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Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

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H. F. AITKEN

MADE TO DR. JAMES B. AYER

The Fort Hill Press
BOSTON, MASS.
1909

SUPPLEMENT TO
THE BOSTON MEDICAL AND SURGICAL JOURNAL
VOLUME CLX, NO. 18, MAY 6, 1909.

A REPORT ON THE CIRCULATION OF THE LOBAR GANGLIA. MADE TO DR. JAMES B. AYER.

IT is a matter of importance that the anatomy of the circulation of the danger spot of the brain should be thoroughly understood. Owing to the barren description given in the text-books, Mr. H. F. Aitken, artist at Massachusetts General Hospital, has, with the facilities of the Massachusetts General Hospital Pathological Laboratory, made fresh dissections and drawings of the region.

In 1874, H. Duret, a pupil in the Salpêtrière, did the anatomical work for Charcot and has been referred to since that time by all anatomists as authority upon cerebral circulation.

He stated in *Recherches Anatomiques sur la Circulation de l'Encéphale* (*Archives de Physiologie Normale et Pathologique*, 1874, p. 60): "We have often noted the insufficiency of the actual knowledge of cerebral circulation of certain lesions of the brain, particularly of hemorrhage and softening. . . . The anatomists who have gone before us have been content to describe the origin and distribution of the brain in a general manner, . . . and they have not been able to foresee the interest which the detailed study of the vascularization of the organs of the brain, of the striate body, of the optic thalamus, of the circumvolutions, and of the two substances will have."

It would be difficult to find greater encouragement for this work.

It is the clinical anatomy connected with old age which is the incentive of our study.

The apt-to-be-neglected care of the old is the proper study and specialty, so to speak, of the practitioner. One feels that it is imperative to understand numbness, fatigue, tremors, all degrees of unconsciousness, and all forms of cerebral softening, if one adds cerebral arteriosclerosis to the study of old-age conditions, understanding that in many cases old age is renal, cardiac, cerebral, arteriosclerosis.

We must build up on the "detailed study" of the cerebral anatomy, as Duret has said, in order to understand old age, using this knowledge as the foundation before studying the physiology of the circulation, or of the pathology or of the walls of the vessels.

Mr. Aitken's report follows:

Dr. Ayer, —[1] The system of the circulation of the lobar ganglia as taught to-day is the description presented by M. Duret in 1872, 1873, and 1874, and it apparently has never been corroborated by any investigator since.

In 1872, Dr. Heubner, of the University of Leipzig, published a short account which M. Charcot [2] wrongly stated was in all essential points identical with M. Duret's.

Dr. Heubner's findings will be indorsed in the present report, which is at variance with M. Duret's,[3] a condensation of which follows.

[4] The base of the a. cerebri anterior gives off branches to the nucleus caudatus. *These branches are not constant, for the nucleus caudatus may receive arterial blood from the ventricular arteries* and also from the a. cerebri media. They are distributed in two ways. Springing from the *origin* of the a. cerebri anterior they *almost immediately* penetrate the brain within the trygonum olfactorium and perforate the vault of the corpus callosum and go into the head of the nucleus caudatus. They divide into five or six branches *which are nearly subependymal; they do not go beyond the first 2 cm. of the nucleus caudatus.* In other cases one sees the a. cerebri anterior give *origin to one or two arterioles which pursue a long retrograde course from 3 to 4 cm. in order to reach the most internal part of the substantia perforata anterior, and they supply exclusively the nucleus caudatus.*

Often the a. cerebri anterior gives no branches to the nucleus caudatus.

The a. cerebri media from 1 to 1½ cm. from its origin gives out from its upper border the arteries of the corpus striatum. The external are voluminous, the internal ones smaller; among the first there is one which skirts along the base of the putamen near the surface in order to reach the nucleus caudatus, where it divides into four or five terminal branches. *It is this artery which*, after our studies at the Salpêtrière, and after the teachings of M. Charcot, we designate as *the seat of hemorrhages of the corpus striatum.*

This arteriole furnishes many collateral branches to the putamen. There are also two or three external branches. Some are carried forward in the putamen and often reach the ends of the nucleus caudatus. One can class this group of arteries under the name of the "lenticulo-striate arteries." Others come behind at the posterior end of the putamen *and end in the thalamus and are classed as "lenticulo-optic arteries."*

The internal arteries coming to the point of the globus pallidus are "lenticular arteries.'" It is necessary, also, to understand in the groups of internal arterioles the branches furnished to the nucleus caudatus by the a. cerebri anterior *when they exist.*

The lenticulo-optic arteries arising from the a. cerebri media direct themselves backward and traverse the putamen, *then the capsula interna, and distribute themselves at the anterior part of the thalamus.*

[1] Part of the findings given in this report were printed in the *Boston Medical and Surgical Journal*, June 13, 1907, and all of the important findings were communicated by Dr. James B. Ayer to the Boston Society of Psychiatry and Neurology on January 22, 1909, and many of our findings have been corroborated by the late Dr. C. E. Beevor. See "Textbook of Nervous Diseases and Psychiatry," Charles L. Dana, M.D., etc. Seventh edition, 1908, pp. 405-6.

[2] In Localisation of Cerebral and Spinal Disease. New Sydenham Society, London, 1883.

[3] H. Duret: Recherches Anatomiques sur la Circulation de l'Encéphale. Archives de Physiologie Normale et Pathologique, bl., 1874, p. 70.

[4] The portions of M. Duret's description which are unconfirmed in this report are printed in italics.

Dr. Heubner's report,[5] condensed, is as follows:

From the basal region proceed numerous small arteries, 1½ to ½ mm. in diameter, from the main branches, and sink themselves, after a short course ½ to 1½ cm. long, into their proper districts.

These vessels have no anastomoses with each other, but they are genuine end-arteries, in Cohnheim's sense. From the base of the a. cerebri anterior, which lies between the a. cerebri media and the a. communicans anterior, there proceeds quite near the latter *constantly* a small artery which provides blood to the head of the corpus striatum.

From the first centimeter of the a. cerebri media there go little vessels which care for the front leg of the capsula interna and the globus pallidus.[6]

From the first 2 cm. of the a. cerebri media proceed those little arteries which care for the putamen and the middle part of the nucleus caudatus and the capsula externa.

From the a. communicans posterior there is an artery to the front of the thalamus.

The a. chorioidea supplies the posterior leg of the capsula interna and the front part of the thalamus.

From the first 2 cm. of the a. cerebri posterior go those little vessels which care for the back half of the thalamus.

[5] The Topography of the Nutritive Area of the Single Brain Arteries. In the Centralblatt für die Medizinischen Wissenschaften, Leipzig, December 7, 1872, pp. 817–821.

[6] These vessels from the base of the a. cerebri anterior to the globus pallidus I have found to be a variation, occurring in less than 10% of the brains dissected, while one was found in 90% of the dissections to originate from the base of the a. cerebri anterior.

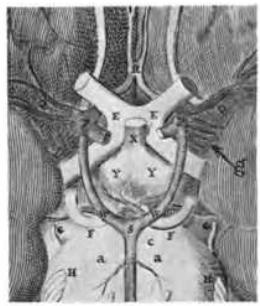

FIG. 1.

Shows an early illustration of the circle of Willis (Willis Opera, Amsterdam, 1682). It is probably safe to say that Willis was the first to picture even so much of these arteries to the lobar ganglia which are shown (point φ) arising on the a. carotis interna between the origins of the a. cerebri media and a. communicans posterior.