NOTES ON THE COLLATERAL CEREBRAL CIRCULATION
AS DEMONSTRATED BY CAROTID ANGIOGRAPHY

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When Moniz in 1926 introduced cerebral angiography as a new diagnostic method, it was a contribution of no less value than the cerebral pneumography introduced by Dandy 8 years previously. For the detection of intracranial disorders, and especially for the diagnosis of intracranial neoplasms, these two radiological methods are indispensable to the neurosurgeons of today.

For the full appreciation of carotid angiography, and for the understanding of its diagnostic possibilities and limitations, a fundamental knowledge concerning the carotid circulation under normal and pathological conditions is necessary. A few remarks referring to this point may therefore be appropriate.

While a contrast medium injected into the carotid artery of a corpse readily proceeds to the contralateral hemisphere, as shown by Moniz, this is normally not so in a living person. Under normal circumstances the blood stream through the internal carotid artery on each side proceeds to the homolateral hemisphere, and, if at all, only to a slight degree intermingles with the blood flow from the internal carotid artery on the opposite side.

Partial or total obliteration of the internal carotid artery on one side, with consequent partial or total circulatory arrest, demands a compensatory supply of arterial blood from the patent internal carotid artery in order to prevent symptoms due to cerebral anaemia.

In cases of insufficiency of the communicating arteries many neurosurgeons have seen the development of disastrous clinical conditions, such as hemiplegia or even death, following ligation of the internal carotid artery. Valuable prognostic information in cases of contemplated ligation of the internal carotid artery may be obtained by carotid angiography, which readily discloses to what extent one hemisphere may be supplied by arterial blood from the carotid on the opposite side.

We shall attempt to demonstrate the collateral circulation which is called into activity in cases of obliteration of the internal carotid artery (1) at its beginning near the bifurcation of the common carotid artery; (2) at the point where the internal carotid artery bifurcates into the anterior and middle cerebral arteries; and (3) in cases of hypoplasia of the internal carotid artery. Possible secondary collaterals which may develop in cases of long-standing obliteration of the internal carotid artery will also be discussed.

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FIGS. 1 and 2. Case 1. The needle for percutaneous angiography is seen in the left common carotid artery immediately below its bifurcation. Perabrodil has entered the external carotid. The occlusion of the internal carotid is just above the point of bifurcation. There is considerable retrograde filling with perabrodil, probably because it was injected under a pressure higher than arterial pressure and faster than it could be carried away by the arterial blood stream.

FIGS. 3 and 4. Case 1. Right carotid angiography. There is satisfactory filling with perabrodil of the branches of both anterior and middle cerebral vessels. The AP view shows that these vessels on the left side are supplied by blood also from the right internal carotid.