The Occipital-Vertebral Anastomosis

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The presence and significance of collateral circulation between the various branches of the intracranial circulation and branches of the intracranial and extracranial circulation have been described in the literature. With the current interest and emphasis in the medical and surgical treatment of cerebrovascular disease and with improvements in diagnostic procedures, a clearer demonstration of these collateral channels is now more frequently sought and recognized.

Most of these potential collateral channels become obvious only when occlusive vascular disease interrupts the normal pathways, and the channels dilate to form alternate routes for the passage of blood to vital areas. A temporary differential in the hydrodynamics of two opposing systems may also reverse the flow of blood and demonstrate these channels.

For a better understanding of vascular disease as a whole, these potential sites must be known and their presence recognized. The ophthalmic anastomosis frequently is seen and recognized in cerebral angiograms, whereas the less frequent occipital-vertebral anastomosis has not received appropriate emphasis and its role in the collateral circulation has not been fully appreciated.

During carotid angiography on the right side, medium passing retrogradely down the carotid artery not infrequently enters the vertebral artery. This may result from a technically poor injection, when the tip of the needle may elevate the intima and partially obstruct the lumen of the vessel, or when occlusive disease is present in the carotid artery distal to the site of puncture. The pathway of the contrast medium in such cases is down the right carotid artery to the innominate artery, where it is then swept into the subclavian artery and into the vertebral artery. In the past this was, in fact, the basis for techniques of indirect vertebral angiography in which the right carotid artery was compressed distal to the site of the puncture during angiography. Similarly retrograde carotid catheterization may also be used to demonstrate the vertebral artery and its branches.

When filling of the vertebral artery occurs during the injection of contrast medium into the carotid artery or vice versa, the occipital-vertebral anastomosis may be demonstrated by including the cervical course of the vertebral artery in the film. Absence of contrast medium in the proximal portion of the common carotid artery and vertebral artery will be recognized readily, excluding this as the possible course of flow (Figs. 1–4).

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Fig. 1. Vertebral angiogram. Note filling of both vertebral arteries and filling of branches of external carotid artery via the occipital anastomosis. Marked narrowing at the origin of internal and external carotid arteries was present on the side of anastomotic filling of branches of external carotid artery.
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Fro. 3. Towne's projection of vertebral angiogram (Fig. 2). Note filling of occipital branch of external carotid artery.

In a review by the author of 1,000 consecutive cerebral angiograms this anastomosis was seen 8 times.

In 2 of these patients, stenotic disease was present in the cervical course of the vertebral arteries and the contrast medium passed from the external carotid artery to the basilar artery via this vertebral anastomosis.

A third patient suffering from a ruptured aneurysm of the posterior communicating artery was treated by ligation of the common carotid artery. A postoperative angiogram was attempted above the occluded vessel and contrast medium introduced directly into the external carotid artery filled the aneurysm via the anastomosis from the occipital artery (Fig. 5a, b, c, d). The direction of flow was from the occipital branches of the external carotid artery to the vertebral artery to the basilar artery to the posterior communicating artery to the posterior communicating aneurysm. The anterior and middle cerebral arteries also filled from this injection.

In the fourth patient stenotic disease was present at the origin of the external and internal carotid arteries and a vertebral angiogram performed via a subclavian puncture resulted in filling of the branches of the external carotid artery via the muscular branches of the vertebral artery to the occipital vessels (Fig. 1).

No vascular disease was present in the other 4 cases. In one of these, a catheter introduced into the common carotid artery inadvertently entered the occipital artery; the contrast medium introduced directly into the occipital artery flooded this vessel and filled the vertebral circulation. In another, the occipital

Fro. 2. Vertebral angiogram with filling of branches of external carotid artery via the occipital vertebral anastomosis. Note also filling of both posterior communicating arteries and branches of anterior and middle cerebral arteries.

Fig. 4. External carotid angiogram. The needle is in external carotid artery. Note filling of this vessel and its branches (4), (2), and (3). The basilar artery and its branches (1) have filled via the occipital anastomosis (8).