BRACHIAL CEREBRAL ANGIOGRAPHY

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Initial efforts to opacify the vascular network of intracranial regions irrigated by the carotid arteries relied upon operative exposure and cannulization of the carotid artery in the neck. It was not long before percutaneous injections of cervical carotid arteries were described. Certain fairly standard methods were then developed to obtain optimum opacification of the vessels. Today, percutaneous techniques for carotid puncture are in more or less general use. Satisfactory injection of the small-caliber vertebral artery has remained a difficult problem, and various percutaneous\(^{17,19}\) and other\(^{20}\) approaches to this vessel in current use at different clinics are still regarded with reluctance by many physicians (vide infra).

Little doubt has been expressed in regard to the desirability of complete contrast-study assessment of the intracranial circulation for patients with intracranial aneurysmal bleeding\(^{2,22}\). There is now hope that early diagnosis by angiography, and alert use of neurosurgery may lower drastically the mortality rates in another type of cerebral bleeding—the elderly patient with massive brain hemorrhage.\(^7\) The value of angiography in patients with cerebral tumor and craniocerebral injuries has been well proved. It now seems probable that occlusive disease of the cervical carotid artery is one of the most common and important lesions triggering cerebrovascular accidents.\(^{18}\) Major arterial trunks in the apex of the thorax also have been implicated in the genesis of cerebral ischemic syndromes,\(^5\) and surgical repair of arterial occlusive disease in both sites has been accomplished successfully. A natural consequence has been that the number of procedures necessary to visualize the arterial structures under suspicion multiplied steadily to provide necessary information.

It would now appear to be mandatory to determine the state of health of all arterial trunks supplying blood to the cerebrum during investigation of the patient with signs or symptoms of cerebral ischemia suspected to be caused by cerebrovascular disease. Studies of Gurdjian\(^{12}\) and Fields,\(^5\) and their co-workers have indicated the frequency of segmental arterial occlusion not only at the carotid bifurcation but in the more proximal arteries. Kuhn\(^{14,15}\) has stressed the extreme difficulties encountered frequently in establishing a correct anatomic diagnosis in these patients by clinical examination alone. In view of the demonstrated nonspecificity of clinical diagnosis, and the diagnostic value of cerebral angiography, it is remarkable that a recent detailed discussion of differential diagnosis in strokes devoted only four sentences to this technique.\(^{196}\)
In patients with cerebral "insufficiency," and in others to be discussed (vide infra), the trend in cerebral angiography is strongly in the direction of total survey of the cerebral vascular tree from its thoracic roots to its final intracranial and cervical emptying phases. In order to attain this end in a patient with cerebrovascular dysfunction, each cervical carotid must be punctured percutaneously and the vertebral artery either exposed and cannulated or injected percutaneously, usually under general anesthesia. In addition, for information in regard to origins of the vertebral or carotid arteries, the subclavian trunk must be needled through a supraclavicular approach. It is therefore probable that many patients will require as many as five separate percutaneous punctures and five injections of contrast material. Entirely aside from the time-consuming aspects and large amounts of contrast material used in this clinically extensive program, certain serious disadvantages attend these multiple insertions of the needle.

The method of brachial angiography is offered as a partial answer to the present need for complete cerebral angiography. It fulfills many of the criteria listed above. The technique requires little time, seldom more than is usually required for percutaneous carotid puncture in the hands of a practiced arteriographer.

No trauma is inflicted on cervical soft tissues. Bleeding does not occur in or around the carotid sheath or important anatomic structures nearby. Crucial arterial trunks, themselves frequently suspected to be diseased, are not damaged.

Dependable, artifact-free filling of vessels with contrast material is obtained regularly.

Following one retrograde injection of the brachial artery, two thirds of the total cerebral circulation becomes opacified sequentially. An extensive detailed picture of the right upper thoracic-cervical-cerebral arterial system results. The great vessels at the base of the neck, the right common carotid and the right vertebral arteries fill with contrast material. As these arterial trunks empty in physiologic fashion, the bolus of dye can be followed in its passage through cervical and intracranial portions of the internal carotid and vertebral arteries.

Information is obtained in regard to time of cerebral circulation and collateral blood flow that is difficult to obtain with other methods.

The technique allows leisurely, accurate positioning of the patient. Little operative trauma is produced. The patient experiences no discomfort except for the transient pain that customarily attends all injections of dye. The short incision and brief cannulization of the brachial artery result in no clinical sequelae. Observing certain simple precautions, cerebral angiography using this method has not produced morbidity or mortality in a series of over 200 adults and children for whom it has been employed.

TECHNIQUE

Adult patients are brought to the special study room in the radiology department under fairly heavy sedation. If the angiography is not an emergency, 100 mg.