RETROGRADE CAROTID CATHETERIZATION FOR ARTERIOGRAPHY

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The increasing number of articles in the medical literature on cerebrovascular disease and its treatment reflects the interest of neurosurgeons and vascular surgeons in this problem. 

It is apparent, however, from the methods of arteriography described, that an entirely satisfactory method of visualizing the cerebrovascular circulation and origin of the cerebral vessels has not as yet been evolved. Demonstration of the entire vascular tree is as important in the patient in whom a bleeding aneurysm is suspected, as in one with evidence of cerebrovascular insufficiency. The method that we wish to present has proved to be useful and is not complicated. It has the advantage of giving the maximum amount of information with a minimal number of needle punctures. Figs. 1 and 2 are representative of the roentgenograms that are obtained by this method of catheterization.

From April 15, 1960, until June 27, 1961, 103 patients were studied. There was a failure to introduce the catheter in 5 additional patients. In 2 of these 5 cases we subsequently visualized the carotid systems by direct percutaneous injection of Hypaque.

A brief review of previous methods tried reveals that many of the modifications were described after the excellent article by Fisher appeared. Prior to this article, attempts at arteriography were directed primarily toward the intracranial circulation. However, after his article, most investigators modified their technique to demonstrate the common carotid artery at its bifurcation. At the present time most examiners feel that the vessels contributing to the cerebral circulation should be demonstrated from the aorta outward, and attempts are now being made at what may be described as “total cerebral angiography.”

In 1947, Radner described a method of catheterizing the vertebral artery via the radial artery, but this method was never generally accepted.

In 1953, Seldinger described a method of aortography via the femoral artery. His method of passing the catheter over a spring-steel guide wire was quickly accepted and adapted to the particular vessel in which the investigator was interested.

Sheehan et al. used Seldinger’s technique to pass a catheter through the brachial artery into the innominate artery on the right and subclavian artery on the left. They were able to obtain excellent visualization by this method. Kuhn and Gurdjian have advocated brachial arteriography, but do not use it.

Fig. 1. Normal cervicothoracic view. Catheter enters the common carotid artery below its bifurcation (upper arrow). Tip of catheter (lower arrow) lies just inside carotid orifice.
a catheter in their technique. Their method is to insert a needle into the brachial artery and obtain pictures by retrograde injection of radiopaque material. Tindall and Cupp\textsuperscript{14} used direct retrograde injection into the carotid artery. In their technique the point of the needle was directed toward the heart. Of the 125 patients that they injected, in only 39 were good examinations obtained; 46 were useful, and 40 were poor. In order to get adequate films, they had to compress the carotid artery and thus were able to attain only filling of the vertebral artery on their roentgenograms.

In December, 1960, some 9 months after we became interested in retrograde carotid arteriography via catheter, Berk\textsuperscript{1} described a method of combined carotid-vertebral angiography by passing a Seldinger catheter in a retrograde fashion down the carotid artery. He recommended that a size PE 205 catheter be used. No series of cases was reported and our technique differs from his in several important details.

In March, 1960, after we became dissatisfied with direct vertebral angiography and direct subclavian arteriography, we began to investigate the possibility of retrograde carotid arteriography via catheter. In our first attempts a large-bore needle, through which a catheter could be inserted into the right carotid artery in retrograde fashion, was utilized; a large Bardie Intra-Cath was used. We were able to get excellent visualization of the carotid and vertebral circulation on the right, as well as the origin of these vessels in the thorax, but the method had the disadvantage of causing frequent large hematomas. On one occasion a fatality occurred because of a massive hematoma, although a tracheotomy was done promptly. This patient also had severe cardiac disease and expired in spite of the tracheotomy.

The technique using the Intra-Cath was soon abandoned and since June, 1960 we have been using the Seldinger technique to pass a size PE 160 catheter into the innominate artery in retrograde fashion. This method has the advantage of demonstrating the right carotid and right vertebral arteries with only one puncture of the carotid artery. The left carotid artery can then be injected directly with a needle. Should the origin of the left carotid artery from the aorta be in question, this area of the vessel can be demonstrated by compression of the carotid artery above the needle so the Hypaque is forced in a retrograde fashion into the aorta. The left vertebral artery may be demonstrated via the brachial artery by the technique described by Sheehan et al.\textsuperscript{13} It is thus possible to demonstrate the entire cerebral circulation with three arterial punctures.

The portion of the right carotid artery through which the catheter is inserted is relatively free of disease. We have not encountered arteriosclerotic plaques in this portion of the carotid artery. This method has the theoretic disadvantage that one might dislodge an embolus by introducing the catheter. However, this has never happened and we do not feel that the risk is any greater than in the older method of direct puncture of the carotid by needle. We have not felt that the risk of this complication is sufficient to contraindicate the use of either of these two methods.

**TECHNIQUE**

The method of examination is carried out as follows:

1. The neck and upper thorax are shaved if necessary, painted with an antiseptic, and draped with sterile towels. (The face also is draped.)