AN ADDITIONAL APPROACH TO THE INTERNAL CAROTID ARTERY FOR CEREBRAL ANGIOGRAPHY

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Since the introduction of cerebral angiography in 1927 by Egas Moniz, studies of the cerebral circulation have been limited largely by technical difficulties. The purpose of this paper is to describe an additional site through which radiographic contrast medium may be introduced into the internal carotid artery. The site to be described is immediately below the carotid foramen at the base of the skull and, in our hands, has proven to be an advantageous method of approach in certain cases. With this method it is possible to obtain satisfactory angiograms, percutaneously, with 35 per cent diodrast.

CONSIDERATION OF REQUIREMENTS FOR COMPLETE CEREBRAL ANGIOGRAPHY

Technical considerations for complete cerebral angiography may be tabulated as follows:

1. Complete serial exposures during the passage of contrast medium through the cerebral circulation by means of mechanical facilities for changing the films rapidly. Thus, there are obtained capillary and venous phases as well as the arterial one.

2. Inclusion of both the right and left carotid circulations in the study unless the first lateral study is unequivocal. In certain instances the vertebral-basilar circulation should be included.

3. Inclusion of stereoscopic exposures, at least in the lateral projections of the carotid arterial phases.

4. Inclusion of anteroposterior projections as well as the lateral ones.

5. Repetition of the studies whenever physiological or morphological change is anticipated.

6. Choice of a suitable contrast medium. No perfect contrast medium is available at this time, but the choice between thorotrast and one of the organic iodides is influenced by the volume necessary for the above considerations and their relative merits in regard to:

a. General toxicity: both immediate and delayed (including residual radioactivity in the case of thorotrast).

b. Inflammatory reaction in the soft tissues of the neck and speed of resorption in the event of extravasation into those tissues.

c. Density of the radiographic image produced.

7. Disadvantages of the incisional approach. Although an open incision
gives better access to the carotid and may be employed either routinely or when it is felt to be expedient, percutaneous methods should be less troublesome procedures and, if perfected, avoid the psychological barriers to routine use of cerebral angiography.

8. Preference to injection of medium as high as possible in the circulation, i.e., into the internal rather than the common carotid. The inclusion of the external carotid circulation offers no appreciable disadvantage to interpretation, but it is our impression that it is possible to reduce the total volume or concentration of the contrast medium by confining the visualization to the internal carotid.

The discrepancies between the optimal considerations listed above and the performance obtainable with methods previously described have prompted us to report the method of high approach to the internal carotid. Although it suffers from limitations also, it has been useful in certain cases.

ANATOMICAL CONSIDERATIONS

An appreciation of the anatomical relationships is a necessity for this procedure. The internal carotid artery enters the base of the skull through the carotid foramen, which lies medial and slightly anterior to the base of the styloid process. As viewed laterally just below the base of the skull the carotid is framed by a triangular window formed by the styloid process posteriorly, the posterior edge of the mandibular ramus anteriorly, and the base of the skull superiorly. Posterior to the internal carotid, but usually separated from it by the styloid process, lie the internal jugular vein and the last four cranial nerves. Anterior to the internal carotid lies the Eustachian tube. At the level we are considering, the internal carotid is relatively fixed because of the proximity to its bony canal.

TECHNICAL METHOD

1. Sensitivity. Inasmuch as diodrast has been chosen as a contrast medium in this method some form of test for sensitivity seems to be advisable and we have considered the procedure contraindicated when one obtains a general history of allergy in the patient or if there is a positive response to an intradermal or conjunctival test. An oral test is also employed if the patient is conscious and cooperative.

2. Premedication and Anaesthesia. Premedication has been routinely employed, consisting of 0.2 gm. of nembutal, orally, 2 hours before the procedure, and hypodermic injection of 0.016 gm. of morphine with 0.0006 gm. of atropine an hour beforehand. The premedication is varied according to the size and condition of the patient. An ordinary shaving of the face is adequate; it is not necessary to shave the scalp. No further general anaesthesia is necessary.

3. Apparatus. The apparatus prepared consists of 3 spinal puncture needles, 19 gauge, with a side arm attachment (Fleischer needles); 3 strong syringes of 10 or 20 cc. capacity; 60 cc. of 35 per cent diodrast. Before these materials are sterilized, a 35 cm. length of strong rubber tubing, 4.5 mm. in diameter, is tied firmly to the side arm of the needle and an adapter which will accept the locking device of the syringe is tied to the opposite end of the length of rubber tubing. It is desirable to insert a short length of glass tubing, for visualization, near the attachment of the rubber tubing to the needle. The rubber tubing tends to prevent jarring of the needle and keeps the operator's hands out of the primary beam of roentgen rays. A rubber-covered clamp is used to prevent the needle from descending deeper into the tissues from its own weight, after the tip is in place in the internal carotid artery.