CEREBRAL ANGIOGRAPHY RECORDED CINEFLUOROGRAPHICALLY

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The purpose of this paper is to report progress in the development of a successful cinefluorographic method of cerebral arteriography.

Stationary records of the shadows of brain vessels as obtained in the conventional method of single or even repeated roentgen-ray exposures allow only glimpses of the vascular flow of a contrast medium. Although in many instances such glimpses reveal sufficient information for diagnosis, frequently, because of faulty timing, these glimpses are not enough. Efforts to overcome this deficiency have been largely in the direction of increasing the number of exposures during the injection, repeating the injection of the dye and secondary injections for stereoscopic views. Most of these efforts have further complicated the technique. The ultimate aim has been to obtain a continuous record of the flow of radiopaque dye through the vessels of the brain. The potential yield of information from such a record might go far beyond the identification of pathological vascular configurations.

The need for the development of such a technique has been recognized before but to our knowledge only one attempt at producing one for practical use has thus far been reported. This was by Holm in 1944. He also used the indirect method of photographing the images on a fluorescent screen and took 8 or 16 frames per second. Although he was able to obtain some records he admitted that the quality of the films was not adequate to permit the clinician to rely on this technique alone and recommended its use as a complement to the conventional method. With the development at Strong Memorial Hospital of a practical cinefluorographic apparatus it has now become possible to make continuous cerebral arteriographic records that are satisfactory for clinical use. Earlier publications have described the technical construction of this apparatus in detail.2

We have employed this method thus far in obtaining 20 satisfactory angiograms. By preference we have used the percutaneous method exclusively although the direct surgical exposure technique is equally suitable.

The patient is first appropriately fixed in a recumbent position so that his head is immobilized adjacent to the screen. We use a specially built platform upon which the patient lies which has a prolongation at one end to which his head is secured with restraining straps (Fig. 1). If necessary a pillow is placed under his shoulders

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for slight hyperextension of the neck. The hands and knees are restrained. One person only is needed to make the puncture and the injection. The cinefluorographic apparatus can be operated by one technician.

In making the puncture we use an ordinary #18 lumbar puncture needle. The skin and subjacent tissues are first infiltrated with 1 per cent novocain down to the wall of the artery. We have found it extremely satisfactory then to give the patient an intravenous dose of sodium amytal varying between 0.3 and 0.6 gm. This is generally sufficient to render him amnesic or asleep for at least 10 to 15 min. so that he remembers nothing of the procedure when he awakens. As soon as the patient is asleep the puncture is made with the stylette of the needle removed. Once a satisfactory flow of blood is obtained the needle is secured firmly with the fingers of one hand while the stylette is replaced with the other hand. A few seconds are then required for the radiologist to set the machine for filming. As soon as he is ready the stylette is removed and the syringe with dye is attached to the needle, making certain that a free flow of arterial blood is still occurring. At a prearranged signal the injection is started rapidly and the exposure is begun at the same moment. This insures filming the beginning of the ascent of dye up the internal carotid. The exposure is continued for a total of not more than 5 sec. Usually 3½ sec. is ample to visualize the whole of the arterial phase. During a single such 5 sec. exposure the patient receives a dose of about 25 r of radiation. The operator’s hands are kept out of the field by the use of a cone reaching from the tube nearly to the patient’s head. A leaded shield can be conveniently interposed between the patient’s chin and the operator’s hands if desired, although one is safe without it.

We have employed diodrast varying in concentration from 35 to 70 per cent, but are most satisfied with 50 per cent. Legible films are obtained, however, with 35 per cent. The test is not done if the patient is found sensitive to either of the two preliminary diodrast sensitivity tests, the intradermal or the intravenous (5 cc.), both of which are done routinely. Satisfactory records have been obtained