ARTERIOGRAPHY AND VASOSPASM

THE EFFECTS OF INTRACAROTID CONTRAST MEDIA ON VASOSPASM

RICHARD B. RAYNOR, M.D., AND GERALD ROSS, M.D.

Department of Neurological Surgery, College of Physicians and Surgeons, Neurological Institute of Columbia-Presbyterian Medical Center, New York, New York

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Cerebrovascular disorders have assumed new importance because of the improved techniques now available to treat many of them. The advent of anticoagulant treatment for embolic and thrombotic phenomena, and successful operations on aneurysms and arteriovenous malformations have made it essential that diagnoses be established accurately and quickly so that the available therapeutic measures may be instituted. Delay is often costly to the patient.

One of the most informative of the available diagnostic procedures in these disorders is cerebral angiography. It is a clinical impression that the incidence of complications following this procedure is greater in primary vascular disorders and in conditions that also involve the vasculature secondarily. Pool et al.11 felt that vasospasm may be important in the etiology of symptoms of some of these disorders. If this is so, then it is possible that the cerebral vasculature may exhibit additional spastic phenomena under the influence of contrast media. Decreased flow of blood to an already damaged area could be expected to cause or enhance clinical symptoms. A transient vasoconstriction during and immediately after the injection of contrast media has been demonstrated in the pial vessels of animals;2,6,7 however, long-term effects have not been shown.

This investigation used diatrizoate sodium (Hypaque) because it was the agent then in use on the clinical services of the Neurological Institute of New York. It is also supposed to be one of the least irritating of the available contrast media.4

METHOD

Twelve cats were used. They were anesthetized with 50 to 100 mg. of Pentothal Sodium intravenously and this was supplemented with additional doses during the experimental period to keep the animal under light anesthesia. A tracheotomy was done and the animal was placed on a positive-pressure respirator to insure adequate ventilation. The left common carotid artery was dissected free and ligated proximally. A polyethylene catheter #240 was passed into the distal segment of artery for 1 to 2 cm. and irrigated with several ml. of normal saline solution. Room temperature was kept at 28.5° to 32° C. to prevent excessive loss of heat from the animal.

A left craniotomy was performed and the entire left supratentorial area of the brain was exposed except for the anterior portion of the frontal lobe. It was necessary
to remove the ramus of the mandible to achieve this exposure. The dura mater was opened first along the inferior edge of the temporal lobe and then in a stellate fashion back to the margins of the craniotomy. It was reflected back over the bony edges to expose the brain. The arachnoid remained intact.

A retractor was slipped under the temporal lobe and the brain was elevated until the internal carotid artery was well visualized as it left the intracavernous region. The prechiasmal portion of the optic nerve was seen frequently.

A Zeiss camera-microscope with a robot camera attached was focused on the artery (Fig. 1). Four photographs were taken at 30-sec. intervals as controls. Using a blunt nerve hook, the artery was stroked 20 times for a distance of about 1 cm. Photographs were taken initially at 30-sec. intervals for 5 to 9 min. The interval was then increased to 1 min. and pictures were taken until the artery appeared to have returned to normal size. Several additional pictures were taken at 1-min. intervals.

Eighteen to 25 min. after the initial stroking, 4 control pictures were taken again at 30-sec. intervals. The artery was stroked 20 times in the same area as previously. In 8 cats 3 cc. of diatrizoate sodium were injected through the carotid catheter immediately following the stroking. The same force and speed of injection used in patients were used in the animals. A 9th animal had had a previous injection of saline into the carotid artery (see below). In a 10th animal subarachnoid hemorrhage developed during the final stroking. Photographs were taken in a manner similar to that described above.

Eighteen to 25 min. after the injection, control pictures were taken again; the artery was stroked 20 times in the area manipulated previously and its size was then followed by serial photographs.