Effect of cerebral angiography on subsequent brain scintigraphy

EDWARD B. SILBERSTEIN, M.D., AND ALAN B. ASHARE, M.D.

Department of Radiology (Radioisotope Laboratory) and Medicine, University of Cincinnati Medical Center and the Jewish Hospital, and Nuclear Medicine Laboratory, Bureau of Radiological Health, Federal Drug Administration, Cincinnati, Ohio

The authors report examination of 27 brain scintigraphs performed 1 day following cerebral angiography, and 48 performed within 2 weeks. No artifactual areas of uptake were produced in the scintigraphs by the radiographic contrast medium.

KEY WORDS □ cerebral angiography □ brain scintigraphy □ blood-brain barrier

Virtually all radiopaque substances used in cerebral angiography can alter the blood-brain barrier at certain dosage levels. Such changes in blood-brain barrier permeability prior to administration of $^{99m}$TcO$_4^-$ could theoretically induce artifactual abnormalities in subsequent brain scintigraphs. Although there have been statements in the literature that a $^{198}$Hg-chloromerodrin brain scan immediately following angiography may be uninterpretable or that false positive scans may result, these claims have never been substantiated by an objective study. The purpose of this study has been to determine if cerebral angiography alters the brain scintigraph when the latter test is performed from 6 hours to 2 weeks after the angiogram.

Materials and Methods

A total of 75 patients were studied who had no evidence of cerebrovascular occlusion, hemorrhage, or other space-occupying lesions on cerebral angiography, and who had subsequent brain scintigraphy within 2 weeks. Of the 75, 27 patients had brain scintigraphy within 24 hours after angiography, and of these, 10 patients consented to have brain scintigraphy performed both 24 hours prior to and again within 24 hours following the angiographic procedure. The remaining 48 patients had scintigraphic studies from 1 to 14 days after angiography.

For brain scintigraphy 300,000 counts were accumulated for right and left lateral, anterior, and posterior views, obtained 1 to 3 hours after the intravenous injection of 15 mCi of $^{99m}$Tc-pertechnetate. Each patient received 200 mg of potassium perchlorate prior to the study. All scintigraphs were interpreted twice, once at a daily "readout" session and again by one of the authors.

Cerebral angiography was performed with 60% meglumine iohalamate, 25 cc for carotid injections, 60 cc for the brachial artery route.

*Conray-60 made by Mallinckrodt Chemical Works, Diagnostic Products Division, P.O. Box 5439, St. Louis, Missouri 63160.
Cerebral angiography and scintigraphy

Results

All 75 of these patients with no evidence of cerebrovascular accident (CVA), tumor, or arteriovenous malformation on intracranial angiography had normal brain scintigraphs when interpreted independently on two occasions. This includes the 27 patients with brain scintigraphy performed within 24 hours after the angiogram, and within this group of 27, the 10 sets of brain scintigraphs performed both 24 hours prior to and within 24 hours after angiography. Thus, a falsely abnormal brain scintigraph was never seen following angiography although intracranial atherosclerotic vascular narrowing was not uncommon on the latter study (79%). Furthermore, the quality of the brain scintigraphs following angiography was judged equal to that of patient studies where angiography was not performed.

Discussion

We have documented that, in patients without CVA or tumor found on cerebral angiography, the brain scintigraph remains normal, even when, in 27 patients, it was performed within 24 hours of the angiogram. In fact, six of these 27 brain scintigraphy studies were performed within 6 hours after the angiogram, and all were normal. The brains of 10 patients were imaged with $^{99m}$TcO$_4^-$ before and after angiography, with the same results.

Similar results have been reported in two series,¹⁰ which, however, are not truly comparable to our study. Heinz, et al.,⁶ scanned 10 patients with negative angiograms 2 to 10 days after the roentgenologic procedure and found no abnormal scans. In contrast to our study, however, none of their patients was studied until 48 hours after angiography. Anderson and Siemsen¹ studied 69 patients in whom scanning took place within 2 weeks after angiography. Seven of their patients who had a brain scintigraph performed 1 day after angiography had abnormal studies fully explained by central nervous system (CNS) disease. Thirty-one had both positive scintigraph and angiogram, while three had a negative angiogram but positive scintigraphy at 1, 7, and 12 days after angiography. There were clinical or histological data (tumor, scalp trauma, depressed skull fracture) to fully explain these three positive scans. Thus, in none of their cases could angiographic contrast medium be blamed for false positives in these patients with CNS disease.

Our study gives no information regarding alterations that might occur in an abnormal scintigraph performed following angiography, but previous work indicates that no new, unexplained lesions result.¹,⁶

There are, in fact, no solid data showing any effect of angiography on subsequent brain scintigraphy. Bender⁴ was quoted, in 1959, as saying "... for a period sometimes of weeks, scans were completely uninterpretable ..." after angiograms and pneumoencephalograms. He was discussing $^{201}$Hg-chloremerodrin brain scans, which may be quite difficult to read under any circumstances. Other authors have cited Bender or have made the statement anecdotally, without analysis.⁵,⁶,⁷,¹⁰

That hypertonic angiographic media may cause histological alterations in the area of the blood-brain barrier is unquestioned.⁴,¹⁰ However, there is no evidence in our data that abnormal scintigraphs result from the perfusion of 60% meglumine iothalamate, in volumes of 25 to 60 cc, into cerebral vessels which either appear to be normal angiographically (21%) or which show mild to marked atherosclerotic narrowing (79%).

References


Address reprint requests to: Edward B. Silberstein, M.D., Radioisotope Laboratory, Cincinnati General Hospital, Cincinnati, Ohio 45229.