COMPLICATIONS OF ANGIOGRAPHY

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The short history of cerebral angiography reveals a constant search for an inert, more miscible contrast medium that is devoid of untoward side reactions. None of the substances thus far used have been free of adverse reaction. The first practical radiopaque material used was 25 per cent sodium iodide. Egas Moniz\textsuperscript{10} carried out all angiography with this until 1931. Many complications were seen with this material and his mortality rate was between 2 and 3 per cent. Thorotrast was introduced at about this time and became a very popular substance, although its use was mainly confined to the continent. Complications with this substance were reported by Ekström and Lindgren\textsuperscript{3} and Northfield and Russell.\textsuperscript{11} The potential danger of radioactivity served to limit its use in this country. Gross\textsuperscript{6,7,8} introduced diodrast in 1939 and, in the 35 per cent solution, it is now perhaps the most widely used of the contrast media. Relatively few complications with this substance have been reported in the literature. Engeset\textsuperscript{5} reported 2 fatalities in a series of 100 patients and in neither case did he feel that death was due primarily to angiography. Bull\textsuperscript{4} reported 3 deaths in a series of 1,000 cases, all of which were complicated by large intracranial tumors. Chusid, Robinson and Margules-Lavergne\textsuperscript{2} reported 2 cases of transient hemiplegia. Dyke\textsuperscript{3} reported a case of thrombosis of the carotid artery. Urticarial reactions have been seen. In the main, however, the literature emphasizes the relative safety of the procedure. Indeed, in Torkildsen’s recent monograph\textsuperscript{13} on 2,000 cases of angiography, no major complications nor death have been listed.

The authors have seen a rather wide variety of adverse reactions to diodrast angiography and would like to emphasize its potential hazards. The present study is based on a series of 147 carotid angiograms performed with 35 per cent diodrast on 108 patients in the years 1946 to 1950. The series constitutes 30 cases of brain tumor, 17 of aneurysm, 19 of subarachnoid hemorrhage, 12 of cerebral thrombosis, 7 of degenerative disease, 4 of subdural hematoma and 19 undiagnosed cases. Complications occurred in 14 of the 108 cases.

COMPLICATIONS

I. FATAL (3 cases)

Death occurred in 3 cases in which cerebral angiography contributed, at least in part, to the cause of death.

Case 1. M. J., a 35-year-old female with renal hypertension, was admitted to the
neurosurgical service with diplopia, blurred vision and focal seizures associated with loss of consciousness. Examination was essentially negative except for cardiac enlargement and B.P. of 244/160. Percutaneous angiography under local anesthesia with premedication of 0.4 mg. nembutal and 40 mg. atropine revealed inadvertent filling of the left vertebral artery after an injection of 10 cc. of 35 per cent diodrast. A 2nd injection into the carotid artery gave satisfactory films. The patient was subdued and uncommunicative following this procedure. Twelve hours after angiography, she rather suddenly expired from respiratory failure. At autopsy approximately 250 cc. of blood were found in the neck, deviating the trachea to the opposite side but not obstructing it (Fig. 1). In addition to marked kidney pathology, con-

![Fig. 1. Case 1. Postmortem neck dissection, showing deviation of trachea to the right and hemorrhage into the neck. Patency of airway tube seen through midline incision in the trachea.](image)

considerable cerebral edema was present. It was the feeling that the extravasation of blood into the neck had caused bilateral jugular compression and secondary venous stasis in the brain and that this, in turn, led to edema and respiratory failure of central origin.

Case 2. C.O., a 65-year-old female, was admitted because of a fracture of her right femur. B.P. 128/86. She was seen in consultation because of a rather marked exophthalmos and mental confusion. History revealed that 12 years previously she had noted the onset of exophthalmos and left 3rd nerve paralysis. Surgery had been refused. On examination an additional left 4th and 7th nerve paralysis and a left Foster Kennedy syndrome were found. Skull x-rays confirmed the impression of a sphenoid wing meningioma. Bilateral percutaneous angiography under local anesthesia with 0.4 mg. atropine and 250 mg. sodium luminal was carried out with a total of five 10 cc. injections on the right and two 10 cc. injections on the left. It was noted that the patient was less responsive after this procedure but it was not felt to be related directly to the angiography. Because of previous poor filling on the left side, an open angiogram was performed 2 days later with 50 mg. of demerol and 4 mg. of atropine as premedication, and a total of 50 cc. of 35 per cent diodrast was injected on the left. The patient deteriorated rapidly within the next 24 hours and expired