CEREBRAL ANGIOSCINTIGRAPHY IN BRAIN DEATH AND IN COMA DUE TO DRUG INTOXICATION

S. Nordlander, P. E. Wiklund, and P. E. Åsard
Danderyd Hospital, Danderyd, Sweden

Scintigraphic examination of the cerebral circulation by i.v. injection of 15 mCi 99mTc-per-tecnetate may be of value in patients in deep coma to distinguish brain death from coma due to drug intoxication. Two illustrative cases are presented.

The diagnosis of brain death has been the subject of many discussions. Definite recommendations to guide the clinician are still lacking in many countries.

Brain death will often be diagnosed by clinical examination, but confirmation of the diagnosis by demonstration of impaired cerebral circulation is desirable. This can be done by selective roentgenological angiography of the cervical vessels, either by direct puncture of the carotid artery or by catheterization from the femoral artery. The circulation, however, can also be demonstrated by angioscintigraphy with radionuclides (1,2).

The signs of brain death are deep coma with dilated pupils, inability to react to light, lack of spontaneous respiration, loss of all cerebral functions, low body temperature, isoelectrical EEG at two different examinations, and absent intracranial circulation.

Deep coma with clinical symptoms similar to those at brain death is found in heavy drug intoxication. This condition may be difficult to distinguish from brain death, especially since the EEG may occasionally be isoelectric. In drug intoxication, however, the cerebral circulation is always maintained, though often rather slow. For that reason, a study of this circulation could be of value in diagnostic examinations of unconscious patients.

This paper presents two illustrative cases of impaired cerebral circulation.

CASE REPORTS AND METHODS

Fifteen millicuries of 99mTc-pertechnetate is rapidly injected into a brachial vein. The thyroid gland should be blocked before the examination by potassium perchlorate. The circulation through the vessels of the neck, the base of the skull, and the intracranial space is studied by the scintillation camera in an anterior view and is recorded on videotape (Nuclear-Chicago, Direct Store System).

In brain death, i.e., total cerebral infarction, the cerebral arterial bloodflow ceases because of the marked cerebral edema. No circulation can be detected, either in the internal carotid artery or in the sagittal sinus. Obvious activity, however, is found in the arteries of the neck and in the external carotid artery.

Normally, 10-sec elapse from injection until the bolus arrives in the carotid arteries (Fig. 1, line 1). The time required for radioactivity, detected in the carotids, to reach the sagittal sinus is 4 sec in this same person.

In a case of brain death (Fig. 1, line 2) there is no detectable intracerebral circulation. The scintiphotos are from a patient with a ruptured intracranial arterial aneurysm and a hemorrhage in the pons, verified by autopsy. The radioactivity visible on the scintiphotos comes from the blood in the external carotid artery. There is no activity in the anterior or middle cerebral artery.

A patient in deep coma due to drug intoxication with hypnotics* is shown in Fig. 1, line 3. The patient's pupils did not react to light, spontaneous breathing was lacking, and the body temperature was 31°C. The EEG was highly abnormal, being sometimes flat, almost isoelectrically silent for periods of 10 sec. The circulation time was prolonged (more than 20 sec). The examination of the cerebral perfusion showed a maintained but very slow

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For reprint contact: Sverker Nordlander, Danderyd Hospital, 182 03 Danderyd 3, Sweden.

* Vesparax (secobarbital + barbital + hydroxyzine hydrochloride) and Mandrax (methaqualone + diphenhydramine hydrochloride).
intracranial circulation (15 sec). This stresses the importance of prolonging the examination of the circulation for at least 1 min. The patient eventually regained consciousness and was discharged from the hospital.

DISCUSSION AND CONCLUSIONS

The method of examination that has been used aims at an anatomic delineation of the intracranial vessels apart from other methods where the radioactivity has been determined by detectors placed outside the skull (3). Using this last method, the radioactivity is determined simultaneously in the extra- and the intracranial vessels. Therefore, it is impossible to decide whether the detected activity comes from vessels in or outside the brain.

The findings by this method can be of value in supporting the diagnosis of brain death. It is advisable to document the cerebral circulation by a tape recorder or by other data-collecting devices for further processing of the raw data. It is also of importance to continue the examination for at least 1 min.

REFERENCES