Scintigraphic Evaluation of Renal Function in Heart-Beating Brain Death Patients Using Technetium-99m Diethylenetriamine Pentaacetic Acid

B.	Belkis	Erbas ^a
G.	Günaydin	Erbengi ^a
T.	Tülin	Aras ^a
A.	Aykut	Erbeng ^b

Departments of ^aNuclear Medicine and ^bNeurosurgery, Faculty of Medicine, Hacettepe University, Ankara, Turkey

Assoc. Prof. Belkis Erbas, MD, Klinikum rechts der Isar der TUM, Nuklearmedizinische Klinik, Ismaninger Strasse 22, D-W-8000 München 80 (FRG)

Dear Sir,

There is a need to define brain death as soon as it occurs, in order to be able to salvage organs for possible transplantation. The radionuclide and radiographic procedures infer brain death on the basis of demonstrated cessation of cerebral blood flow [1]. However, radiographic studies cannot be performed at the bedside, are more costly and involve administration of contrast material, with its attendant risks for the patient, and in the case of potential renal transplant donors, for the viability of the transplanted kidney.

Radionuclide techniques provide a non-invasive and reliable method for the diagnosis of brain death with no risk for the patients [2, 3]. Radionuclide cerebral angiography, one of the tests used to confirm brain death, can demonstrate the absence of cerebral blood flow during the first-pass study [4]. Several technetium (Tc) compounds, such as ^{99m}Tc pertechnetate, ^{99m}Tc diethylenetriamine pentaacetic acid (DTPA) and ^{99m}Tc gluco-heptonate, can be used for this purpose. ^{99m}Tc-DTPA, used for both cerebral angiography and static brain scintigraphy, has an advantage over the other radionuclide compounds because of its ability to demonstrate renal perfusion and glomerular filtration functions at the same time.

During the scintigraphic evaluation of cerebral blood flow, we investigated the renal function of 19 patients with brain death confirmed using the clinical findings and brain-stem-evoked auditory potential. Following intravenous administration of 370 mBq (10 mCi) ^{99m}Tc-DTPA, cerebral angiography was performed in the first 2 min. Immediately, a gamma camera was placed under the patient to image the renal regions. Renal uptake of ^{99m}Tc-DTPA was recorded in a matrix size of 256 × 256 with a total count of 500.000 per image during 20 min with 5-min intervals. The symmetry and homogeneity of renal accumulation of radiotracer, visualization time of the renal pelvis, patency of the ureters and bladder were examined. Following renal imaging, anterior, posterior and lateral views of the head were recorded in order to complete the brain scan.

Fifteen patients had a good function of both kidneys. Three patients showed a significant decrease in renal function bilaterally, and 1 patient had a single kidney. The kidneys of 3 patients with normal renal function who fulfilled the other criteria for renal transplantation were used for

renal transplantation. After renal transplantation, the function of 6 transplanted kidneys was also examined serially using radionuclide methods.

Possible renal anomalies, decreased renal function or unilaterally impaired renal function which may not be detected using a standard laboratory test can be easily detected using radionuclides. It is especially important to define the renal morphology and renal function of heart-beating brain death donors with head trauma whose kidneys could be also affected by trauma. In our study group, 7 patients had a history of head and body trauma as a cause of brain death.

Previously, we investigated the renal function of related living donors using radionuclide methods before and after renal

transplantation [5]. According to our knowledge, in the literature there is no other study describing the scintigraphic evaluation of renal function in brain death patients.

We conclude that renal scintigraphy using ^{99m}Tc -DTPA can be performed at the same time as the radionuclide examination of cerebral blood flow in patients with suspicion of brain death. It is a noninvasive, simple, reliable method without extra cost and extra time which may be also useful to give additional information about the heart-beating brain death patient in the possibility of renal transplantation.

References

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