STUDIES OF SUPRARENAL SCINTIGRAPHY IN HUMANS USING ^{131}I-DDD

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Since 1946 (*1*) dichloro-dichloroethane (DDD) has been subjected to pharmacological investigation because of its peculiar toxicity for the adrenal cortex. Three isomeric forms are known, and the DDD of technical grade is a mixture of all three isomers (*2,3*). Two of them have been used in medicine for the treatment of malignancies of the adrenal glands, its metastasis, and in cases of Cushing's syndrome (*4,5*). One of the isomers is currently being investigated as a possible scanning agent and reports have been made on experiments on dogs and rabbits (*6,7*). In 1968 we started working with DDD labeled with ^{131}I for scanning purposes, first in animals (*8*) and later in humans (*9*). A group of patients with diagnosis of pheochromocytoma and cortical adenoma was scanned after the oral administration of this tracer, and the purpose of this paper is to present the results.

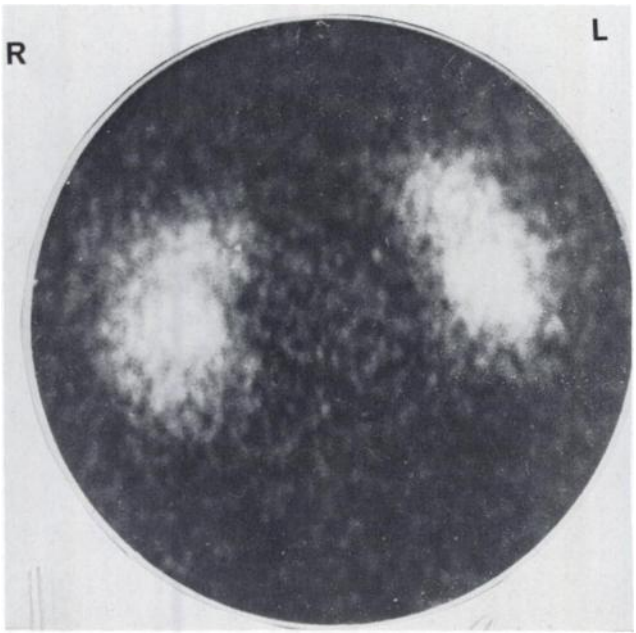

FIG. 1. Composite image of kidneys and suprarenal glands of normal subject. Observe superimposed structures in both superior renal poles.

MATERIAL AND METHODS

Our method for labeling DDD is being published elsewhere (*9*). The product was tagged with ^{131}I, and the specific activity obtained ranged from 20 to 100 μCi/mg. Free iodide was removed and chemical purity assessed by means of paper electrophoresis in sodium bicarbonate 0.002% solution or alternatively by paper chromatography in 0.9% solution of sodium chloride. The labeled compound was dissolved in oil to a final concentration of 6–15 mg/ml. It was then administered in gelatine capsules in doses of 200–350 μCi 18 hr before scanning. The scans were performed on the patient lying in the prone position with a scintillation camera or a rectilinear scanner. The images corresponding to adrenal glands were obtained alone. Immediately after the first scanning, a dose of ^{131}I-Hippuran was injected, and a second scan was performed with the patient in the same position to superimpose an image of the kidneys as a reference to locate the adrenal glands.

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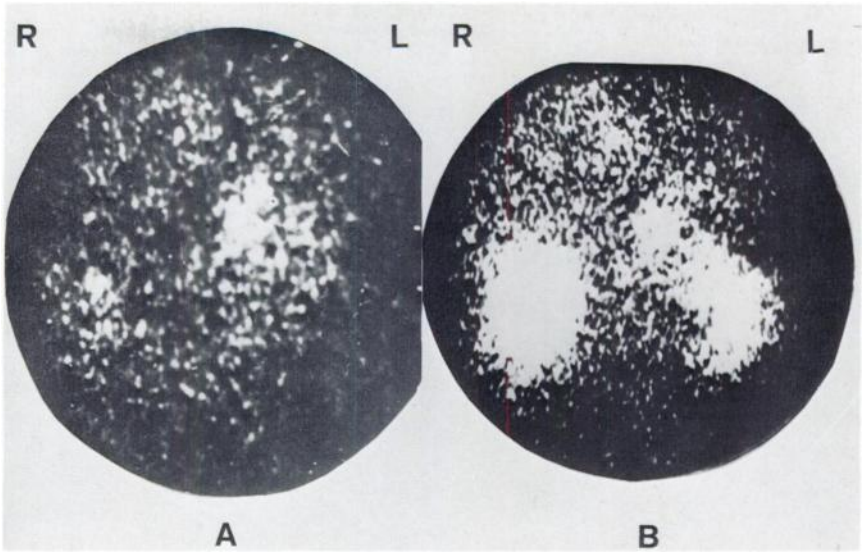

FIG. 2. In 2A are shown adrenals alone with enlarged left gland and displaced right adrenal gland. 2B shows (when we added renal image) that right kidney hides right adrenal gland.

The doses of ^{131}I-DDD were established in a previous work on organ distribution of this compound in rats, rabbits, and guinea pigs (*9*).

The present paper includes suprarenal scintigraphy performed in 13 normal volunteers and in five patients with the clinical diagnosis of suprarenal tumors (two cortex adenomas and three pheochromocytomas) made by indirect methods (urography, tomography, etc.). In two of them the diagnosis was confirmed by surgery.

RESULTS

Figure 1 shows a composite image of kidneys and suprarenal capsules of a normal subject. An added structure can be observed above the superior poles of both kidneys. This was usually the finding in 13 normal humans, although in some cases the area corresponding to the right adrenal was shown in a para-aortic position. Differences in concentration of the radiopharmaceutical were observed in different studies performed on the same individual at different times of day (daily rhythm). These findings are now under investigation and will be published in a future communication.

Figure 2 shows a patient with a pheochromocytoma on the left side, corroborated by surgery and anatomo-pathological studies. Figure 2A (^{131}I-DDD) shows the adrenals alone with an enlarged left gland. Figure 2B (^{131}I-DDD and ^{131}I-Hippuran) shows that the right kidney hides the right gland. The existence of the displaced right adrenal gland was demonstrated by surgery.

DISCUSSION

The adrenal glands are influenced by hypophysis (ACTH), and its function fluctuates with the hours of the day. Since DDD also influences the secretion and the peripheral metabolism of corticoids (*10*), it is reasonable to expect periodic variations in its concentration by the adrenal cortex, and this is in agreement with other findings (*11*).

The tracer is only concentrated by the cortex, and the presence of medullar tumors is found from the enhancement or deformation of the concentrating tissue. Due to this fact, displaced adrenal glands can only be seen when they have a functioning cortex. The study of pure medullary tissue can not be performed with this radiopharmaceutical.

As we have reported previously (*9*), no chemical or radiological toxicity has been observed, and we consider that the method is safe. Three of the normal patients have been under periodic clinical control during 2 years, and they are completely healthy. Data concerning metabolism and radiotoxicity of ^{131}I-DDD have been reported previously (*8*).

CONCLUSIONS

DDD labeled with ^{131}I is concentrated by the adrenal cortex and can be employed as a scanning agent for routine studies. According to the previously described method, a group of 13 normal volunteers was studied to obtain the normal pattern that should be expected. Results indicate that there are variations in the image corresponding to different individuals and to the same individual at different time of the day. Five patients with clinical diagnosis of suprarenal tumor (two cortex adenomas and three pheochromocytomas) were also studied. In five cases it was possible to show the size and location of the tumor by direct visualization, in one instance in an abnormal site. The method is very useful for diagnosis of tumors of the medulla or cortex of the gland. No chemical of radiological toxicity was found at the doses of ^{131}I-DDD employed.

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