Localization of Gallium-67 in the Normally Functioning Allografted Kidney: Concise Communication

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Radiogallium localization in the normally functioning renal allograft is a normal finding in the immediate postoperative period. The intensity of tracer accumulation decreases with time and is no longer demonstrable by the end of the second postoperative month.

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Renal accumulation of gallium-67 citrate has been observed in inflammatory, neoplastic and other diseases of the kidneys (*1-7*). Normally some 12% of gallium-67, administered as citrate, undergoes renal excretion within the first 24 hr after administration (*8*). The presence of faint renal radioactivity during this period is therefore considered normal, whereas demonstration of persistent renal radioactivity at 24 or more hours is considered abnormal (*3*). It has been stated that abnormal radiogallium localization may be the first evidence of renal disease (*1*), although the predictive value of the finding is not established.

Uptake of Ga-67 in the rejecting renal allograft has also been reported (*2*). There is little information, however, about accumulation in the normally functioning transplanted kidney. During searches for infection using Ga-67, we had noted occasional uptake of tracer in recently implanted renal allografts that functioned well and were infection-free. The present study was undertaken to determine the incidence and significance of Ga-67 localization in the normally functioning renal allograft relative to time after transplantation.

MATERIALS AND METHODS

Patients. Two groups of patients were examined, all after informed written consent. The first group comprised 11 patients who had clinical and laboratory evidence of normal renal allograft function, with no infection or acute tubular necrosis. These patients underwent examination on the third to sixth day after transplantation. Of this group, five continued to show uncomplicated clinical courses at 4–5 wk after transplantation, evidenced by their requirement for the same or lower doses of immunosuppressor medications. These patients then underwent a second radiogallium study. Of the latter subgroup, three exhibited normal renal function 2 or more months after transplantation, when the third radiogallium study was performed.

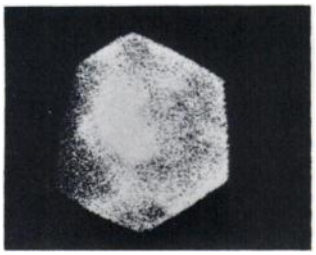

FIG. 1. Intense radiogallium localization is noted in a normally functioning renal allograft on the third postoperative day. The image was obtained 24 hr after injection. Similar images were obtained at 48 and 72 hr.

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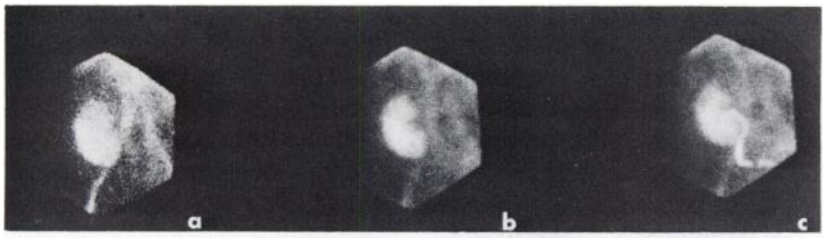

FIG. 2. Technetium-99m DTPA dynamic renal imaging in the patient shown in Fig. 1, obtained 1 day after transplantation: (a) normal perfusion, (b) normal cortical localization, and (c) normal excretion.

The second group consisted of four patients with normal renal function who underwent a single radiogallium study 24–60 mo posttransplantation for the purposes of this investigation.

Imaging. Allograft imaging was performed 24–72 hr after i.v. administration of Ga-67 citrate, 45 μCi/kg, using an Anger camera with medium-energy collimator and with spectrometer adjusted to accept the 90- and 186-keV photons. The intensity of renal radiogallium concentration was scored by comparison with the radioactivity in the adjacent ilium. Each study was preceded by dynamic renal imaging using Tc-99m diethylenetriaminepentaacetic acid, 200 μCi/kg. Urine cultures and analyses and serum creatinine levels were obtained in all patients within a few days of radiogallium imaging.

RESULTS

All 11 patients studied during the first postoperative week showed localization of radiogallium in the renal allograft. In all cases its intensity was equal to or greater than that in the ilium (Fig. 1). The distribution was uniform. In these patients the urinalyses, urine cultures, and dynamic renal imaging were normal (Fig. 2).

In five patients studied approximately 1 mo after transplantation, radiogallium localization was demonstrable but its intensity was less than that in the adjacent ilium (Fig. 3). Distribution was again uniform.

In the seven patients studied 2 or more months after transplantation (three patients from the group studied prospectively plus the four patients in the second group described above), there was no evidence of radiogallium localization in the transplanted kidney.

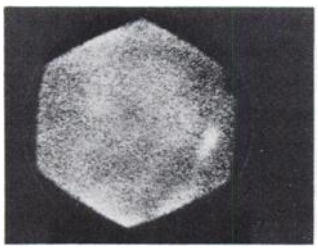

FIG. 3. Faint radiogallium localization is noted in a normally functioning renal allograft on the 33rd day after transplantation. The image was obtained 24 hr after injection. Similar images were obtained at 48 and 72 hr.

DISCUSSION

The data presented indicate that delayed renal allograft accumulation of Ga-67 is a constant finding in the early postoperative period in patients whose renal function is normal and who have no evidence of infection or acute tubular necrosis. The intensity of the renal uptake diminishes with time and is absent about 2 mo after transplantation.

The mechanism responsible for Ga-67 accumulation in the normally functioning renal allograft is not clear. Surgical manipulation or trauma during transplantation seems unlikely in view of the uniform distribution of Ga-67 throughout the allograft. Negative urinalyses and urine cultures excluded occult infection as a possible explanation. None of the patients had evidence of acute tubular necrosis, which has been associated with renal Ga-67 localization (*9*). By exclusion, therefore, the most likely mechanism appears to be subclinical cell-mediated rejection. It is known that in spite of immunosuppression all renal allografts stimulate the host's efforts at rejection, starting during the first week after transplantation and usually subsiding several months later (*10*). Cell-mediated rejection, with infiltration by lymphocytes and other monocytes, predominates in the early phase (*10*). Thus, radiogallium accumulation in the early weeks after transplantation may be due to tracer concentration in the infiltrating cells. To test this hypothesis we are currently evaluating the correlation between gallium localization in the renal allograft and the degree of cellular infiltration in renal biopsy specimens.

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