Indium-111 White Blood Cell Scan for Infectious Complications of Polycystic Renal Disease

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This case report describes the localization of a unilateral renal abscess with [111]n]oxinelabeled autologous leukocyte scanning in a febrile patient with polycystic renal disease, after other noninvasive imaging procedures failed to identify a source of infection. In polycystic renal disease, leukocyte scans have advantages over standard diagnostic modalities and are very helpful in planning appropriate therapy.

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R enal cyst infection is always an important clinical CASE REPORT (PCRD) becomes febrile without an obvious source. Cysts are present bilaterally and infections are frequently diagnosed by excluding all other possible sources of infection (1). Since antibiotic therapy alone often fails, because of inadequate concentrations in large cysts (2), bilateral nephrectomy must be considered unless the infection can be localized to one kidney (3). Even in the presence of chronic renal failure, bilateral nephrectomy is not desirable because the nonfunctioning kidneys are capable of stimulating hematopoesis. Computerized tomography (CT) and ultrasound (US) are not sensitive in identifying or localizing renal cyst infections (4,7). Gallium-67 (⁶⁷Ga) scintigraphy has been used to identify perinephric abscesses but there are no reports in the literature of its use in the setting of renal cyst infection (4,5). This report describes a case where leukocyte scintigraphy led to the localization of a unilateral renal abscess in a febrile patient with PCRD after extensive noninvasive evaluation failed to identify a source of infection.

A 52-yr-old black male with PCRD on chronic hemodialysis was admitted to our institution with fever and inflammation of the left forearm. Three days prior to admission a hematoma had developed at the site of a left forearm Gortex A-V fistula following problems with cannulation. On admission, his temperature was 103°F and the left forearm graft site was warm, swollen, erythematous, and tender. The white blood cell (WBC) count was 7,500. The patient was started on i.v. vancomycin, and blood cultures obtained prior to treatment were positive for coagulase positive staphylococcus. The left forearm graft was excised and vancomycin was continued. Although the patient initially became afebrile, recurrent fevers up to 103°F associated with marked leukocytosis (up to 22,000 with a left shift) developed. A gallium-67 (⁶⁷Ga) citrate scan in multiple projections at 24 and 48 hr, abdominal ultrasound, computerized tomography, and echocardiography did not reveal a source of infection. Two weeks after admission, an indium-111 (111In) oxine-labeled leukocyte scan was done. Whole-body and spot views obtained 24 hr postinjection showed leukocyte accumulation in the right flank area corresponding to the right kidney (Fig. 1). No activity was seen in the area of the left kidney. A right nephrectomy was performed 2 days after the ¹¹¹In-WBC scan. The kidney was markedly enlarged and anteriorly displaced. Pathology revealed a large polycystic kidney with a single well-defined 5 cm abscess cavity surrounded by a thick capsule containing polymorphonuclear leukocytes and gram positive cocci in clusters (Figs. 2 and 3). Postoperatively, the patient's fever resolved and the leukocyte count returned to normal. He was discharged 11 days following nephrectomy.

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FIGURE 1

Indium-111 leukocyte scan anterior view at 24 hr (left) shows focus of activity inferior to liver (arrow) and spot view (center) localizing abnormal collection of activity to right flank area. Spot view of left forearm (right) shows linear focus in area of graft excision



FIGURE 2 Large polycystic kidney (sliced open) with 5 cm abscess cavity in right lower pole (arrow)

DISCUSSION

This case illustrates the clinical utility of $[^{111}In]$ oxinelabeled leukocyte scanning in the diagnosis and localization of infected renal cysts complicating PCRD. CT and ultrasonography, although highly sensitive in identifying fluid-filled cavities within the kidney and abdomen, are not able to specifically indicate the presence of infection in such a structure (4-6). Labeled leukocytes, on the other hand, appear both highly sensitive and specific for the presence of infection (7-10).

Although [⁶⁷Ga]citrate scanning has been used for many years in the diagnosis of occult infection, there are limitations to its use in this setting. The exact mechanism of gallium uptake in inflammatory processes is not fully understood but adequate blood supply is essential. The renal cysts found in polycystic kidneys appear to lack a good blood supply, possibly contributing to the frequent failure of antibiotic treatment alone for cyst infections and the failure of gallium to identify the abscess in this case despite scanning in multiple projections at 24 and 48 hr (2). Some gallium is excreted by the kidneys and may make image interpretation more difficult, although this is usually in small amounts and symmetric in appearance. Gallium excretion by the colon, however, can make the identification of intra-abdominal infection difficult, especially at 24 to 48 hr. Multiple projections should be obtained, particularly where normal anatomy can be distorted as in polycystic renal disease. Furthermore, gallium accumula-



FIGURE 3

Interior of abscess cavity showing extensive PMN infiltration. Gram stain showed gram + cocci in clusters

tion is not specific for the presence of pyogenic infection and may be seen with nonbacterial inflammatory processes and certain tumors, among others.

Indium-111 leukocyte accumulation is almost always a reflection of an acute pyogenic process. Studies have shown the concentration of indium-labeled leukocytes in abscesses to be 10–15 times higher than [67 Ga]citrate (8,9). Indium-111 leukocyte studies are usually complete at 24 hr, avoiding the 2- to 3-day delay often necessary with [67 Ga]citrate to allow for reduction in background counts and clearing of colon activity.

CT or US identification of fluid-filled cavities within the abdomen is often accompanied by percutaneous needle aspiration for definitive diagnosis and therapy. In the setting of PCRD, where multiple bilateral fluid filled cysts are usually present, this approach becomes seriously limited. Indium-111 leukocyte scanning permits unilateral localization of the infection and thus greatly enhances further therapeutic decisions.

CONCLUSIONS

Indium-111 oxine-labeled autologous leukocytes may

be used to accurately delineate infected renal cysts complicating polycystic kidney disease. Such scans have advantages over standard diagnostic modalities and are very helpful in planning appropriate therapy.

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