# Renal Allograft Abscesses Following Transplant: Case Report and Literature Review

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**Intrarenal and perinephric abscess formations are infrequent infectious complications in kidney allograft recipients. A 37-year-old man who was a victim of mustard gas chemical weapons from the Iran-Iraq war received a live-donor kidney transplant for end-stage renal disease. The posttransplant course was complicated by clinical rejection, which subsided after a 2-week infusion of antithymocyte globulin. One month subsequent to this, the patient presented with renal allograft dysfunction and multiple intrarenal abscesses. Culture from the purulent aspirate of a percutaneously drained renal abscess revealed multidrug-resistant *Pseudomonas aeruginosa*. A concomitant acute cytomegalovirus infection was detected based on positive serologic tests. Treatment with intravenous meropenem (3 g/day for 3 weeks) and oral ciprofloxacin was begun, which resulted in the complete resolution of the intrarenal abscesses. To our knowledge, this report represents the first description of pseudomonal renal abscesses in a renal transplant recipient. A review of the relevant literature is presented.**

**Key words:** *Transplantation,* Pseudomonas aeruginosa, *Mustard gas, Kidney, Cytomegalovirus*

Intrarenal and perinephric abscess formations are infrequent infectious complications in kidney allograft recipients (1). Infections with such organisms as *Escherichia coli* (2, 3), *Ureaplasma urealyticum* (1), *Mycobacterium tuberculosis* (4), *Nocardia* spp. (5), *Staphylococcus* spp., *Streptococcus agalactiae, Bacteroides* spp. (6), and *Aspergillus fumigatus* have been reported as causes of intrarenal or perinephric abscesses following kidney transplant (7). Renal abscesses are difficult to diagnose (8), and early diagnoses and treatment are associated with better outcomes (9). In a series of 88 nontransplant patients with renal abscess, only 15% to 25% received the correct diagnoses at the time of admission (10). Immunosuppression associated with renal transplant may further complicate the clinical course of a renal abscess. Here, we report a kidney transplant recipient with multiple intrarenal abscesses due to *Pseudomonas aeruginosa*. Antibiotic therapy resulted in complete resolution of infection. A review of the relevant literature is presented.

## Case report

A 37-year-old man with end-stage renal disease who had undergone hemodialysis for 3 years received a living-unrelated renal transplant. The cause of his end-stage renal disease was undetermined. The patient was an Iranian veteran and the victim of mustard gas chemical weapons from the Iran-Iraq war approximately 20 years earlier. He had a history of recurrent, mustard-related bullous skin lesions on his limbs. His immunosuppressive regimen included cyclosporine, mycophenolate mofetil, and prednisolone. On posttransplant day 14, his serum creatinine level increased to 305.1 $\mu$mol/L (4 mg/dL). A renal allograft ultrasound and Doppler study disclosed increased cortical echogenicity and an elevated intrarenal vascular resistive index. The patient refused to undergo a renal allograft biopsy. However, with the clinical suspicion of acute rejection, antithymocyte globulin (400 mg/d) was started. His renal function gradually improved, and his serum creatinine level decreased to 152.5 $\mu$mol/L (2 mg/dL) on posttransplant day 22. Antirejection therapy was continued up to posttransplant day 27. The patient was discharged in a favorable clinical condition with a serum creatinine level of 144.9 $\mu$mol/L (1.9 mg/dL) on posttransplant day 29.

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One month later, the patient was admitted with renal allograft dysfunction (serum creatinine, 213.5 μmol/L). His immunosuppressive regimen consisted of mycophenolate mofetil (2 g/d), cyclosporine (300 mg/d), and prednisolone (20 mg/d). His blood pressure was 130/70 mm Hg and his body temperature was 39ºC. A physical examination revealed an alert and oriented, ill-appearing man in no acute distress. Left knee periarticular erythema, tenderness, moderate joint effusion, and restriction of motion were noted. Initial laboratory findings were white blood cell count, 7000/μL; hemoglobin, 105 g/L; hematocrit, 33%; platelet count, 144 000/μL; erythrocyte sedimentation rate (second hour), 90 mm/s; and fasting blood glucose level, 7.22 mmol/L (130 mg/dL). A urinalysis revealed many white and red blood cells. The blood cyclosporine level was 250 ng/mL (on radioimmunoassay). A renal allograft ultrasound study (Figure A) showed 3 cortical, round, hypodense regions (2-3 cm in diameter). Under ultrasound guidance, percutaneous aspiration of the renal cysts was performed that yielded purulent material. Cultures from aspirated material as well as blood and urine samples were performed. Empiric antibiotic therapy with intravenous ceftriaxone (ceftazidime from day 3), gentamicin, and metronidazole was begun. A repeat Doppler study 2 days later demonstrated 2 additional hypoechoic areas (approximately 1 cm in diameter). The previously detected cysts also had grown to 3 to 4 cm (Figure A). On day 4, aspiration of the left knee was performed, which was grossly clear revealing a white blood cell count of 20 000/mm$^3$ (with 40% polymorphonuclear cells), a glucose level of 3.31 mmol/L (60 mg/dL), and a lactate dehydrogenase level of 3.33 μkat/L (200 U/L). A Gram stain of the synovial fluid was unremarkable, and subsequent cultures were sterile suggesting a nonspecific reactive arthritis. A radiograph of the knees and wrists showed soft tissue swelling without any lytic bone lesion.

Direct staining of the aspirate revealed Gram-negative bacilli. Cultures from the patient's urine and renal abscess aspirate (on blood, eosin-methylthionine blue, chocolate, and triple sugar iron agars) showed *Pseudomonas aeruginosa* colonies with characteristic odor/color, Gram morphology, inability to ferment lactose, and positive oxidase reaction. Isolated micro-organisms were resistant to many aminoglycosides (gentamicin and amikacin), β-lactams (cephalexin, ceftriaxone, and ceftazidime), and fluoroquinolones (ofloxacin and ciprofloxacin). The patient had intermittent fevers of 38ºC. Antibiotics were switched to meropenem (intravenously, 1 g t.i.d.) and ciprofloxacin (orally, 0.5 g b.i.d.) on day 5. Anticytomegalovirus IgM and IgG titers were positive. A decreasing white blood cell count with a nadir of 2600/μL was noted on day 7. Results of the patient's liver function tests were normal. Mycophenolate mofetil was reduced to 1 g/day and subsequently, ganciclovir (intravenously, 500 mg/day in 2 divided doses) was administered. On day 9 of admission, the patient developed generalized arthralgia and swelling of both knees and wrists. Joint tenderness and limitation of motion were prominent.

With the initiation of antibiotics, the patient soon became afebrile, and his serum creatinine level decreased to 106.8 μmol/L (1.4 mg/dL) on day 21. Joint pain and swelling gradually resolved within 12 days of their onset. On repeat Doppler ultrasonography, 2 renal abscesses had disappeared and 3 had significantly decreased in size (1-2.5 cm). Meropenem was continued for a total of 3 weeks and oral ciprofloxacin for 8 weeks. On day 50 of admission, the patient was discharged in favorable clinical condition with a serum creatinine level of 99.1 μmol/L (1.3 mg/dL). At 5- and 15-month follow-ups, the patient's renal allograft was functioning well, and all allograft abscesses had disappeared on ultrasonography (Figure B).

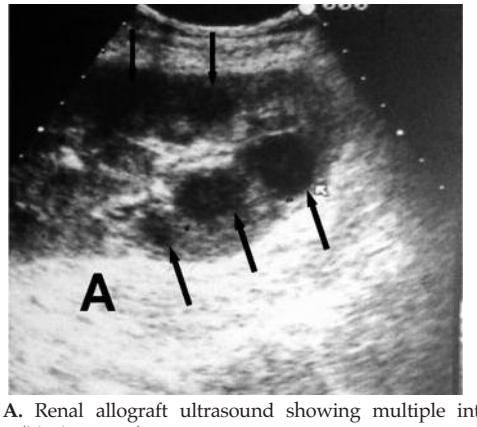


**Figure A.** Renal allograft ultrasound showing multiple intrarenal abscesses (black arrows).

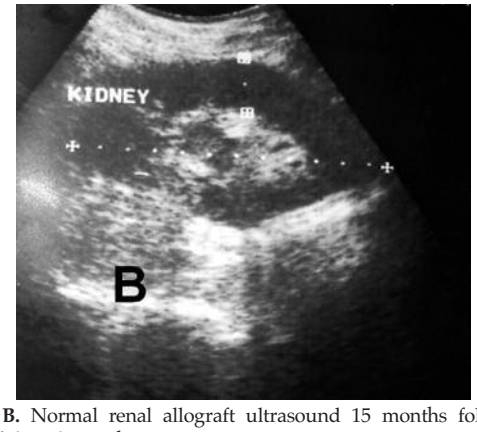


**Figure B.** Normal renal allograft ultrasound 15 months following successful antibiotic therapy.

## Discussion

This report describes a renal transplant recipient with multiple intrarenal abscesses due to multidrug resistant *Pseudomonas aeruginosa*, all of which completely resolved on antimicrobial treatment. The patient had received a prolonged infusion of antithymocyte globulin 4 weeks prior to his presentation. Simultaneous with pseudomonal infection, he developed reactive arthritis, which progressed to a transient and symmetric distal (rheumatoid arthritislike) polyarthritis following the initiation of antipseudomonal antibiotics.

In past decades, *Pseudomonas aeruginosa* was the most common cause of Gram-negative bacteremia in renal transplant recipients (11). Infections with this organism are associated with an increased posttransplant mortality (12). Today, pseudomonal infection has become uncommon following renal transplant. In a series of 269 renal transplant recipients, 1 case of *Pseudomonas* bacteriuria was detected (13). In another study of 142 patients from a kidney transplant center in Iran, 6 cases of urinary tract infection and 1 case of sepsis secondary to *Pseudomonas aeruginosa* were identified (14).

Urolithiasis, diabetes mellitus, use of corticosteroids and immunosuppression are major predisposing factors to renal abscess formation (8-10). Interestingly, enhanced survival of Pseudomonal aeruginosa has been reported following anti-lymphocyte serum administration in animal models (15, 16). Hence, in the present patient, the history of recent prolonged antithymocyte globulin therapy could be considered a potential predisposing factor for Pseudomonal infection of the allograft. However, such an association remains to be investigated in future studies of patients with infections following renal transplant. Moreover, the present patient had been exposed to mustard gas 20 years earlier. Previous studies have shown that acute mustard gas exposure is associated with long-term immune dysfunction. Patients exposed to mustard gas may have dysmorphic T cells, lower levels of CD4+/CD25+ lymphocytes, and higher rates of recurrent infections with opportunistic micro-organisms (17).

Pseudomonas has an affinity for hematogenous spread and inoculation of the sternoclavicular and sacroiliac joints as well as the other fibrocartilaginous joints of the axial skeleton (18, 19). In the present patient, the culture of synovial fluid was sterile, which excluded direct pseudomonal infection as the cause of arthritis. However, the concomitance of reactive arthritis with pseudomonal infection and its aggravation on the initiation of antipseudomonal antibiotics are in keeping with a cytokine-mediated mechanism. In certain infectious diseases, the first doses of an effective antimicrobial drug can trigger a potent host reaction to liberate proinflammatory cytokines (20, 21). In vitro studies show that exposure to ceftazidime and to a lesser extent, carbapenems, could enhance endotoxin release from *Pseudomonas aeruginosa* (22, 23). Bacterial endotoxins subsequently induce the release of interleukin (IL)-1, IL-6, IL-8, and tumor necrosis factor-alpha from circulating mononuclear cells (20). These cytokines, especially IL-1 and tumor necrosis factor-alpha, are implicated in the pathogenesis of rheumatoid arthritis or rheumatoid arthritislike polyarthritis (24). Interestingly, Kobayashi and associates reported a reactive arthritis in a patient with *Pseudomonas aeruginosa* infection (25). Gerard and associates also identified DNA of *Pseudomonas* spp. in the synovial fluid and tissue of 3 patients with reactive arthritis (26).

Additionally, the present patient had received a 2-week infusion of antithymocyte globulin 1 month prior to admission. He also had a concomitant acute cytomegalovirus infection (based on serologic studies) and received meropenem and ciprofloxacin for chemotherapy. Antithymocyte globulin, a polyclonal antiserum against lymphoblastic T cells, is usually raised in rabbits (27, 28). Serum sickness has been reported to occur 7 to 13 days following antithymocyte globulin infusion (29, 30). Serum-sicknesslike reactions also have been described with meropenem and ciprofloxacin (31, 32). Arthritis of the shoulder and metacarpophalangeal joints secondary to direct cytomegalovirus invasion has been reported in renal transplant recipients (33). However, the course of such viral arthritis is usually protracted and requires longer antiviral therapy (33, 34).

In conclusion, we have reported a renal transplant recipient with multiple intrarenal abscesses due to multidrug-resistant *Pseudomonas aeruginosa*, which completely resolved by parenteral antibiotic therapy. To our knowledge, this is the first description of pseudomonal renal abscesses in a renal transplant recipient.

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