

# Unilateral Acute Renal Cortical Necrosis in a patient with Sepsis

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## Abstract

Unilateral renal cortical necrosis is a rare entity with few cases reported across the globe. Acute kidney injury occurs as a complication of the cascade of immunological events that ensue once the host's system is compromised due to invasion of microorganisms or due to other noninfectious causes. We present a case of unilateral acute renal cortical necrosis in a patient presenting with acute respiratory distress syndrome (ARDS) and sepsis with multi-organ failure that required extracorporeal cytokine adsorber therapy

**Keywords:** Extracorporeal cytokine adsorber therapy, Sepsis, Renal cortical necrosis, ARDS.

## Introduction

Renal cortical necrosis as such is a rare clinical entity with reported global incidence of 2-4% [1]. Cases have been reported following poisoning, obstetric complications, acute pancreatitis or sepsis [2]. Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection [3]. Being the leading cause of death in any intensive care unit, research on newer modalities of treating sepsis has not ceased. Unilateral acute renal cortical necrosis is uncommon while there have been reports of bilateral cortical necrosis in patients with Sepsis. We present an interesting case of acute unilateral renal cortical necrosis in a young woman presenting with ARDS and sepsis with multi-organ failure. She was managed with early appropriate antibiotic therapy and renal replacement therapy (RRT) using extracorporeal membrane filter and multi-disciplinary care which resulted in complete recovery.

## Case Report

A 31-year-old female was admitted to our tertiary care hospital located in Chennai, India with complaints of high grade fever for 2 days and sudden onset breathlessness of

one day duration. In view of acute respiratory distress, she was intubated at an outside health care facility, started on vasopressors for hemodynamic support and referred to our hospital thereafter. Before referral, she was also diagnosed to have left distal ureteric calculus causing mild hydronephrosis (HUN) after having reported abdominal pain for 3 days and decreased urine output. At the time of presentation to our facility, she was febrile, tachycardic and hemodynamically labile on vasopressor support with GCS of 3T (E1VTM2). On examination, bilateral basal crepitations with decreased air entry were noted along with anuria. Baseline investigations on admission revealed anemia, leukocytosis, thrombocytopenia, deranged renal parameters and liver enzymes and coagulopathy. Arterial Blood gas analysis revealed severe metabolic acidosis with increased lactate levels. ECG and echocardiography were within normal limits. Emergency renal replacement therapy (RRT) in the form of sustained low efficiency dialysis (SLED) was initiated in view of acute kidney injury, anuria and metabolic acidosis. She was started on empirical broad spectrum antibiotic therapy after sending blood cultures and

bronchoalveolar lavage (BAL) samples. Non contrast Computed Tomography (CT) chest revealed diffuse ground glassing with patchy airspace opacities and bilateral mild pleural effusion. Contrast enhanced CT abdomen showed non-enhancing right renal cortex, features of acute renal cortical necrosis and left distal ureteric calculus causing mild hydronephrosis (HUN) of left kidney. Screening for tropical illnesses such as Dengue, Malaria, Scrub Typhus and Leptospirosis were negative. Procalcitonin levels were very high suggesting of systemic infection. Patient remained sick with worsening shock, hypoxia requiring ventilator support and was initiated on extracorporeal blood purification using Cytosorb®. Initial interleukin 6 levels were 200.72pg/ml (normal range 5-7pg/ml) and following Cytosorb® therapy interleukin 6 levels dropped to 15.36pg/ml and shock improved with gradual weaning off vasopressor support. Urologist opinion was sought later and she further underwent cystoscopy and left ureteroscopy along with lithotripsy and a double J (DJ) stent was placed. Right kidney de-cortication was done and post operative period was uneventful. Bronchoalveolar lavage revealed growth of

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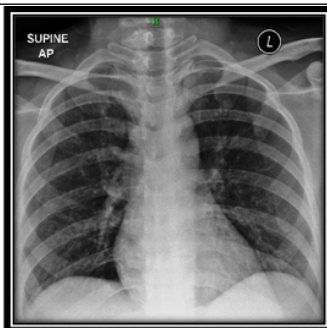
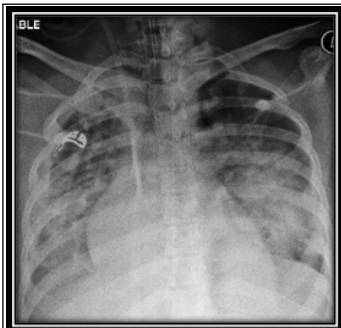
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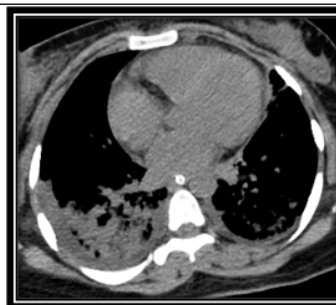
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Dr. Visweswar Reddy



**Figure 1 & 2:** Chest X-ray on admission showing ARDS with right IJV dialysis catheter (Fig-1 left) and normal X-ray (Fig-2 right) at discharge after full recovery.



**Figure 3 & 4:** Non-Contrast CT Chest (Fig-3 mediastinal window on the left, Fig-4 Lung window on the right) showing bilateral consolidations involving both lower lobes along with pleural effusion.

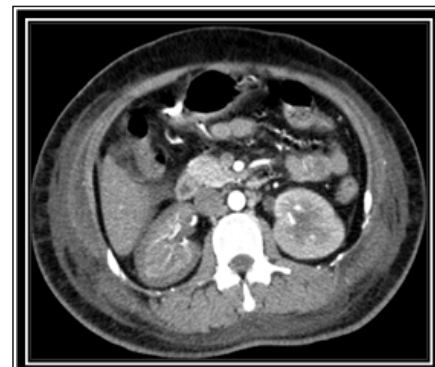
Candida tropicalis and multidrug resistant Pseudomonas which were treated with appropriate antibiotics and antifungals. Urine and blood cultures were reported negative. Once hemodynamically stable and symptomatic improvement was achieved, she was weaned off ventilator. Regular monitoring of baseline blood parameters, chest X ray were done and showed consistent improvement. She was subsequently discharged on partial recovery of acute kidney injury. She remained stable at one month follow up with complete recovery of renal functions.

**Discussion**

Microorganisms entering a host are the first trigger to inflammatory response. Inflammatory response begins after interaction between pathogen-associated molecular patterns expressed by pathogens and corresponding pattern recognition receptors expressed by host cells on cell surface [4]. Foci of infection resulting in sepsis could be from respiratory tract (pneumonia), urinary tract (UTI, pyelonephritis), intra-abdominal infections etc [4]. The foci for sepsis in our patient was probably respiratory tract infection as she presented with acute respiratory distress.

Renal calculus which was surgically managed could have also worsened her general condition. All these entities resulted in acute renal cortical necrosis. The forerunner of inflammatory mediator released as a result of pathogen-host interaction is cytokines, the earliest and robust pro-inflammatory cytokine being Interleukin - 6 [5]. Measuring cytokine levels in blood has therefore become a potential marker for diagnosing sepsis. Our patient had elevated levels of Interleukin - 6 and procalcitonin in blood suggesting sepsis. However, her blood cultures did not reveal significant growth and may suggest partial treatment or culture negative sepsis. Elevated endotoxin levels as a result of bacterial multiplication in sepsis patients can also be an ideal target for diagnosis and monitoring treatment prognosis. For this reason, endotoxin removal using polyester filters often referred as ‘blood purification’ is increasingly being considered [6]. This method involves the use of a biocompatible polymer which binds to compounds with a molecular weight between 10 and 55 kDa such as cytokines [7]. This results in marked reduction of cytokine levels in blood of sepsis patients on continuous renal replacement therapy.

Modifications such as the addition of Polymyxin-B immobilized polystyrene derived fibers have gained popularity in Japan, Europe [8,9]. We reiterate the benefits of early renal replacement therapy in a patient with unilateral renal cortical necrosis. Early renal replacement therapy has proven to be beneficial in patients with bilateral renal cortical necrosis as reported by Kennedy et al. [10] Positive correlation with a significant difference in cytokine levels (Interleukin-6) was noted in our patient. Our literature search revealed various reports of bilateral acute renal cortical necrosis in sepsis. Unilateral acute renal cortical necrosis has been reported in renal transplantation [11], malignancy, [12] and with physical exercise [13]. To our knowledge this case of unilateral cortical necrosis in patients with an infectious etiology is one of the very few isolated cases reported in the literature. Most cases of unilateral cortical necrosis present with



**Figure 5 & 6:** Figure 5 (left): Contrast Enhanced CT abdomen showing non-enhancing right renal cortex suggestive of acute renal cortical necrosis and leftHydroureteronephrosis . Figure 6 (right): Non Contrast CT-KUB showing pig-tail inserted in right pelvic cyst and left DJ stent noted in situ.

Table 1: Baseline investigations done at admission.	
Investigations	Value
Hemoglobin	8.9 gm%
PCV	28%
Total leukocyte count	37.14 (10 <sup>3</sup> /mm <sup>3</sup> )
Platelet count	36 (10 <sup>3</sup> /mm <sup>3</sup> )
Differential count:	
Neutrophils	88%
Lymphocytes	9%
Monocytes	3%
Urea	204 mg/dl
Creatinine	4.9 mg/dl
Total bilirubin	1.6 mg/dl
SGOT	95 U/L
SGPT	50 U/L
Alkaline phosphatase	46 U/L
Gamma glutamyltransferase	32 U/L
Total serum protein	4.6 g/dl
Serum albumin	2.6 g/dl
Serum globulin	2 g/dl
Sodium	136 mEq/L
Potassium	3.2 mEq/L
Calcium	7.2 mg/dl
Chloride	110mEq/L
Random blood glucose	91 mg/dl

contralateral hydronephrosis [14]. We observed the same pattern in our patient with contralateral hydroureteronephrosis due to distal ureteric calculus. The presence of unilateral hydronephrosis may be protective and help conserve a kidney in shock [14]. This might also be the reason for good prognosis and recovery in our patient. A large study on renal cortical necrosis from India classifies patients based on clinical course into five categories such as (1) death in uremia during the acute phase; (2) survival without dialysis; (3) late return

to dialysis/transplant; (4) survival only with chronic maintenance dialysis/transplant; and (5) late resumption of sufficient renal function to become dialysis independent [15]. High mortality rates were observed in patients with uremia during acute phase. Those patients on dialysis have lower mortality rates signifying positive benefits of early dialysis in patients with renal cortical necrosis. Although the incidence of acute renal cortical necrosis has significantly decreased in developing countries, scattered reports and unique clinical presentations

like the one we present should be reported to pick up these cases early and effectively manage the same.

### Conclusion

Unilateral Cortical Necrosis is rare in patients with Sepsis. Applying evidence based principles of sepsis management and use of extracorporeal membrane filters was associated with a positive renal and overall outcome in our patient.

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