

# Role of Computed Tomography in the Management of Acute Pyelonephritis

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## A B S T R A C T

**Introduction:** Acute pyelonephritis (APN) is most common urinary tract infection, accounts for high morbidity and health care cost. The aim of this present study was to evaluate the role of computed tomography (CT) in the management of acute pyelonephritis.

**Material and Methods:** This was a prospective study carried out in Department of Radiology, MNR Medical College Hospital, from May 2015 to June 2017. This study was based on the analysis of CT images of acute pyelonephritis. Statistical analysis was done by using SPSS 20.0 software. The study was approved by institutional ethical committee.

**Results:** A total of 250 patients clinically diagnosed with acute pyelonephritis were included in the study. About 44% had normal CT scan report and 56% patients had minor or major abnormalities. 12.4% patients had hydronephrosis, 8.8% had renal abscess, and 10% had emphysematous changes. Renal edema, renal cyst, renal stone, perinephric fat was 36%, 35.2%, 30.8%, 6.8%, respectively. Only 5% patients needed percutaneous nephrostomy or drainage of an abscess.

**Conclusion:** Management of acute pyelonephritis by using computed tomography imaging system provide better treatment outcome.

**Key words:** Acute Pyelonephritis, Computed Tomography, Renal Calculi, Renal Abscess

## INTRODUCTION

Acute pyelonephritis is define as a renal inflammation, most commonly occurs in female population age group between 15-40 years.<sup>1,2,3</sup> Most of times, the diagnosis of APN is made by clinical and laboratory tests.<sup>4</sup> Various imaging technique are available to diagnose the renal inflammation cases. Computed tomography imaging provides better management of such cases because of its high sensitivity and specificity.<sup>1,5,6</sup> But its routine use is hindered by the risk of radiation exposure and allergic reactions and nephrotoxic risks due to contrast.<sup>7,8</sup> Thus its utilization is basically restricted to cases of suspicion of complications, patients with an unfavorable clinical progression or in functional or morphological alteration of the urinary tract.<sup>7,9</sup> Therefore the present study was designed to evaluate the role of computed tomography in the management of acute pyelonephritis cases.

## MATERIAL AND METHODS

This was a prospective study conducted in Department of Radiology, MNR Medical College and Hospital during the period of 2 years from May 2015 to June 2017.

Clinical, laboratory diagnosis and CT findings were done for all the suspected cases. The contrast enhanced images were acquired after intravenous injection of iodinated, nonionic (Opriray, 320-320 mg/ml) contrast agent, at a dose of 2 ml/kg, up to a maximum volume of 200 ml, with an injection pump (rate 3 ml/s). The institutional ethical committee approved the study.

## STATISTICAL ANALYSIS

Statistical software SPSS 20.0 used to analyze the data. Descriptive statistics were used to interpret the data.

## RESULT

A total of 250 patients clinically diagnosed with acute pyelonephritis were included in the study. 45.2% were male patients and 54.8% were female patients. Patient's age group ranges from 15-50 years [Table 1]. About 44% had normal CT scan report and 56% patients had minor or major abnormalities. 12.4% patients had hydronephrosis, 8.8% had renal abscess, and 10% had emphysematous changes. Renal edema, renal cyst, renal stone, perinephric fat was 36%, 35.2%, 30.8%, 6.8%,

Variable	Total No. of cases (%)
Male	45.2
Female	54.8
Age group	
15-20	6.4
21-30	31.6
31-40	23.6
41-50	38.4

**Table-1:** Demographic data of acute pyelonephritis cases (n= 250)

Category	Total No. of cases (%)
Normal	44
Major abnormality	18.8
Hydroureteronephrosis	12.4
Renal abscess	8.8
Emphysematous changes	10
Minor abnormality	37.2
Renal edema	36
Renal cyst	35.2
Renal stone	30.8
Perinephric fat	6.8

**Table-2:** Computed tomography findings of acute pyelonephritis.

respectively. Only 5% patients needed percutaneous nephrostomy or drainage of an abscess [Table 2].

## DISCUSSION

Acute pyelonephritis is a major public health problem. Diagnosis of APN is based on clinical features, laboratory diagnosis and radiological findings. Untreated cases of obstructive uropathy, renal abscess, and emphysematous pyelonephritis, can result in septic shock and death.<sup>1,10</sup> Therefore it is necessary to diagnose the case as early as possible for better treatment. Radiological imaging techniques such as Ultrasonography, CT scan etc. are available for the diagnosis of such cases. Though these imaging tests are widely available, over utilization of resources and workforce without any added benefit to patient care remains a concern. Hence, we evaluated the utility of computed tomography in the management of APN. Our study showed abnormalities on CT in 56% of patients. The detection rate of major abnormalities in our study (18.8%) was lesser than that reported by Chen et al., Shubhanker Mitra et al. and Lim SK et al.,<sup>11,12,13</sup> As per the American College of Radiology guidelines, routine radiological imaging (X-ray pyelography, EUS, CT, or magnetic resonance imaging) has a limited role and adds little to the management of patients with acute uncomplicated APN if the patient responds to therapy within 72 hours[14] We, therefore, tried to evaluate the factors predicting abnormalities on a CT so that indiscriminate use of CT can be avoided. We found the presence of diabetes mellitus, peripheral WBC count

>10,000 cells/cumm, serum creatinine >1.4 mg%, and urine WBC count >100 cells/hpf to be associated with abnormal CT findings. Rollino et al. found no significant correlation between leukocytosis, ESR, CRP, urinary leukocytes, urine culture, and duration of symptoms between patients with positive and negative CT scans.<sup>14,15</sup> Surgical interventions that are usually required in cases of complicated APN include percutaneous nephrostomy, abscess aspiration, nephrectomy. Although more than half of our patients had an abnormal finding on CT, only 5% of the patients required surgical intervention. Hence, only patients with a high risk of developing a complicated APN should be screened so that appropriate surgical intervention may be initiated. Certain limitations of our study, such as, less sample size and study conducted in single medical centre.

## CONCLUSION

The present study showed that, in patients submitted to CT scan, the frequency of the different tomography findings suggestive of acute pyelonephritis is high. Despite their subjectivity, tomography signs of acute pyelonephritis present high reproducibility, ratifying the CT value in the evaluation of this group of patients.

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