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CASE SERIES ON ROLE OF RADIOLOGY IN DIAGNOSIS AND MANAGEMENT OF EMPHYSEMATOUS PYELONEPHRITIS

Radiology

KEYWORDS: Emphysematous Pyelonephritis (EPN), Pyelitis, percutaneous catheter drainage.

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ABSTRACT

Emphysematous pyelonephritis (EPN) is a severe life-threatening, necrotizing infection of the kidneys, the hallmark of which is gas formation within the renal parenchyma, the collecting system, and perirenal tissues. Radiology has a challenging role; while X-rays and USG can often prove inconclusive, C.T. Scan has emerged as the most sensitive imaging tool and has proved beyond doubt to be the corner stone for confirmation of diagnosis. Radiology also plays an important role in grading of severity as well as management of cases of EPN.

INTRODUCTION

Kelly and Mac Callum reported the first case of emphysematous pyelonephritis (EPN) in 1898. Emphysematous Pyelonephritis is a rare necrotising infection of the renal parenchyma and perirenal tissues which carries a high risk of mortality if not treated promptly. The term EPN should be applied to the disease characterized by gas formation in the renal parenchyma, collecting system and perirenal tissue. Gas in the renal pelvis alone, without parenchymal gas, is often referred to as emphysematous pyelitis. The predisposing factors are diabetes mellitus and ureteric obstruction. Escherichia coli and Klebsiella pneumoniae are the most common organisms isolated from urine culture in such cases. The diagnosis of EPN is established Radiologically.

Emphysematous pyelonephritis is classified according to the Huang-Tseng's CT classification as follows :

Class 1: gas confined to collecting system
Class 2: gas confined to renal parenchyma [Figure - 1]
Class 3a: extension of gas to perinephric space
Class 3b: extension of gas to pararenal space [Figure - 2 & 3]
Class 4: bilateral or solitary kidney with EPN

AIMS AND OBJECTIVES

To diagnose the extent of pathology by using CT Scan and grading its severity by applying the Huang-Tseng's C.T. Classification.
To ascertain the most successful treatment regime.

Materials and Methods

We reviewed the hospital records of 10 patients admitted between January 2015 and January 2017 with EPN for Clinical, Laboratory, Radiological, and Microbiological findings, treatment given, and outcome. The severity of EPN was graded as per the Huang-Tseng's C.T. Classification.

Certain factors have been associated with poor outcome in EPN; these bad prognostic indicators include thrombocytopenia, azotemia, hematuria, altered consciousness, shock (systolic blood pressure [BP] <90 mmHg) on initial presentation, severe proteinuria, need for emergency hemodialysis, severe hypoalbuminemia (serum albumin <3 g/dl), polymicrobial infections, and extension of infection to the perinephric space.[3],[8],[9],[10],[11]

We defined conservative treatment of EPN as medical treatment alone or a combination of medical treatment and percutaneous catheter drainage. The success of conservative treatment was defined as clinical resolution and disappearance/decrease in gas on follow-up imaging during hospitalization and after discharge from hospital. As per the protocol followed at our department, the treatment included achieving early adequate fluid electrolyte balance, rapid control of hyperglycemia through insulin infusion, close clinical and biochemical monitoring, initiation of two potent antibiotics at diagnosis, and percutaneous catheter drainage (if required). The antibiotics included a third-generation cephalosporin and a fluoroquinolone; patients who had septic shock received Vancomycin and Imipenem. The antibiotics were revised if indicated by the results of susceptibility testing of the isolated organism. Cases where candida species was isolated were managed with Amphotericin B for 2 weeks followed by oral Fluconazole for 2 weeks. Deterioration on this protocol leads to consideration for nephrectomy. All patients were followed up for at least 6 months after discharge from the hospital. Results are expressed as mean ±standard deviation.

Laboratory and Radiological Data

All patients had pyuria and a quarter (25%) had hematuria. A majority (90%) of patients had leukocytosis and a third (33%) had thrombocytopenia; the mean total leukocyte count of the patients was 18,230/mm 3 with a range of 13,800–22,340/mm 3. The blood glucose concentration at admission ranged from 240 to 900 mg/dl with a mean of 450 ±150 mg/dl; the mean glycosylated hemoglobin (HbA1c) at diagnosis of EPN was 10.7 ±2.4% and ranged from 6.4 to 16% reflecting a poor glycemic control in majority of the patients. More than three-fourths (80%) of the patients had azotemia at presentation; the mean serum creatinine was 2.14 ±0.9 mg/dl with a range of 1.9–4.7 mg/dl. Six patients had severe hypoalbuminemia (serum albumin <3 g/dl). All patients had ultrasonography and CT of abdomen; while the former was diagnostic in 20%, the latter revealed the diagnosis in all. The left kidney was involved in 1, the right kidney in 8, and both kidneys in 1 patient. We classified our patients on the basis of Huang-Tseng's C.T. Classification with 4 (40%) in class 1, 3 (20%) in class 2, 1(15.3%) in class 3A, 1 (10%) in class 3B [Figure 1], and 1 (10%) in class 4 [Figure 2]. Of 10 patients, 2 (20%) had two or more bad prognostic indicators.

Microbiologic data

Escherichia coli was the most commonly isolated organism and was isolated in all the 10 patients (from blood and urine in 5, urine alone in 3, and pus alone in 2). Proteus mirabilis was isolated from urine in 1 patient. In two patients, we isolated candida species from urine.

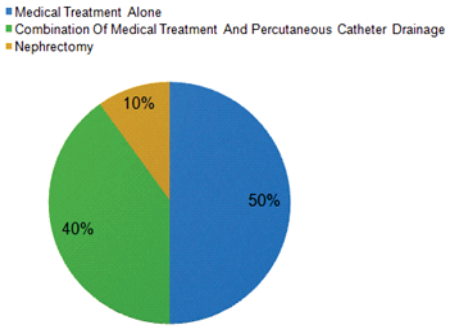
Post Treatment Outcome

Of the 10 patients in our series, 5 were managed with medical treatment alone, 4 with a combination of medical treatment and percutaneous catheter drainage, and only one patient underwent nephrecto-

my and survived. The first patient was a 54-year-old female with type 2 DM and liver cirrhosis who presented with class 3A EPN and initial CT abdomen had shown more than 50% renal parenchymal destruction. She deteriorated on conservative treatment and repeat CT revealed worsening of renal parenchymal destruction which prompted the decision to subject her to nephrectomy 5 days after admission.

Review of literature reveals that earlier, nephrectomy was the only treatment offered to cases of EPN. However, in recent times, aided by better diagnosis with the help of Multidetector C.T.Scan and guided by the Huang-Tseng's C.T. Classification, nephrectomy can be averted and the kidney saved successfully with just conservative management.

The treatment in our series had a very impressive (90%) success rate considering in 9 of the 10 patients who did not need to undergo nephrectomy, thus salvaging the affected kidney with conservative treatment alone



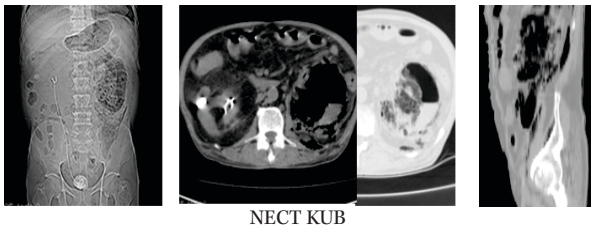
Pie Chart showing the Post Treatment Outcome



X RAY FRONTAL RADIOGRAPH KUB REVEALS :-

- RADIO OPACITY IN THE RIGHT LUMBAR REGION AT THE LEVEL OF L1 VERTEBRAL BODY MEASURING APPROXIMATELY 2 X 2 CM
- SIMILAR RADIO OPACITY IS ALSO SEEN IN THE PELVIS MEASURING 5X4 CM
- FINDINGS SUGGESTIVE OF S/O CALCULI IN THE RIGHT KIDNEY AS WELL AS IN THE BLADDER
- THERE IS A WELL DEFINED RADIOLUCENCY SEEN ALONG THE LEFT RENAL FOSSA EXTENDING FROM D12 TO L2 VERTEBRAL BODY WITH INFERIOR MARGIN APPEARING HAZZY WITHOUT ANY EVIDENCE OF ANY FLUID LEVELS SEEN WITHIN IT.
- THERE IS NO EVIDENCE OF ANY AIR FLUID LEVELS SEEN IN THE ABDOMEN AND PELVIS.
- DJ STENT IS SEEN ON THE RIGHT SIDE AND IS IN SITU
- VISUALISED BONES APPEAR NORMAL

Further Ultrasound KUB was performed which was inconclusive due to excessive bowel gas, hence a NECT KUB was advised.



NECT KUB

FIG.1. - C.T. TOPOGRAM

FIG.2. = SHOWS A CALCULUS IN THE MID POLE OF THE RIGHT SIDE. A RIGHT SIDED D.J.STENT IS SEEN IN SITU. THERE ARE MULTIPLE AIR POCKETS SEEN WITHIN THE LEFT RENAL FOSSA WITH COMPLETE DESTRUCTION OF THE LEFT RENAL PARENCHYMA AND AIR FLUID LEVELS SEEN. THERE IS EVIDENCE OF AIR SEEN IN THE LEFT PARARENAL SPACE.

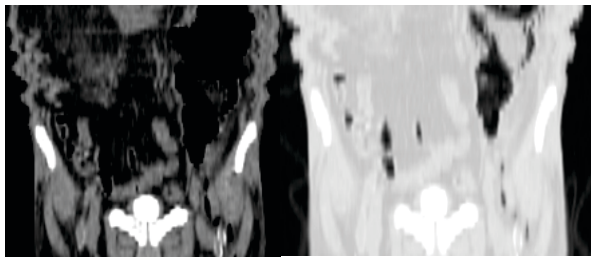


FIG.1. = C.T. TOPO FIG.2. :- C.T. AXIAL IMAGES (L= ABDOMEN WINDOW, R= LUNG WINDOW)

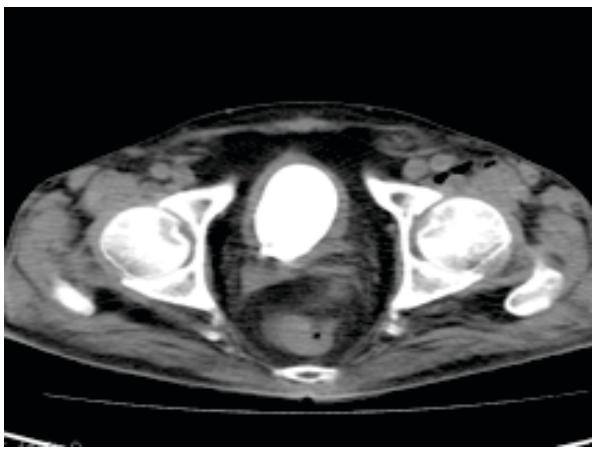


FIG.3. :- RECONSTRUCTED C.T. SAGGITAL IMAGE

FIG.3. & .4. = THERE IS EVIDENCE OF AIR POCKETS SEEN GOING ALONG THE LEFT PSOAS MUSCLE DOWN TOWARDS THE LEFT INGUINAL REGION.

FIG.5. = THERE IS A LARGE CALCULUS SEEN WITHIN THE BLADDER.

DISCUSSION

In summary, in high risk groups, such as diabetic patients, who present with persistent upper urinary tract infection that does not resolve with antibiotic treatment, the presence of a severe renal infection such as EPN should be considered. CT- guided percutaneous drainage or open drainage, along with antibiotic treatment, may be a reasonable alternative to nephrectomy. However surgical intervention should not be delayed in patients with extensive disease or in those who do not substantially improve after

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appropriate medical treatment and drainage.

The clinical scenario of EPN has changed over the years, which is reflected in our study. Earlier EPN used to be synonymous with perilous presentations with extensive disease. Owing to widespread availability of better investigative Radiological tools, early detection (even small pockets of air in kidney in patients of urosepsis) has become possible. With more effective newer antibiotics and better intensive care including dialytic support services, the outcome in these patients has improved remarkably. There is a distinct trend of managing EPN more conservatively with favorable outcomes and impressive reduction in overall mortality. Managing EPN more conservatively has thus become the standard of care with Radiology also playing an active role vide guided percutaneous drainage procedures. However patients with high CT grade of lesions (CLASS 3B and CLASS 4) with altered sensorium, oliguria, hematuria and deranged renal function tests at presentation are more likely to die due to the disease and may require a more aggressive surgical plan.

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