

ACUTE SUPPURATIVE RENAL INFECTIONS

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SYNOPSIS

18 cases of acute suppurative infections seen as renal carbuncles (cortical abscesses), perinephric abscesses and acute pyonephroses are presented. The vast majority (83.3%) were females. 75% of those with carbuncles and perinephric abscesses were diabetics. A variable symptomatology is seen and this influences diagnostic accuracy. Intravenous urogram and ultrasound are the main methods of diagnosing the pathological processes. Abscess culture grew gram negative organisms in 94.7%. An intrinsic renal tract disease is therefore the starting point in the majority. Nephrectomy was needed in 62.5% of renal carbuncles, whereas perinephric abscesses occurring in isolation were treated by drainage procedures. The acute pyonephroses were managed by initial drainage and subsequent removal of the underlying obstruction and when necessary a nephrectomy was carried out. Whenever possible, consideration was given for conserving the kidney. The mortality directly related to sepsis was 16.7%.

INTRODUCTION

Acute pyogenic infections in or adjacent to the kidney presents as an important urologic emergency. The surgeon encounters this entity in the form of renal carbuncles, perinephric abscesses and acute pyonephroses. A renal carbuncle forms as a coalescence of multiple cortical abscesses whereas a perinephric abscess is a collection of pus between the kidney and Gerota's fascia. Both of these can occur in isolation or simultaneously, stemming from a similar starting point believed to be pyelonephritis (1). The acute pyonephroses arise secondary to obstruction of the urinary tract and the suppurative process may be so destructive as to involve the renal parenchyma and perinephric space. The presentation can be variable and a delayed or misdiagnosis can lead to a disastrous outcome. Optimum management would therefore

TABLE I
SEX INCIDENCE

Sex	Carbuncles	Perinephric Abscesses	Obstructive Pyonephrosis	Total
Female	8	2	5	15
Male	0	2	1	3
Total	8	4	6	18

TABLE II
SYMPTOMS AND SIGNS

Symptoms & Signs	Carbuncles (8)	Perinephric Abscess (4)	Pyonephrosis (6)	Total (18)
Fever	7	4	6	17 (94.4%)
Loin Pain	6	4	6	16 (88.9%)
Loin Swelling	1	3	1	5 (27.8%)
Dysuria	2	1	2	3 (16.7%)
Haematuria	1	1	1	3 (16.7%)
RHC Pain	1	0	0	1 (5.6%)
Palpable Kidney	2	0	5	7 (38.9%)

demand a high index of suspicion. Confirmation of diagnosis is by excretory urogram, ultrasonography (2), CT Scan and rarely arteriogram. There has been changing concepts in the modes of management. Though surgical drainage or nephrectomy remain as important traditional practices a more conservative approach with percutaneous drainage (2, 3, 4) and intensive antibiotic therapy in the case of carbuncle of the kidneys may be successful in some cases.

The purpose of this paper is to review our experience with this group of patients and to work out the diagnostic approach and future management policy.

METHODS

We received 18 case histories during the period from 1980 to April 1984. 7 of them were transferred from the medical unit while the remainder were direct admissions to the surgical unit. It was convenient to highlight them as 2 major groups:

- (A) the non-obstructive and
- (B) the obstructive acute renal infections

Of the non-obstructive group 3 were renal carbuncles, 5 were carbuncles with perinephric abscesses and 4 were isolated perinephric abscesses. There were 6 cases of acute pyonephroses due to distal obstruction of the urological tract. (5 renal calculi and a Pelvi-ureteric junction obstruction).

RESULTS

Patient Characteristics

The youngest patient was 16 years old and the oldest was 83. Peak incidence occurred in the 50-69 age group (61.1%). The overall sex ratio showed an impressive predominance of females in both obstructive and non-obstructive groups of 5:1 (Table I).

All cases showed unilateral involvement with both right and left kidneys affected equally.

SYMPTOMATOLOGY

The symptomatology is presented in Table II. Fever was the most common complaint (94.4%) and were usually above 30°C. 88.9% had loin pain at the affected side.

Dysuria was an infrequent complaint (11.1%). One of the 18 patients presented with significant right hypochondrium pain and was mistaken for acute gall-bladder disease.

The duration of symptoms ranged from 2 days to 4 weeks in this series. The majority were however less than 1 week. In the clinical examination 5 cases (27.8%) had a tender loin swelling and these were mainly those who had perinephric abscesses where the inflammatory process was in closer proximity to the surface. Another 7 (38.9%) had a tender palpable kidney and they were mainly the pyonephrotic involvements. 2 cases of renal carbuncles belonged to this category.

Diabetes was the most interesting associated clinical problem. 75% of those with carbuncles and perinephric abscesses were diabetics while only 33.3% of the acute pyonephroses were so. (Table III).

TABLE III
DIABETIC INCIDENCE

	Total No.	No. of Diabetics
Non-obstructive (carbuncles and perinephric abscesses)	12	9 (75%)
Obstructive (pyonephrosis)	6	2 (33.3%)

LABORATORY EVALUATION

Leucocytosis was demonstrated in 83% of our patients, 50% had a count more than 15,000. We found

TABLE IV
ABSCESS CULTURE

	E. Coli	Klebsiella	Proteus	Others
Non-Obstructive (Carbuncles & perinephric abscesses)	6 (33.3%)	5 (27.7%)	0	Staph. Aureus — 1
Obstructive (Pyonephrosis)	0	0	4 (22.2%)	Citrobacter — 1 No growth — 1

*GM Negative Organisms: 88.9%

TABLE V
ANTIBIOTIC SENSITIVITY

Organisms Nos.	Ampicillin	Gentamicin	Cephalosporin	Bactrim	Cloxacillin
E. Coli (6)	2	5	4	2	0
Klebsiella (5)	0	3	3	1	0
Protens (4)	2	3	3	3	0
Staph (1)	0	0	1	1	1
Total	4	11	11	4	1

no correlation between the severity of leucocytosis and the severity of the infective episode. Haemoglobin of less than 10 gram % was revealed in 57.9% of cases.

Pyuria was seen in 72.2% of cases, correlating well with other studies, and implying that lack of pyuria does not exclude a suppurative renal infection. Urine cultures were not helpful in diagnosis in our study. Contaminated urine samples were common and when cultures were positive the correlation with final abscess cultures were poor. Blood cultures were however more helpful. 10 positive cultures were obtained out of 12 which were done. All grew gram negative organisms, with an 80% correlation with abscess cultures. A scrutiny of the abscess culture revealed an overwhelming incidence of gram negative organisms — Table IV. The main aetiological agents were E. Coli, Klebsiella and Proteus. The latter occurred only in the obstructive pyonephroses group when secondary to calculous disease. There was a solitary case due to Staphylococcus in a perinephric abscess.

Table V illustrates the antibiotics sensitivity of the abscess organisms. Most of the organisms were sensitive to gentamicin and cephalosporins.

ACCURACY OF CLINICAL DIAGNOSIS

A correct diagnosis at the initial moment of presentation was made in only 7 out of 18 cases (38.9%). Inaccuracies were common and the usual label being urinary tract infection, pyelonephritis and renal mass for investigation. 2 cases were given a non-urolologic diagnosis — acute cholecystitis and abdominal wall abscess. A further breakdown illustrates that the acute pyonephrosis were diagnosed more accurately because of the presence of a palpable kidney as well as calculi on radiographs. Only one-third of the carbuncles and perinephric abscesses were diagnosed correctly prior to subjecting them for further investigations.

RADIOLOGICAL AND ULTRASOUND DIAGNOSIS

Helpful imaging techniques were plain abdominal

films, intravenous urogram and ultrasound.

2 patients had plain films showing gas in the perinephric area pointing to a diagnosis of perinephric abscess (Figure 1).

5 out of 6 patients with pyonephrosis showed urinary calculi in the plain films. Other features included enlarged renal shadow, loss of renal and psoas outline.

Intravenous urogram form a mandatory investigation in these patients. They were performed with a view to diagnosis and assessment of the contralateral kidney. Diminished renal function shown as diminished nephrogram, delayed pyelogram were seen in less severe cases of carbuncles and perinephric abscesses. In very severe cases a non-excreting kidney was a feature. Suggestion of a perirenal space occupying lesion (perinephric abscess) or an intra-renal lesion displacing the calyces (carbuncle) were other features noted. The pyonephrotic kidneys usually presents with non-excreting kidneys due to the degree of obstruction. A poorly excreting hydronephrotic kidney was sometimes seen.

Ultrasonography was employed in 5 patients with accurate localisation of perinephric abscesses in 4. One case of carbuncle was mistaken for a perinephric abscess. This was realised at operation. (Figure 2).

2 patients had renal arteriograms for suspected renal tumours. This helped to rule out tumour lesions by the lack of vascularity of the renal lesions.

MANAGEMENT: (TABLE VI)

All patients were treated with antibiotics (mainly ampicillin and gentamicin) from the start. These were modified as necessary when culture sensitivities were known.

Percutaneous drainage was carried out in 5 patients. This was the only procedure necessary in one case of renal carbuncle with perinephric abscess. 3 others needed nephrolithotomy procedures when the pyonephrosis subsided. The remaining case required a nephrectomy for irreversibly damaged kidney from calculous disease.

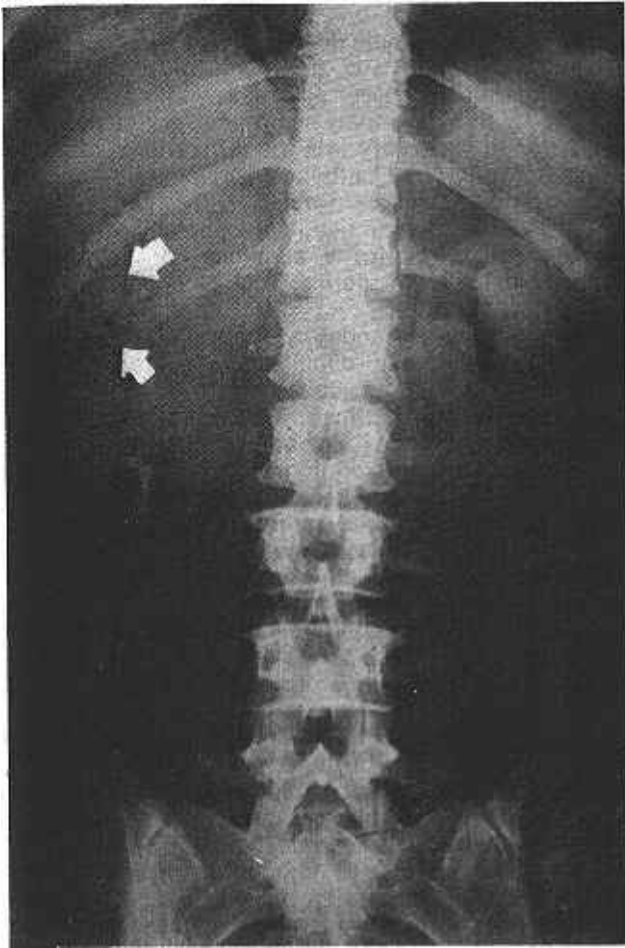


Figure 1: Plain film showing perinephric gas.

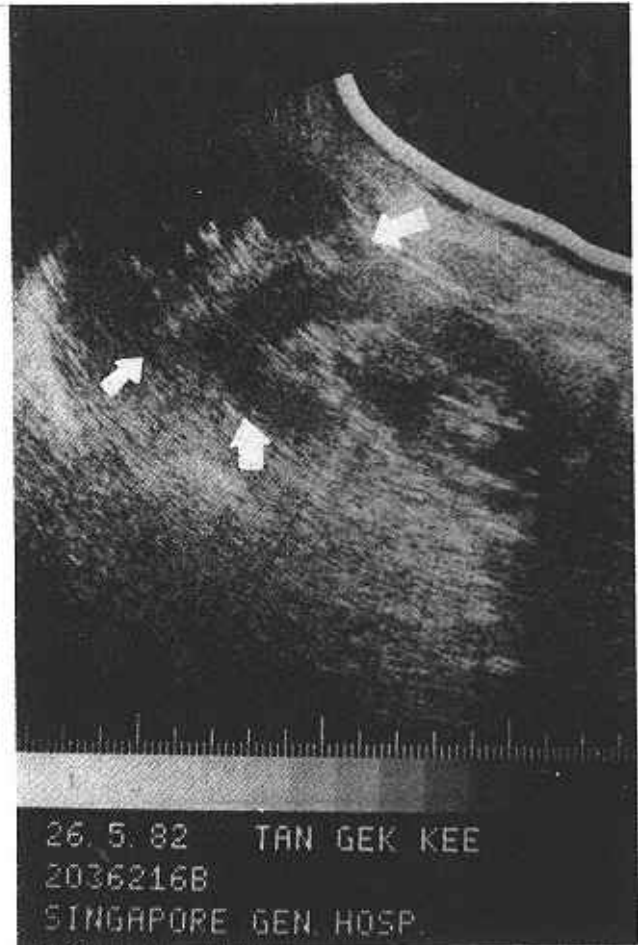


Figure 2: Ultrasound showing Perinephric abscess.

TABLE VI
TREATMENT

Treatment Modality	Carbuncles ± Perinephric Abscess	Perinephric Abscess	Pyonephrosis
1. Percutaneous drainage only	1*	0	0
2. Percutaneous drainage followed by Nephrolithotomy	0	0	3
3. Percutaneous drainage followed by Nephrectomy	0	0	1
4. Incision and drainage only	1*	4	1
5. Incision and drainage with Nephrostomy	1+	0	1 (Pujo)
6. Primary Nephrectomy	5**	0	0

* Carbuncle and perinephric abscess combined

** 2 were extensive carbuncles alone

3 were combined carbuncles and perinephric abscesses

+ isolated Carbuncle

The solitary case of PUJ obstruction was initially treated by nephrostomy drainage followed by pyeloplasty when sepsis subsided. Follow up IVU, 4 months later showed return of good renal function.

When perinephric abscesses occurred in isolation (4 cases), drainage procedures were itself sufficient. The usual way to achieve this in the series was open

drainage. Carbuncles occurring by itself or in conjunction with perinephric abscesses were a particularly serious group. The nephrectomy incidence was 62.5%. Patients in this category were usually severely ill with septicemia. Operative intervention was necessary in view of non-response to conservative antibiotic therapy. When the kidney was assessed at operation to

be salvageable, intensive antibiotic therapy with drainage of the accompanying perinephric abscess was successful in 3 cases.

MORTALITY

There were 3 deaths related to the acute septic process (16.7%).

The first patient, a 68 year old diabetic female presented with right hypochondrium pain and fever; Gallstones were seen on the plain film and a diagnosis of acute biliary disease was made. At surgery, a non-inflamed gallbladder containing a few stones was found and removed. Exploration of the right kidney and needling revealed no evidence of pus. She deteriorated and was re-explored the next day. A large renal carbuncle was observed and a nephrectomy was done. She succumbed to complications of septicemia 2 days later.

The next 2 cases were already in chronic renal failure before the acute septic episode, one from diabetic nephropathy and the other from bilateral renal calculi. The former had a renal carbuncle complicated by perinephric abscess and was treated with an open drainage procedure. The latter had pyonephrosis which was drained percutaneously followed by a nephrolithotomy. Both showed declining renal function and continuing sepsis.

FOLLOW-UP

8 of our patients progressed well over a period of 5 months to 3 years. One continued on with chronic renal impairment: 3 defaulted follow-up. Another 3 died from 2 months to 14 months after discharge. One patient with carbuncle died of acute myocardial infarction. While the other 2 died of chronic renal failure, one due to diabetic nephropathy and other due to neurogenic bladder.

DISCUSSION

Campbell in 1930 (5) and Acheson in 1941 (6) reported 83 and 117 cases of perinephric abscesses respectively. Salvatierra in 1967 added another milestone with 71 cases (7). What remained unchanged was the variable symptomology and a high rate of misdiagnosis at the initial presentation. Up to a third were diagnosed at autopsy in their series (5, 7).

In the pre-antibiotics era, patients with renal and perinephric abscess were predominantly males, and the abscess cultures grew mainly staphylococcus. These organisms were thought to reach the kidney or perirenal tissues via the hematogenous routes from distant primary sources e.g. skin furuncles. The past 3 decades have been the emergence of gram-negative organisms usually linked to the urinary tract. (1, 3, 7, 9, 10, 11). Presently, the majority of cases are due to intrinsic renal disease. Maligni (1) reported pyelonephritis evidence in 72% of the pathological specimens studied which reinforces it as a starting process in renal and perirenal suppurations.

In our series, the diabetic female formed the commonest patient characteristics. This may be due to the greater susceptibility to urinary tract infection. There were one case each of hemiplegia and spina-bifida.

The diagnosis of obstructive pyonephrosis has been less of a problem here especially when calculous disease is apparent on plain radiographs. Androulakakis (12) reviewed 131 cases and found the main cause to be urolithiasis (70.2%). Other causes in his series were bladder carcinoma, bladder outlet obstruction, congenital abnormalities, tuberculosis and retroperitoneal tumour. Severe cases can be complicated by extension of the suppuration into the renal parenchyma and perinephric space. In this situation,

nephrectomy is usual.

TABLE VII is a simple flowchart that we adopt in the diagnostic workup and treatment of a case that presents with high fever, loin pain with or without a palpable kidney or urinary symptoms. A high index of suspicion is necessary with the differentials of acute pyelonephritis, renal carbuncle, perinephric abscess and acute pyonephrosis in mind.

The plain abdominal film is of value as presence of calculi would lead to a suspicion of obstructive pyonephrosis while perinephric gas points to a perinephric abscess.

An urgent IVU is mandatory. A normally functioning kidney or minimally diminished nephrogram and delayed pyelogram, are consistent with acute pyelonephritis. The correct therapy is then appropriate intravenous antibiotics (aminoglycoside or cephalosporin) plus adequate hydration.

If the IVU shows marked diminished function with other features described earlier or a non-functioning unit, there is then a possibility of pyonephrosis, extensive carbuncle or perinephric abscess. The appropriate step to follow is an ultrasound. A pyonephrosis would show up as a hydronephrotic kidney with evidence of loose echoes within the pelvis. An obstructing calculus will also be evident. A renal abscess will be evident as a space occupying lesion within the renal substance while a perinephric fluid collection will point towards a perinephric abscess. In the equivocal situation, C.T. Scan will provide a better resolution to the problem (13, 14). An example would be the 2 cases of which arteriography had to be resorted to.

Perinephric abscesses should be drained. Open drainage was performed for most of our patients but percutaneous tube drainage was successful in one case of perinephric abscess associated with renal carbuncle. If conservative therapy is chosen, we again advocate vigilant watch on the progress of the patient. As no response would mean timely executed surgical intervention. In this instance considerations would have to be given to a nephrectomy for an accompanying extensive carbuncle besides drainage of the perinephric space.

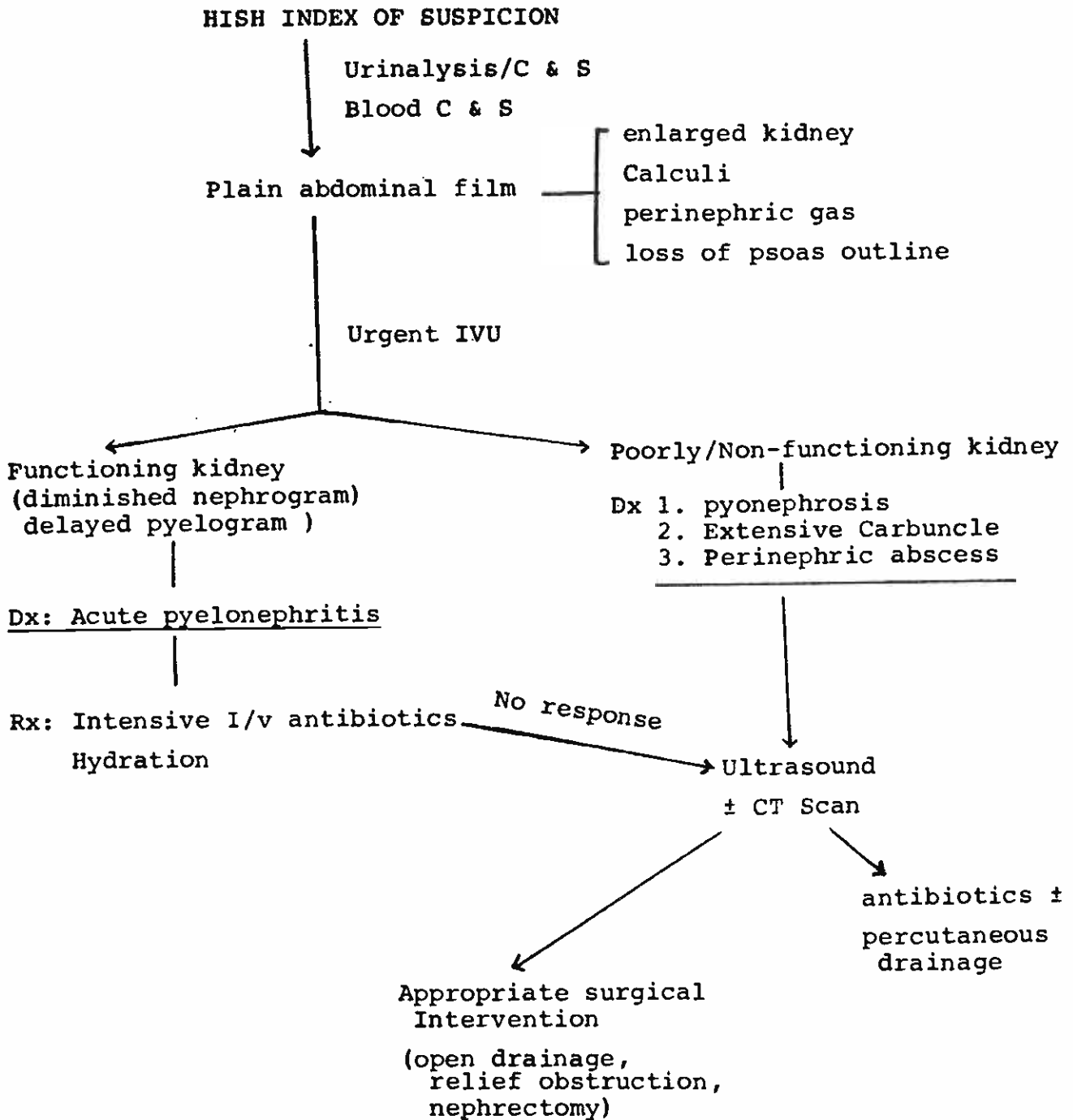
The obstructive pyonephrosis can be treated by initial percutaneous drainage while awaiting the sepsis to subside with antibiotics. An elective procedure is then planned to remove the offending lesion or a nephrectomy may be needed for an irreversibly damaged kidney.

The initial treatment for renal carbuncles should be conservative with high dose antibiotics, and close observation of the patient. Successful treatment with antibiotics alone and careful ultrasound or CT Scan follow up has been reported (15, 16). If there is no response and patient continues in severe sepsis, exploration of the kidney should be done. In such instances, nephrectomy had to be done usually due to extensively involved kidney with multiple abscesses which is impossible to drain successfully. There have been reports of successful percutaneous tube drainage of isolated renal abscesses (2, 3, 4). This is an interesting modality of treatment in the suitable case.

CONCLUSION

Our overall aim in the treatment of patients with acute suppurative renal infection would be to conserve the kidney whenever possible. This would need a high index of suspicion in its diagnosis and early institution of appropriate antibiotics or percutaneous drainage. However, if conservative measures fail one should not hesitate to remove the septic kidney to prevent death from septicemia.

TABLE VII: PLAN OF MANAGEMENT



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