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CURRENT TREATMENT AND OUTCOMES OF PERINEPHRIC ABSCESSES

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ABSTRACT

Purpose: We characterize the treatment and outcomes of perinephric abscesses in a contemporary cohort of patients.

Materials and Methods: We reviewed the experience with perinephric abscesses at a single community based hospital. Abdominal computerized tomography (CT) was widely available during the study period and experience with radiographic guided percutaneous drainage was extensive. Therapy and intervention for individual patients were dictated by the treating physician.

Results: Of the 25 patients identified with perinephric abscesses 3 (12%) ultimately died. Although 40% had multiple risk factors for perinephric abscesses only 35% were identified at presentation. Urine cultures were positive in 72% of patients and CT had a diagnostic sensitivity of 92%. Ten patients with a mean abscess size of 1.8 cm. were treated with antibiotics alone (mean hospitalization 10 days) while 11 with a mean abscess size of 11 cm. received antibiotics and initial percutaneous drainage (mean hospitalization 30 days). Of the 11 patients treated with percutaneous drainage 4 ultimately required surgical exploration and nephrectomy.

Conclusions: The clinical characteristics of perinephric abscesses have not changed significantly but improved imaging with CT allows earlier diagnosis and treatment, which likely contributed to the reduced mortality in our cohort compared to historical series. With accurate staging and careful followup, a variety of treatments can be successful, including antibiotics alone or in conjunction with percutaneous drainage and urinary drainage. Open surgical drainage and nephrectomy may eventually be required in some patients and should be considered if adequate drainage is not achieved.

KEY WORDS: abscess, drainage, pyelonephritis, antibiotics

Suppurative infections involving the kidney are difficult to diagnose and treat. Traditionally, perinephric abscesses have been associated with significant morbidity and mortality. Despite aggressive surgical drainage, Salvatierra et al reported a mortality rate of 56% in a series of 71 cases.[1] Similarly, Adachi and Carter noted significant mortality (39%) from perinephric abscesses even after open surgical incision and drainage.[2] An important factor in the poor outcomes was the delay in diagnosis due to nonspecific clinical findings and limited specificity of studies such as excretory urography.

During the last 20 years the availability of cross-sectional imaging, such as computerized tomography (CT) and magnetic resonance imaging, has become nearly universal. In addition, technological improvements have increased the quality of retroperitoneal and renal ultrasound examinations. Moreover, percutaneous catheter drainage of intra-abdominal and retroperitoneal abscesses is now feasible and commonly performed with minimal morbidity and reasonable results.[3,4] These improvements in the diagnosis and treatment of perinephric abscesses are believed to have improved outcomes for this disease process. Nevertheless, to our knowledge no contemporary series has been reported in the literature. We describe our experience treating patients with perinephric abscesses in the era of CT and interventional radiological techniques.

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Editor's Note: **This article is the second of 5 published in this issue for which category 1 CME credits can be earned. Instructions for obtaining credits are given with the questions on pages 1546 and 1547.**

MATERIALS AND METHODS

We retrospectively identified all cases of perinephric abscesses at the San Francisco General Hospital between 1992 and 1999 by reviewing urological consultations, operative reports, radiological records and hospital diagnoses. We only included in the study patients with perinephric abscesses and not those with renal abscesses. Patient characteristics were compiled as well as diagnostic, treatment and outcome information.

Treatments were determined by physicians for individual patients. All patients were empirically treated with broad-spectrum antibiotics, which typically included the combination of penicillin with aminoglycoside or a third-generation cephalosporin in patients with renal insufficiency. More recently, piperacillin/tazobactam has been used in patients with increased creatinine. Percutaneous abscess drainage was performed under CT or ultrasound guidance. Catheters remained in place until output was minimal and complete resolution was documented by CT. The decision to proceed with open surgical intervention was dictated by the clinical course.

RESULTS

A total of 25 patients with a mean age of 45 years (range 17 to 80) with perinephric abscesses were treated during this period (table 1). Data regarding past and present medical conditions, clinical symptoms, signs, and laboratory data, and admitting diagnoses were obtained from the available records (table 2). Median duration of symptoms at presentation was 7 days (range 0 to 90). Only 35% of the patients were correctly diagnosed at hospital admission. Mean white blood

TABLE 1. *Patient demographics*

	No. Pts. (%)
Male	13 (52)
Female	12 (48)
Rt.	12 (48)
Lt.	10 (40)
Bilat.	3 (12)
Age (yrs.):	
Younger than 20	1 (4)
20–30	2 (8)
31–40	6 (24)
41–50	8 (32)
Older than 50	6 (24)

TABLE 2. *Predisposing factors, symptoms, signs and laboratory data, and admitting diagnoses*

	No. Pts. (%)
Predisposing factors	
Renal calculi	6 (24)
Urinary tract infection	6 (24)
Trauma	4 (16)
Diabetes mellitus	4 (16)
Malignancy	4 (16)
HIV/intravenous drug abuse	4 (16)
Liver disease	4 (16)
End stage renal disease	3 (12)
Risk factors:	
0	2 (8)
1	13 (52)
2	7 (28)
3 or More	3 (12)
Symptoms, signs and laboratory data	
Fever	18 (72)
Nausea/vomiting	16 (64)
Flank pain	11 (44)
Abdominal pain	10 (40)
Chills	10 (40)
Urinary symptoms	5 (20)
Wt. loss	4 (16)
WBC:	
10–19 $\times$ 10^9 cells/l.	15 (60)
20 or Greater $\times$ 10^9 cells/l.	6 (24)
Pyuria greater than 2 WBC/high power field	13 (52)
Hematuria greater than 2 red blood cells/high power field	10 (40)
Admitting diagnoses	
Perinephric abscess	9 (35)
Sepsis/fever	3 (12)
Pyelonephritis	3 (12)
Intra-abdominal process	2 (8)
Other*	8 (32)

* Includes nephrolithiasis, pneumonia, hepatoma, anemia, hydronephrosis, failure to thrive and gastrointestinal process.

cell count (WBC) was 16 $\times$ 10^9 cells per l. (normal 3.4 to 10) and mean serum creatinine was 2.5 mg./dl. (normal 0.6 to 1.2). In those patients not initially identified with a perinephric abscess mean time to diagnosis after hospitalization was 3.4 days (range 1 to 20 days).

Results from microbiological and radiographic studies are listed in tables 3 and 4, respectively. Overall 18 patients (72%) had positive cultures. Urine was most often the only source of a positive culture and was statistically more sensitive than blood and abscess fluid cultures. CT was diagnostic in 22 of 24 cases (92%), while plain abdominal radiography and ultrasound were 25% and 71% sensitive, respectively. On

TABLE 3. *Microbiological data*

	No. Performed	No. Pos.	% Sensitivity	% Unique
Urine	19	13	72	22
Blood	20	10	56	6
Drain	12	9	50	11
Total		18		

Specific organisms were Escherichia coli in 9 cases, Streptococcus in 5, Enterococcus in 4, Proteus in 3 and Staphylococcus aureus in 3.

TABLE 4. *Results of imaging studies*

	Total No.	No. Diagnostic	No. Informative*
Film of the kidneys, ureters and bladder	4	1	2
Ultrasound	7	5	7
CT	24	22	22

* Findings included nephrolithiasis, perinephric air or hydronephrosis.

nondiagnostic but informative studies nephrolithiasis, perinephric air and hydronephrosis were observed.

The various treatments are summarized in table 5. Antibiotics were used in all cases and this was the only intervention in 10 (40%). In 2 patients treated with antibiotics alone the diagnosis of perinephric abscess was only discovered at the time of autopsy (died after 2 and 3 days of hospitalization, respectively) and 1 had a negative CT. One patient was 73 years old and on chronic hemodialysis but the other patient was a healthy 46-year-old woman with no co-morbidities. Both patients were critically ill at presentation and their conditions deteriorated rapidly, eventually resulting in multiple organ system failure including adult respiratory distress syndrome. The mean perinephric abscess size on CT in the remaining 8 patients was 1.8 cm. and the mean duration of hospitalization was 10 days. Subsequent CT confirmed abscess resolution and no delayed sequelae were observed.

In 11 patients (44%) the abscesses were drained by percutaneous catheter. The mean lesion size and time to abscess resolution was 11 cm. and 25 days, respectively. Mean hospitalization was 30 days. Ultimately, 4 patients (35%) initially treated with percutaneous drainage required open surgical exploration and nephrectomy for persistent infection and minimal function of the affected kidney.

In 3 patients with small perinephric abscesses (less than 3 cm.) and associated hydronephrosis drainage of the urinary tract in conjunction with antibiotics was performed with complete resolution on subsequent CT. Mean hospitalization was 11 days without complications. All patients underwent subsequent ureteroscopy and stone removal.

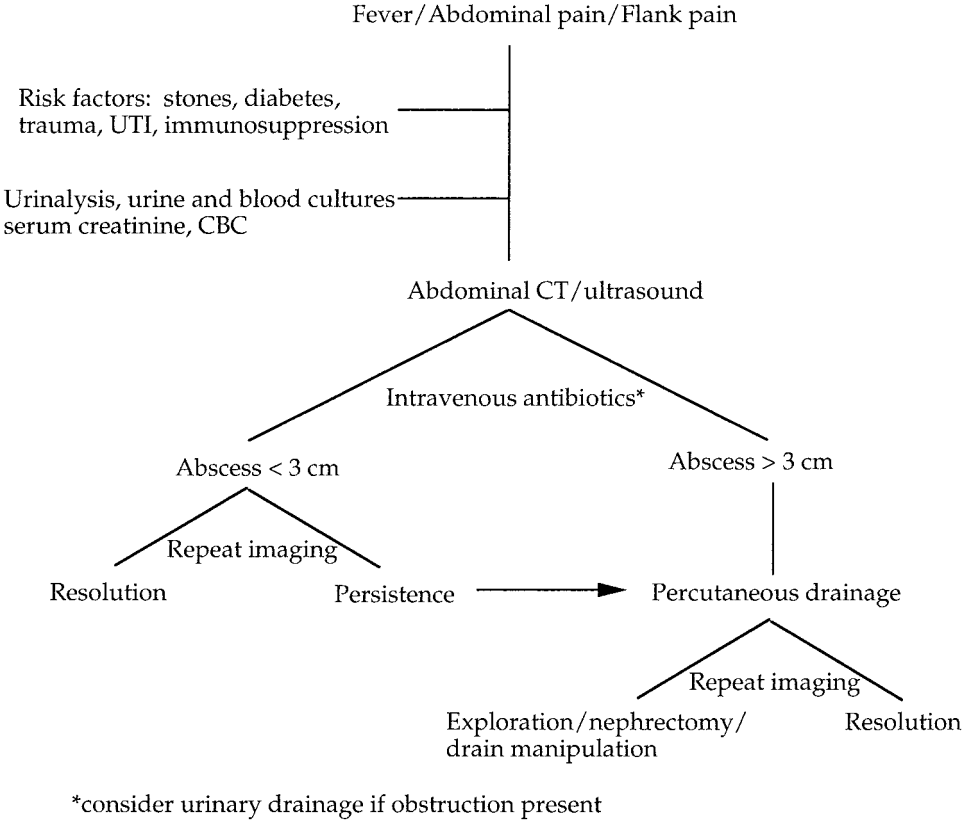
One patient underwent abdominal exploration for sepsis and presumed intra-abdominal abscess, which was found to have originated from a perinephric source. He died 16 days after surgery of sepsis, leading to renal and hepatic failure. He had preexisting alcoholic cirrhosis, and associated hepatic dysfunction and portal hypertension, for which he had undergone prior portocaval shunt.

DISCUSSION

The difficulty in the diagnosis and treatment of perinephric abscesses has been well documented in large series reported between the 1930s and 1960s.[1,2] Aspects of this entity which have been emphasized include the insidious onset, delay in accurate diagnosis and necessity of prompt surgical intervention. Although these principles have been maintained, changes and advances in medicine have led to an evolution in managing perinephric abscesses. The improvements and widespread availability of cross-sectional imaging may improve the diagnosis. CT and magnetic resonance imaging are accurate modalities for renal and retroperitoneal pathology.[4–6] In addition, adequate percutaneous drainage is

TABLE 5. *Treatment and outcomes*

	No. Pts.	No. Nephrectomy	No. Dead
Antibiotics alone	10	0	2
Antibiotics + percutaneous drainage	11	4	0
Antibiotics + urinary drainage	3	0	0
Antibiotics + exploration	1	0	1
Totals	25	4	3



Current treatment algorithm for evaluation and management of perinephric abscesses

now possible and may reduce the need and associated morbidity of open incision and drainage.[3] Despite these general alterations in approach, to our knowledge no studies have documented a change in the natural history of perinephric abscesses or improved outcomes.[7–12]

Our data reveal several important findings. There continues to be a significant delay in recognition of perinephric abscesses. Although 40% had multiple associated conditions potentially predisposing to perinephric purulent collections, only a third were correctly diagnosed at hospitalization. Salvatierra[1] and Thorley[13] et al noted similar rates of misdiagnosis. The spectrum of clinical signs and symptoms remains essentially unchanged with fever, pain, abdominal complaints and leukocytosis the most common findings, often present for a prolonged period. Thus, use of accurate imaging relies on the clinical suspicion of a perinephric abscess.

Antibiotics alone can be effective in select cases. As reported by Siegel et al, small perinephric abscesses may resolve with antibiotic treatment alone.[14] They reported cure in all patients with lesions less than 3 cm. In our series the 8 patients successfully treated with antibiotics alone had a mean abscess size of 1.8 cm. and all were less than 3 cm. This group had reasonable duration of hospitalization and no adverse long-term effects. However, the 2 patients with unrecognized perinephric abscess receiving intravenous antibiotics alone died, and the diagnosis was only made at the time of autopsy. This result reinforces the importance of early identification and prompt drainage of large abscesses, and the significant mortality in untreated patients. The conscious decision to treat using antibiotics alone requires consideration of other associated medical conditions and accurate staging of the abscess.

Nearly a third of our patients presented with a serum creatinine greater than 1.5 mg./dl., which is an important consideration in the appropriate selection of antibiotics for the variety of potential organisms. Broad-spectrum coverage of gram-positive and gram-negative organisms is required, especially before culture growth. In patients with creatinine less than 2.0 mg./dl. we use ampicillin and gentamicin, while in those with creatinine greater than 2.0 mg./dl. we prefer piperacillin/tazobactam. Blood cultures were positive in half of the patients and almost always in conjunction with positive urine cultures. Although typically a sign of systemic and likely more severe infection, positive blood cultures were not associated with worse clinical outcome regardless of treatment modality.

Our 11 patients with large (greater than 5 cm.) perinephric abscesses were treated with antibiotics in conjunction with percutaneous catheter drainage. Although there was no mortality in this group, these patients required longer hospitalization, multiple drain manipulations and prolonged catheter placement. Moreover, more than a third of these patients ultimately required nephrectomy for persistent infection in the nonfunctional kidney. It is interesting to note that all of these patients had larger abscesses, associated stones and positive cultures for Proteus. The patient who underwent open incision and drainage died after surgery of sepsis and multiple organ failure. Early percutaneous drainage is essential in the management of larger perinephric abscesses (greater than 3 cm.) and is usually sufficient, realizing that repeated or more aggressive intervention may be necessary.

Our experience demonstrates that the natural history and outcome of perinephric abscesses have not changed significantly, despite technological advances and less invasive therapy. There were no deaths when diagnosis was prompt. The 12% mortality was due to inadequate or delayed treatment, and nephrectomy was performed in 16%. The improved survival compared to historical series is likely due to more accurate imaging studies, allowing staging and appropriate therapy for the abscesses. Complete drainage of purulent collections remains the most important principle in success-

ful outcomes of larger abscesses, which can typically be achieved percutaneously.

Based on our experience we believe that initial antibiotics alone are reasonable for abscesses less than 3 cm., percutaneous catheter drainage and antibiotics are indicated for collections greater than 3 cm., repeat imaging and drain manipulation are crucial to ensure complete resolution, and open exploration and nephrectomy are appropriate for persistent infection in kidneys with minimal function. An algorithm of our treatment strategy for perinephric abscesses is presented in the figure.

CONCLUSIONS

Despite advances in diagnostic and interventional radiology, perinephric abscesses remain difficult to diagnose and rely on clinical acumen. Minimally invasive approaches to drainage are appropriate after CT imaging with close monitoring. However, aggressive therapy should not be delayed when the clinical course persists or deteriorates. Even with modern medicine, perinephric abscesses are still associated with significant morbidity and mortality, and must be considered and sought in patients with appropriate risks factors, history and clinical findings.

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