Original Article

Perinephric abscesses in the neurologically impaired

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Study design: Retrospective chart review.

Objectives: To document the occurrence and management of large perinephric abscesses in neurologically impaired patients at high risk for this infectious complication.

Setting: US Veterans Affairs hospital.

Methods: The records, radiographs, operative findings and outcomes of all patients who presented with perinephric abscesses evident on physical exam within the last 5 years were reviewed.

Results: Four patients presented with large perinephric abscesses evident on physical examination. All had severe neurologic impairment with high sensory levels; three had spinal cord injuries, one had advanced multiple sclerosis. All had neurogenic bladders and recurrent urinary tract infections. The diagnosis was made through a combination of history, physical examination and computed tomography (CT) examination. All were found to have upper tract obstruction. All were managed with immediate abscess drainage and three had elective nephrectomy once the infection had resolved. No patients died of their perinephric abscess.

Conclusions: These four cases illustrate that although advances in antibiotics, imaging and percutaneous management have improved the speed of diagnosis and reduced the mortality in patients with perinephric abscesses, the neurologically impaired population continues to remain at significant risk for the development and the delayed diagnosis of these morbid renal infections.

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Introduction

Perinephric abscess formation can result in significant morbidity and mortality. Although tremendous advancements have been made in diagnostic imaging, antibiotics, and percutaneous management, perinephric abscess formation continues to be a serious problem for certain groups of patients. Patients with widespread neurologic impairment, such as with spinal cord injury (SCI) or multiple sclerosis (MS) have a higher incidence of urinary tract infections and nephrolithiasis.^{1,2} Their diminished, altered or absent sensation makes it difficult to detect stone disease, occult or incompletely treated infections and urinary obstruction, thereby placing these patients at higher risk for development of a perinephric abscess and a delay in diagnosis. Four cases of large perinephric abscess

presented to our institution in the last 5 years, all in patients with severe neurologic impairment.

Case reports

Case 1

A 56-year-old T6 ASIA A SCI male with a C5 syrinx presented at an outside hospital with fever and was treated with antibiotics for a presumed pneumonia; however, he was noted to develop a bulging flank abscess. He had a history of insulin-dependent diabetes, recurrent pyelonephritis and an obstructed, non-functional left kidney. His neurogenic bladder was managed with an ileal chimney and urostomy. He was transferred to our hospital for management of the abscess. Upon transfer, he was afebrile, with a WBC of 9600 μ l and a creatinine of 0.9 mg/dl. Broad-spectrum antibiotics were started and an incision and drainage was performed with the release of 500 cc of pus. A CT

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Figure 1 CT scan with IV contrast immediately following flank incision and drainage of a large, left perinephric abscess. An atrophic, obstructed left kidney remnant (closed arrow) and a perinephric abscess cavity in the subcutaneous tissue (open arrow) with associated inflammation is seen

scan showed a retroperitoneal abscess in communication with the non-functional left kidney. No stones were noted, but a dilated renal pelvis was seen (Figure 1). Following the drainage procedure, the patient became hypotensive requiring a dopamine infusion. A second debridement was performed and the wound was packed. The patient clinically improved. Both the urine and wound cultures grew *Candida parapsilosis* and fluconazole was started. Twice daily dressing changes were performed for several weeks until the wound healed. A follow-up CT scan 9 months later showed an atrophic left kidney remnant, and an ultrasound 2 years later showed no kidney tissue.

Case 2

A 58-year-old C5 ASIA A tetraplegic man presented with fevers to 101°F, a urinary tract infection and pus draining from a flank wound. He had a history of recurrent pyelonephritis and a neurogenic bladder managed with a Foley catheter. His WBC count was 14 000 μ l and his creatinine was 0.6 mg/dl. An ultrasound showed bilateral kidney stones with left hydronephrosis and renal edema. A CT scan showed a perinephric abscess cavity in connection with the draining flank wound and a hydronephric left kidney with stones. He was taken to the operating room for left flank exploration. Broad-spectrum antibiotics were begun. An inflamed abscess cavity was drained, debrided and packed. The urine culture grew *Citrobacter* and *enterococcus*. The following day, cystoscopy and ureteral catheterization yielded more pus from the collecting system, so a ureteral stent was placed. Four weeks after admission, the patient underwent an elective left nephrectomy to remove the

source of infection. The pathology showed inflammation and necrosis, without stone or tumor. He had an uneventful post-operative course and was discharged with a creatinine of 0.6 mg/dl.

Case 3

A 66-year-old male with severe MS and spastic tetraplegia presented at an outside hospital with a several-week history of fevers, anorexia, increasing weakness and fatigue. He was found to have a urinary tract infection and a tense, fluctuant left abdominal mass extending from the costal margin to the iliac crest. He had a history of recurrent urinary infections, uric acid nephrolithiasis, diminished left renal function and a neurogenic bladder managed with a Foley catheter. On transfer to our institution, his WBC count was 17 000 μ l, he was afebrile and his creatinine was 0.4 mg/dL. A CT scan showed an air-filled left perinephric abscess measuring 14 × 18 × 30 cm, marked left cortical thinning and hydronephrosis due to an obstructing renal stone. Percutaneous drains were placed in the abscess cavity and the renal pelvis with drainage of 800 cc of pus (Figure 2). Broad-spectrum antibiotics were begun. Three days later, the abscess drain was repositioned and another 2 l of pus was aspirated. The patient improved clinically. The urine and abscess cultures grew *Proteus* and diphtheroids. A Lasix renogram done 2 years earlier had shown only 17% left renal function, so 3 weeks after admission, an elective left nephrectomy was performed. The pathology showed inflammation, fibrosis and stones. He had an uneventful post-operative course and was discharged home with a creatinine of 0.6 mg/dl.

Case 4

A 66-year-old T7 paraplegic male presented at an outside hospital with complaints of gastroesophageal reflux, low-grade fevers and a palpable left flank mass. He had a history of urinary tract infections, bladder stones, left nephrolithiasis that required percutaneous nephrolithotomy and a neurogenic bladder managed with a suprapubic catheter. On admission, his WBC count was 23 000 μ l and his urine was infected. Broad-spectrum antibiotics were started and the patient was taken to the OR for incision and drainage of a large perinephric abscess. The wound was packed and he was transferred to our institution for further management. On transfer, his WBC count was 9400 μ l, his creatinine was 0.6 mg/dl and he had a large left flank wound that was packed with gauze. His urine and wound cultures grew *E. coli* and *Proteus*. A CT scan showed an obstructing left ureteral stone with hydronephrosis, so a left ureteral stent was placed. Twice daily dressing changes were continued for several weeks. A Lasix renogram showed only 10% left renal function, so an elective left nephrectomy was performed. The pathology showed chronic inflammation and stones. The patient had an uneventful post-

Figure 2 (A) CT scan with contrast immediately following left percutaneous nephrostomy tube placement. The nephrostomy tube (arrow) has decompressed the kidney, but a massive perinephric abscess with free air still remains posteriorly. (B) A more caudal image from the same CT scan showing extension of the abscess into the pelvis and subcutaneous tissue

operative course and has had no further urologic problems.

Discussion

A perinephric abscess is a collection of pus in the space between the kidney and Gerota's fascia. It evolves from the extension of an intrarenal suppurative process, either from pyelonephritis or urinary extravasation due to obstruction (eg, by kidney stones) with compound infection. The majority of the cases of obstruction are due to renal or ureteral calculi.³ More rarely, perinephric abscesses can result from blood-borne infections or extension of disease from an adjacent organ.⁴ We have found this infectious complication in four patients, all of whom had extensive neurologic

(sensory) impairment, which predisposed them to develop such large collections of pus. Because of the extent of the infection, all of these patients also lost the affected kidneys.

The development of a perinephric abscess can be insidious and its presentation can be both nonspecific and deceptive. Symptoms of abscesses can include dysuria; persistent fevers despite antibiotics; elevated blood glucose levels in diabetics; malaise; anorexia; weight loss; abdominal, chest, flank or thigh pain; hypertension; hematuria; pyuria or full-blown sepsis.⁴⁻⁷ Massive perinephric abscesses can present as palpable abdominal masses; cutaneous abscesses of the flank pointing through Petit's lumbar triangle; chest or thigh abscesses and draining flank or groin sinuses. These masses also can erode through the diaphragm into the pleural space, lungs or pericardium and extend into adjacent structures, such as the colon or spleen.^{3,5,7-12} In 1949, Abeshouse reported an impressive series of 277 reno-visceral and reno-cutaneous fistulae due to retroperitoneal abscesses.¹³

The largest series of perinephric abscesses have been by Campbell in 1930, Atcheson in 1941 and Salvatierra in 1967 reporting on 83, 117 and 71 cases respectively.^{7,14,15} Several more recent smaller series have been reported.^{6,16-18} Delay in diagnosis and high mortality rates have been consistent themes throughout the literature. In the Salvatierra series, the correct diagnosis was made in only 18% of patients on admission. Of the remaining patients, 21% had delayed diagnoses prior to surgery, 27% had diagnosis made at time of operation and 34% had diagnosis made on autopsy.⁷ Similar rates are reported in other series.^{6,16}

More than one third of all patients with perinephric abscesses have been reported to have a history of previous urologic surgery, diabetes mellitus, a history of urinary tract infections or urinary stones.¹⁸ On physical examination, fever and flank pain were the two most common findings,^{14,18} with 70-90% of patients having abdominal and/or flank pain. For the patient with a sensory level above the kidney, pain may not be appreciated, thus masking a localizing sign/symptom.

All cases of perinephric abscess at our institution within the last 5 years have been in neurologically impaired patients with a history of urinary tract infections and upper tract obstruction on presentation. Obstruction was due to nephrolithiasis in three of these cases. Neurologically impaired patients, such as SCI or severe MS, are at higher risk for perinephric abscess formation due to their increased rates of urinary tract infections and nephrolithiasis. Additionally, diminished, altered or absent sensation in neurologically impaired patients makes it difficult to detect urinary obstruction, stone disease and occult or incompletely treated infections. Therefore, any conditions that predispose these patients to upper tract urinary obstruction, such as stones, anatomic anomalies or bladder dysfunction need

aggressive attention to prevent disastrous infectious sequelae.

Time to diagnosis of perinephric abscesses appears to be decreasing, with advancements in radiologic imaging. In the more recent reviews, over one third of patients with perinephric abscesses were reported to have the correct diagnosis made at the time of admission.^{4,17} The use of computed tomography (CT) within the last 15 years has greatly improved the detection of perinephric abscesses. For all the patients in our series, CT was instrumental in confirming the diagnosis, delineating the extent of the abscess cavity and assessing the intrarenal pathology. Alternatively, for patients who cannot tolerate intravenous contrast due to allergy or impaired renal function, magnetic resonance imaging may be used. Ultrasound, although helpful when positive, can have a false negative rate of over 35%.¹⁸

Advancements have also been made in both the understanding of the microbial flora of perinephric abscesses and in the development of stronger, broader antibiotics. In the pre-antibiotic era reports, *S. aureus* from skin infections with hematogenous seeding was the most common etiology for perinephric abscesses.^{14,15} Today the most common infective agents for perinephric abscesses are *E. coli* and *Proteus* species, but all bacteria that are associated with infection stones and fungi have been described in perinephric abscesses.^{4,7,18,19} Often, the infections are polymicrobial.⁴ In the treatment of perinephric abscess, broad-spectrum antibiotics should be initially employed, but then sharply narrowed when the definitive cultures of the urine, blood and abscess fluid return.

The immediate treatment for a perinephric abscess is open or percutaneous drainage of the abscess cavity and drainage of the obstructed urinary collecting system, if present. Each patient then needs to be individually evaluated to determine whether immediate nephrectomy, delayed nephrectomy or definitive treatment of the urinary obstruction with renal preservation is most appropriate. Renal units that are minimally functional and laden with stones or are obstructed should be considered for prophylactic removal to prevent later infectious sequelae. In our series, we performed immediate open or percutaneous drainage of the abscess, provided drainage of the urinary obstruction, administered antibiotics and performed dressing changes on open wounds. Elective nephrectomy was then performed in three cases 3–4 weeks after the initial presentation. Since the inflammatory process had been allowed to resolve prior to each nephrectomy, the operations were technically uncomplicated.

Older series have reported mortality rates from perinephric abscesses to be 20% to 55%, mostly due to sepsis.^{6,7,15–17} The mortality rate in the most current series, however, was only 13%.¹⁸ None of the patients in our series died of their infections. This

is probably attributable to the combination of improved diagnostic imaging and better antibiotics.

Conclusion

We present four cases of large perinephric abscesses, all presenting in a neurologically impaired population. This group has two significant risk factors: neurogenic bladders predisposing them to urinary tract infection and nephrolithiasis; and sensory impairment, clouding their ability to localize pain due to renal infection and obstruction. These abscesses frequently result in kidney loss, in a population that can ill-afford to lose renal function. The morbidity of perirenal abscess may be ameliorated if practitioners are aware of this complication, and aggressively diagnose and treat upper urinary tract obstruction and infection.

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