



Peritoneal Dialysate Leak Mistaken as Fournier's Gangrene

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Abstract

A 47-year-old man presented with an erythematous, edematous, and tender scrotum occurred after prolonged car driving. The patient had a history of end-stage renal disease and was being treated with Peritoneal Dialysis (PD) for 3 years. After admission with an initial diagnosis of scrotal cellulitis, pelvic non-contrast computed tomography revealed a right-sided hydrocele and a small left-sided inguinal hernia. After he became slightly febrile and the swelling and tenderness spread into the perineum, follow-up computed tomography could not rule out an abscess. Fournier's gangrene was suspected and surgical debridement was planned. Computed tomography peritoneography with a non-ionic contrast solution in the dialysate confirmed a dialysate leak into the scrotum and perineum. The PD was discontinued, and hemodialysis initiated. All antibiotics were discontinued. The symptoms resolved within 24 h. This unique presentation of minimal scrotal and extensive perineal edema and pain prompted the misdiagnosis of Fournier's gangrene for its surgical emergency.

Keywords: Dialysate; Fournier's gangrene; Peritoneal leak

Introduction

Diabetes mellitus remains the leading cause of end-stage renal disease worldwide and in the United States. Renal replacement therapy involves either Hemodialysis (HD) or Peritoneal Dialysis (PD). Renal transplant is reserved for suitable potential recipients. While each form of treatment has its unique complications, there is very little evidence to suggest that one form of treatment is more effective than the other [1]. One of the reasons patients continue to choose and utilize PD is the freedom it offers to patients for home therapy and for travel through the use of Continuous Ambulatory Peritoneal Dialysis (CAPD) or nocturnal peritoneal dialysis using cyclers, also known as Cycler Continuous Peritoneal Dialysis (CCPD).

The etiologies for complications of PD can either be infectious or non-infectious. Infectious complications are predominantly peritonitis, occasionally exit-site infections, or tunnel infections. Non-infectious complications include dialysate leaks, hernias, and other rare complications [2]. A study found that among patients who received PD, 67% experienced complications, yet only 1.6% of these experienced genital/scrotal/perineal symptoms; additionally, these symptoms were primarily a result of inguinal hernias that led to swelling of the genital region and not direct complications of PD itself [3].

Here, we report the case of a patient with a history of diabetes mellitus who presented with edema and tenderness in the perineum, genitals, and scrotum that was ultimately misdiagnosed as Fournier gangrene, for which the presence of diabetes mellitus is a strong risk factor; 39% of patients with Fournier's gangrene have a history of diabetes mellitus [4]. The diagnosis of peritoneal leak was confirmed on computed tomography peritoneography, thus informing the change in treatment approach from emergent surgical debridement to termination of PD and initiation of HD.

Patients and Methods

A 47-year-old African American, obese male patient presented to the emergency room with abdominal discomfort and nausea after having driven a car over multiple, consecutive days. The patient had a history of diet-controlled diabetes and end-stage renal disease and had been on

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peritoneal dialysis for three years. During his travel, he reported having maintained his peritoneal dialysis *via* CAPD. After evaluation and a negative workup, he was discharged with a nonspecific diagnosis and was prescribed pain and nausea medications. The symptoms were attributed to mechanical strains related to the prolonged travel. Two days later, he returned with increased abdominal pain, new scrotal swelling, and significant perineal pain. There was no history of fever, rigors, chills, or urinary symptoms; bowel movements were normal.

Physical examination revealed a blood pressure of 120 mmHg/70 mmHg, heart rate of 75, temperature of 98.8°F, and respiratory rate of 18 breaths/min on room air. The patient was awake, comfortable, cooperative, and under no apparent distress. Cardiac examination revealed regular rate and rhythm, with a 2/6 midsystolic murmur. The abdomen was soft and non-tender, with no rebound tenderness. The PD catheter was in the left lower quadrant with no tunnel tenderness and exit site drainage or tenderness. Incidentally, the left arm exhibited an Arteriovenous (AV) fistula.

Genitourinary examination revealed a phallus of normal appearance without lesions. The scrotum was massively edematous, with no evidence of laceration. The perineum did not reveal any swelling.

Investigations

Laboratory investigations revealed the following: White blood cell count: 8.1 K/ μ L, with a mild left shift; hemoglobin and hematocrit: 12.4 g/dL and 37.6%, respectively; creatinine: 18.3 mg/dL; blood urea nitrogen: 39 mg/dL; albumin: 3.1 g/dL; peritoneal dialysate revealed 40 white blood cells (95% of which were monocytes) and 10 red cells; bacterial culture revealed no growth of organisms after 24 h.

Scrotal ultrasound showed no signs of testicular torsion, but revealed a right-sided hydrocele with the possibility of a small left-sided inguinal hernia. Abdominal and pelvic computed tomography revealed induration and skin thickening of the pre-pubic area, and ruled out an incarcerated hernia.

Initial computed tomography without contrast revealed extensive edema within the perineum. Since no intravenous contrast was administered, an abscess could not be completely excluded. Mild inguinal reactive adenopathy and a small-to-moderate quantity of free fluid were evident in the pelvis with a catheter in place.

Differential diagnosis

An initial diagnosis of cellulitis was made; the patient was administered intravenous levofloxacin and piperacillin-tazobactam and provided scrotal support. During the hospital stay, the scrotal tenderness and swelling worsened and extended into the perineum, and the patient developed a fever. Suspecting early-onset abscess formation, the antimicrobial coverage was broadened further with the addition of metronidazole and vancomycin. Computed tomography of the abdomen and pelvis without contrast failed to rule out abscess formation.

Fournier's gangrene was now considered, even though the patient remained hemodynamically stable with no signs of crepitus or sepsis. Repeat computed tomography without contrast revealed extensive subcutaneous stranding within the soft tissue throughout the perineum and extensive edema with evidence of intraperitoneal air secondary to PD. The abdomen was still completely benign on physical examination.

Due to the worsening of symptoms, such as the scrotal and perineal

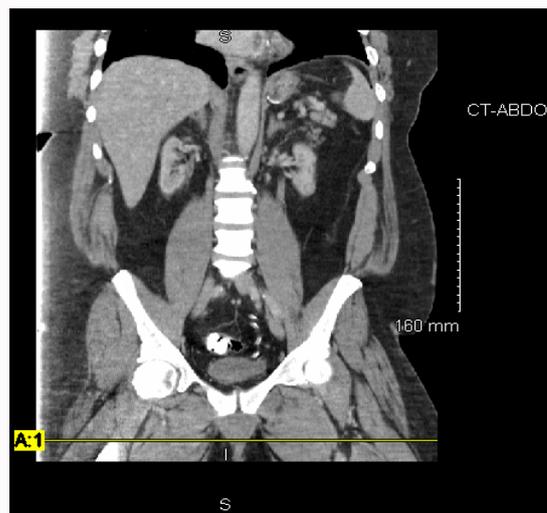


Figure 1: Cross section at the level of A1.



Figure 2: Perineal stranding and swelling.



Figure 3: Contrast in the perineal stranding and swelling.

swelling, tenderness, and fever, surgical debridement was considered. However, prior to surgery, computed tomography peritoneography was suggested to rule out a possible peritoneal dialysate leak into the perineum. Non-ionic contrast medium (100 mL) was added to a 2000 ml dialysate bag (1.5%) and infused into the peritoneal cavity. The dwell time was roughly 30 min to 60 min, during which the patient walked around the hospital wing.

Computed tomography of the abdomen and pelvis with 10-mm slice thickness revealed the contrast solution in the lower abdominal wall, extending into the scrotum with extension into the subcutaneous fat, thus confirming the diagnosis of a peritoneal dialysate leak.

Treatment

The PD was terminated, and HD was initiated *via* the left-arm

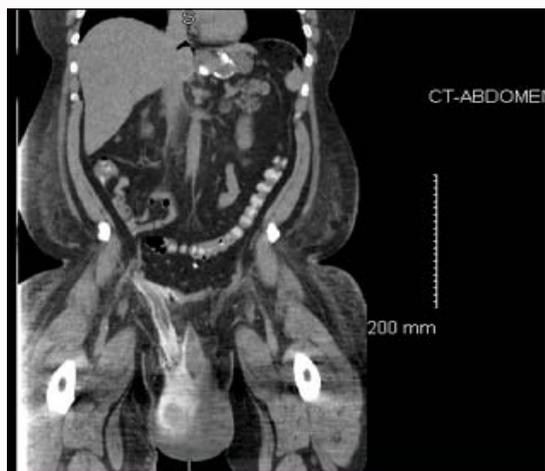


Figure 4: Contrast in the right scrotum.

AV fistula. The swelling decreased, and the patient was discharged two days later.

Outcome and follow-up

Patient failed to follow up with us; he was from another state and returned to his domicile post-discharge.

Discussion

Our patient experienced a complication of PD, which seemingly presented as an infection with symptoms such as fever, perineal and scrotal swelling, and erythema of the scrotum and penis. Failure to improve despite broad-spectrum antibiotics and the consideration of surgical incision and debridement prompted a different diagnostic approach and the need for computed tomography peritoneography.

Since the early 70s, the most common, serious, and well-documented complication of CAPD has been peritonitis, with a morbidity and mortality rate of roughly 60% [5]. Innovations, such as the Tenckhoff catheter with double cuffs, automated cyclers, the Y set with the “flush-before fill” technique, [5] have significantly reduced the complications of peritonitis and the associated morbidity and mortality rates. As a result, complications due to non-infectious etiologies are increasingly being reported [5].

The increasing number of patients on PD and the significant reduction in infectious complications led to the surfacing of peritoneal leaks, hernias, and even the rare hepatic steatosis, first documented in 1989 [2]. The earliest documentation of scrotal swelling in a patient on PD was in 1983, many years after the first patient on CAPD was successfully treated for a long time [6].

In the present case, a history of obesity and diabetes mellitus II and the presenting symptoms of erythema, swelling, and tenderness of the scrotum and perineum led to an initial diagnosis of an infection.

Peritoneal dialysis is known to increase the risk of infections, especially atypical ones. These are often secondary to improper sterilization technique or catheter malfunction, which lead to peritonitis of *Staphylococcus* or *Streptococcus* origin. Peritonitis due to tuberculosis is also more common in patients on PD than in non-PD patients [2]. Furthermore, rare pathogen complications, such as peritonitis secondary to *Pasteurella multocida* infection have also been reported [7]. In the present case, the lack of abdominal symptoms and

a low peritoneal dialysate white cell count of 40 excluded any intra-abdominal infectious process. Thus, considering the risk factors, the lack of response to antibiotics, perineal involvement, and the extent of swelling and associated discomfort, epidermal/dermal etiologies were examined.

These included soft tissue infections due to beta-hemolytic streptococcus, the most common organism for superficial genital infections, and the far more malignant Clostridial infection, which leads to Fournier’s gangrene [8]. Albeit much rarer, Fournier’s gangrene is well documented in literature, especially among patients with diabetes mellitus II [9]. As mentioned earlier, peritoneal dialysis may also complicate the list of pathogens that can cause infections; thus, Fournier’s gangrene was seriously considered.

Fournier’s gangrene has an incidence of 1.6 cases per 1000,008 and specifically refers to the necrotizing fasciitis of the genitals. The Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) score is used as a diagnostic tool for necrotizing fasciitis in acute presentation [10]. A score of 6 or greater has a positive predictive value of 92% and a negative predictive value of 96% [11]. It includes evaluation of C-Reactive Protein (CRP), white blood cells, hemoglobin, sodium, creatinine, and glucose. Although our patient’s score was 3 out of 6, which indicates low risk, necrotizing fasciitis was still considered in the differential diagnosis. This is because CRP, which has the highest diagnostic value for the determination of the score, was not tested for this patient; as Neeki et al. [10] observed, CRP is rarely tested in the emergency room. Additionally, hemoglobin and creatinine have an artificial diagnostic value for patients with end-stage renal disease. Creatinine is elevated in chronic kidney disease and end-stage renal disease. In addition, although the patient’s hemoglobin of 12.4 g/dL appeared relatively normal, it was a mere reflection of his kidney failure. Patients with end-stage renal disease exhibit physiologic low-erythropoietin anemia secondary to kidney failure. They are administered Erythrocyte Stimulating Agents (ESAs) to achieve target hemoglobin of 10 g/dL to 12 g/dL. Similarly, the hemoglobin level in our patient was the result of exogenous stimulation with ESA. At baseline, the LRINEC score would have been 1 point higher, which would have been closer to score required for the diagnosis of necrotizing fasciitis and Fournier’s gangrene.

Fournier’s gangrene is a surgical emergency. Even though broad-spectrum antibiotics are a part of its entire treatment plan, surgical intervention is always required, without which these infections have a documented mortality of 100% [9]. Even with the correct treatment protocol of intravenous antibiotics and surgical debridement, Fournier’s gangrene has a documented mortality rate as high as 88%; however, meta-analysis reveals that it is closer to 60% [9].

As our patient failed to improve with broad-spectrum antibiotics, evidenced by an increasing swelling and tenderness extending into the perineum, surgical debridement was the next step in management. Computed tomography peritoneography, a diagnostic modality with 67% specificity and mainly used to diagnose non-infectious complications of CAPD related to peritoneal leaks, demonstrated contrast in the scrotum. This indicated a peritoneal leak into the scrotum, a relatively rare complication of PD since hernias and leaks usually occur at the entry site of the catheter and lead to anterior abdominal wall edema. The long history of PD and the occurrence of the leak three years after the initiation of PD had made FG a more plausible diagnosis than a leak.

The etiology of leaks and hernias, as complications of PD, is associated with increased intra-abdominal pressure secondary to peritoneal dialysate. Treatment factors, such as the 3 L fill volume, dwell time and incomplete drainage, and are associated with increased abdominal pressure. Normal physiologic pressure changes also include coughing and straining, which is why CAPD is recommended to be performed while supine [2]. Our patient had a history of prolonged seated travel, during which he performed his own CAPD, which presumably contributed to the scrotal edema.

The final computed tomography peritoneography impression revealed that the right-sided hydrocele and small left inguinal hernia, found on the initial ultrasound and computed tomography, were among the complications of the CAPD. The right-sided hydrocele exhibited no signs of infection, such as a lack of initial fever and hemodynamic stability, which precluded any infectious process. Hydrocele is usually diagnosed in children, as a result of a patent ductus vaginalis, which usually closes by the age of 2 years old, and connects the peritoneum and the scrotum. However, it remains open in 15% to 37% of men [2]. The lack of closure can be revealed in adulthood through various pathologies, and the treatment of the hydrocele can vary based on the cause. In our case, the patient may have had a patent ductus vaginalis that led to the formation of a hydrocele due to the increased intra-abdominal pressure created by the peritoneal dialysate fluid.

The discontinuation of all antibiotics and the conversion of PD to HD resulted in resolution of the scrotal and perineal edema within 24 h. The patient was then discharged to continue renal replacement therapy in the form of HD in an outpatient dialysis clinic.

Conclusion

Non-infectious complications of peritoneal dialysis are mainly peritoneal leaks. Perineal swellings, mimicking Fournier's gangrene, may be an unusual presentation of peritoneal dialysate leaks. A good history-taking can help in diagnosis. The LRINEC criteria are not applicable in patients with end-stage renal disease, as creatinine and hemoglobin are misleading factors.

Early consideration of computed tomography peritoneography should be done to differentiate peritoneal leaks. A multi-disciplinary course of action with surgeons, urologists, and radiologists should be consulted in the management of this case.

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