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Scrotal Swelling in a CAPD Patient: A Case of Suspected Dialysate Leak Presenting as Hydrocele

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Abstract: Peritoneal dialysis, particularly Continuous Ambulatory Peritoneal Dialysis (CAPD), is an established modality for renal replacement therapy in patients with end-stage kidney disease (ESKD). Although generally safe, mechanical complications such as dialysate leakage can significantly disrupt treatment. **Case Report:** We present the case of a 32-year-old male with ESKD on dual dialysis (CAPD and hemodialysis) who developed acute right scrotal swelling following CAPD fluid exchange. Physical examination and imaging raised suspicion of a dialysate leak into the scrotal sac, potentially through a patent processus vaginalis, mimicking hydrocele. CAPD was suspended, and the patient was switched to hemodialysis while awaiting urological evaluation. **Discussion:** This case highlights the diagnostic challenge of differentiating dialysate leak from other causes of scrotal swelling, such as hydrocele, hernia, or infection. Prompt identification and management are essential to prevent further complications and maintain dialysis access. **Conclusion:** Dialysate leakage should be considered in CAPD patients presenting with acute scrotal swelling. Multidisciplinary evaluation and temporary suspension of peritoneal dialysis are often necessary for diagnosis and recovery.

Keywords: CAPD; Dialysate Leak; Scrotal Swelling; Hydrocele; Chronic Kidney Disease; Peritoneal Dialysis Complication; Dual Dialysis; Processus Vaginalis; Multidisciplinary Management

INTRODUCTION

Continuous Ambulatory Peritoneal Dialysis (CAPD) is a widely used renal replacement therapy for patients with end-stage kidney disease (ESKD). While generally considered safe and effective, CAPD can be associated with several complications, including infectious, mechanical, and metabolic issues. One uncommon but clinically significant mechanical complication is dialysate leakage, which may occur through anatomical defects such as a patent processus vaginalis, resulting in scrotal swelling or secondary hydrocele formation. (1)

Scrotal edema in CAPD patients presents a diagnostic challenge, as it may mimic other scrotal pathologies, including primary hydrocele, hernia, or infection. Prompt recognition and

differentiation are crucial to prevent further complications, ensure appropriate management, and preserve peritoneal dialysis access. (2)

This case report describes a young male patient on CAPD who developed unilateral scrotal swelling suspected to be due to dialysate leakage, highlighting the diagnostic considerations, management strategies, and implications for continued dialysis care.

Case Report

The patient, a 32-year-old male with a known history of end-stage kidney disease (ESKD) secondary to chronic kidney disease (CKD) stage V, presented with complaints of right scrotal swelling. He first noticed a small lump in his right scrotum one day prior to admission, which progressively increased in size. The swelling was soft in consistency, non-tender, and partially reducible upon manual compression. The patient denied any history of trauma, fever, dysuria, or systemic signs of infection.

In addition to the scrotal swelling, he reported experiencing intermittent abdominal cramps beginning earlier the same day, notably after performing a routine CAPD fluid exchange. Despite the discomfort, he was able to pass stool and flatus normally and denied symptoms suggestive of bowel obstruction or peritonitis. There was no history of scrotal pain or constitutional symptoms such as weight loss or night sweats.

His medical history included hypertension diagnosed a year ago, and he had been undergoing regular hemodialysis since December 2024. A CAPD catheter had been inserted in March 2025 to transition to peritoneal dialysis. However, following catheter malfunction, he underwent laparoscopic repair on April 16, 2025. CAPD exchanges had been resumed postoperatively without major issues until the current presentation. The patient had no known allergies, no significant family history of chronic illnesses, and was compliant with his prescribed medications, which included folic acid, febuxostat, and candesartan.

On examination, the patient was alert and appeared moderately ill. Vital signs were stable, with a blood pressure of 120/70 mmHg, heart rate of 92 beats per minute, respiratory rate of 20 breaths per minute, body temperature of 36.9°C, and oxygen saturation of 99% on room air. Anthropometric measurements revealed a body weight of 62 kg and a height of 169 cm, corresponding to a body mass index (BMI) of 21.7 kg/m².

Cardiopulmonary examination was unremarkable, with normal heart sounds (S1S2) and vesicular breath sounds bilaterally without adventitious sounds. Abdominal examination revealed no distention, no collateral venous circulation, normal bowel sounds, and mild tenderness in the right upper quadrant without signs of peritoneal irritation.

Examination of the scrotum revealed right-sided swelling with soft consistency, non-tender to palpation, without overlying skin changes or erythema. Transillumination test was initially reported positive, suggestive of fluid accumulation, though subsequent evaluation noted absent transillumination, raising suspicion of possible dialysate leakage into the scrotal sac. No hernia impulse was detected. The extremities were warm, with no evidence of peripheral edema.

Initial laboratory evaluation revealed significant uremia, with a blood urea level of 120 mg/dL and serum creatinine of 13.2 mg/dL, consistent with the patient's background of end-stage renal disease. Other routine laboratory parameters were not specified as abnormal at the time of presentation.

An electrocardiogram (ECG) performed on April 28, 2025, showed normal sinus rhythm with a heart rate of 100 beats per minute. The P wave morphology, PR interval (0.12 seconds), and

QRS complex duration were within normal limits. No ST-segment abnormalities or T wave changes were observed.

A thoracic X-ray demonstrated no cardiopulmonary abnormalities. Cardiac silhouette was within normal limits with a cardiothoracic ratio (CTR) of 43%, and there were no signs of pulmonary consolidation, nodules, or pleural effusion. A central dialysis line (CDL) was noted with the distal tip positioned appropriately at the cavoatrial junction.

An abdominal plain film (BOF) revealed no evidence of bowel obstruction, pneumoperitoneum, or radio-opaque urinary tract stones. The distribution of bowel gas was normal, and the preperitoneal fat lines were well-defined. The CAPD catheter was visualized, with its distal tip projecting toward the pelvic cavity, suggesting correct positioning without immediate mechanical complications.

An abdominal ultrasound performed earlier (February 2, 2025) had shown bilateral increased renal cortical echogenicity with blurred corticomedullary differentiation, supporting a diagnosis of diffuse parenchymal kidney disease. Splenomegaly was also noted. The liver, gallbladder, pancreas, urinary bladder, and prostate appeared normal. Importantly, no free fluid collections were detected in the peritoneal or pelvic cavities at that time.

Local scrotal examination findings, along with initial transillumination positivity (later absent), raised clinical suspicion of fluid accumulation, potentially dialysate leakage through a patent processus vaginalis leading to a secondary hydrocele formation.

Upon establishment of the diagnosis, immediate management focused on preventing further complications related to suspected dialysate leakage. Continuous Ambulatory Peritoneal Dialysis (CAPD) was temporarily suspended to minimize the risk of worsening scrotal swelling and to allow the peritoneal cavity to heal. The patient was transitioned back to regular intermittent hemodialysis (HD) sessions, scheduled twice weekly at Surya Husadha Hospital, utilizing a tunneled right internal jugular vein catheter for vascular access. The last hemodialysis session prior to admission was performed on April 25, 2025, and the next session was planned for April 29, 2025.

Supportive medical therapy included the administration of 0.9% normal saline intravenous fluids at a rate of 500 mL over 24 hours to maintain appropriate hydration status. Symptomatic treatment for abdominal discomfort was provided with oral paracetamol 500 mg every eight hours. Maintenance medications were continued as previously prescribed: folic acid 2 mg orally every 12 hours, febuxostat 40 mg orally once daily, and candesartan 8 mg orally once daily. Nutritional management was adjusted to a renal-friendly diet consisting of approximately 2200 kcal per day with 74.5 grams of protein daily, aligned with the patient’s ongoing dialysis requirements.

In addition, consultation with the Urology Surgery Team was requested to further evaluate the nature of the scrotal swelling. A testicular ultrasound was planned to determine whether the swelling was due to hydrocele formation or direct dialysate leakage through a patent processus vaginalis. Surgical intervention would be considered if a persistent communication between the peritoneal cavity and scrotum was identified.

METHOD

Throughout his clinical course, the patient's vital signs remained stable, with no evidence of infection or worsening abdominal symptoms. Fluid intake and output were closely monitored, and no new episodes of scrotal enlargement were observed after suspension of CAPD. The patient continued under multidisciplinary care with regular hemodialysis and was scheduled for ongoing evaluation and definitive management of the scrotal condition.

The patient's history of recent laparoscopic repair of the CAPD catheter and the subsequent development of scrotal swelling strongly suggested a mechanical complication rather than an infectious process. The absence of systemic symptoms such as fever, signs of peritonitis, or bowel obstruction further supported a diagnosis of localized dialysate leakage rather than generalized intra-abdominal pathology. Careful clinical monitoring, combined with supportive measures and temporary cessation of peritoneal dialysis, allowed for stabilization of the patient's condition while awaiting definitive imaging and surgical evaluation. This case underscores the importance of early recognition of CAPD-related mechanical complications and highlights the critical role of multidisciplinary collaboration in achieving optimal outcomes for patients on dual dialysis modalities.

Figure 1. Condition CAPD of the patient and scrotal view

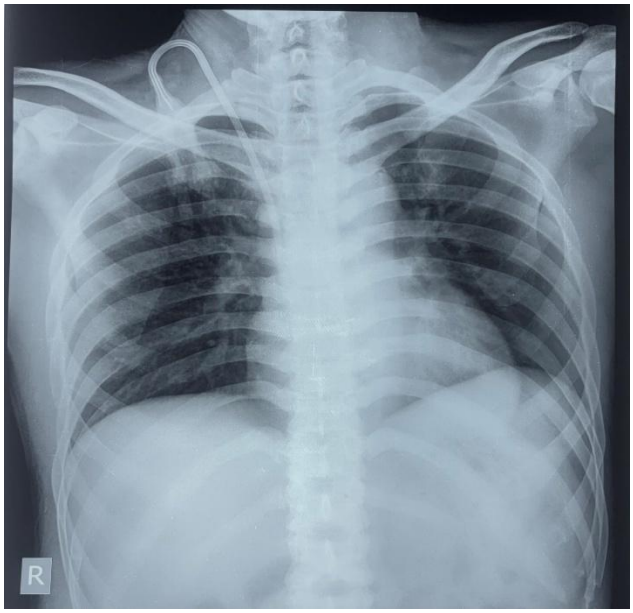

Figure 2. Thorax photo of the patient

Figure 3. BOF of the patient

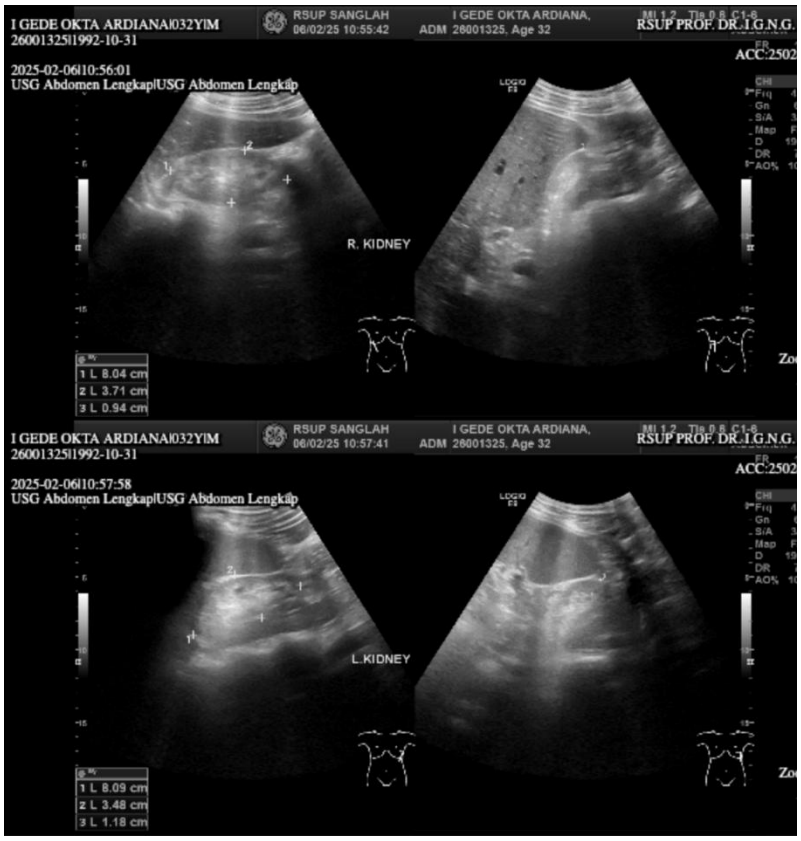

Figure 4. USG of the patient

RESULT AND DISCUSSION

Continuous Ambulatory Peritoneal Dialysis (CAPD) is an important modality for renal replacement therapy, particularly favored for its ease of use and potential to improve patient autonomy. However, CAPD is not without complications. Mechanical complications, such as dialysate leaks, though relatively uncommon, can significantly affect therapy efficacy and patient quality of life. (3)

Dialysate leaks typically occur in the early phase after catheter insertion but may also develop later, especially following catheter malfunction or surgical interventions. The mechanism often involves increased intra-abdominal pressure leading to the passage of dialysate through congenital or acquired defects. In males, a patent processus vaginalis can provide a pathway for dialysate to leak into the scrotal sac, presenting clinically as scrotal swelling, hydrocele formation, or, less commonly, scrotal hernias. (4)

Scrotal swelling in CAPD patients demands careful evaluation to differentiate between infectious causes (such as epididymitis or scrotal abscess), hernias, primary hydroceles, and dialysate-related leaks. Key clinical clues include swelling that fluctuates with fluid exchange cycles, reducibility, and the absence of inflammatory signs. Imaging modalities, particularly scrotal ultrasonography and abdominal imaging, are essential for confirming the diagnosis and planning management.(5)

Management strategies depend on the severity of the leak and the impact on dialysis efficacy. Minor leaks may resolve with temporary suspension of CAPD and conversion to hemodialysis, allowing spontaneous closure of the defect. However, persistent or large leaks, especially those involving the scrotum, often require surgical intervention, such as hernia repair or closure of the processus vaginalis, to prevent recurrence and enable safe continuation of peritoneal dialysis. (6)

In this patient, the decision to suspend CAPD and resume hemodialysis was appropriate to prevent further fluid leakage and allow for tissue healing. Urological consultation was essential to evaluate the need for surgical repair. Early recognition and multidisciplinary management are crucial to preserve peritoneal dialysis options and maintain overall dialysis adequacy.(7)The prognosis for patients with dialysate leaks is generally favorable if managed promptly. However, recurrence of leaks or failure to repair structural defects can lead to the need for permanent transition to hemodialysis. Patient education regarding early symptoms of leaks and adherence to fluid management protocols are important preventive measures. (8)This case highlights the importance of high clinical suspicion for dialysate leaks in CAPD patients presenting with scrotal swelling, and underscores the need for a coordinated approach involving nephrology, urology, and surgical teams to optimize patient outcomes.

Scrotal dialysate leakage is a mechanical complication of peritoneal dialysis that results from abnormal communication between the peritoneal cavity and the scrotal sac. The primary pathophysiological mechanism involves increased intra-abdominal pressure caused by the continuous inflow of dialysate fluid during CAPD exchanges. This pressure gradient encourages the movement of fluid through any pre-existing anatomical defects, particularly in the lower abdominal wall or inguinal region.(9)A key anatomical structure implicated in scrotal leakage is the processus vaginalis, a peritoneal outpouching that normally obliterates during infancy. However, studies suggest that in approximately 5% to 10% of the adult population, the processus vaginalis remains partially or completely patent. This persistence creates a potential conduit through which dialysate can track into the scrotal sac. When dialysate under pressure finds this pathway, it can accumulate within the tunica vaginalis, leading to the development of scrotal edema or a secondary hydrocele. (10)

The clinical presentation typically correlates with CAPD cycles; swelling may worsen following dialysate infusion and improve when fluid volume decreases, providing an important diagnostic clue. Recognizing the role of a patent processus vaginalis in this context is crucial, as it directly influences both the diagnostic approach and the therapeutic strategy, often necessitating surgical closure to prevent recurrence and allow safe continuation of peritoneal dialysis. (11)

The clinical presentation of dialysate leaks, particularly those resulting in scrotal swelling, can be subtle and easily mistaken for other scrotal pathologies. A hallmark feature is the onset or worsening of swelling in relation to CAPD fluid exchanges. Patients often report that scrotal swelling becomes more pronounced following dialysate instillation and may partially regress when the abdomen is emptied or when CAPD exchanges are withheld. This temporal relationship between dialysis cycles and symptom severity is an important diagnostic clue suggesting a mechanical dialysate leak rather than a primary scrotal disease. (12)In contrast to inguinal hernias, which typically present as a bulge in the groin or scrotum that may be reducible and often associated with a cough impulse, dialysate-related scrotal swelling is generally soft, non-tender, and less responsive to manual reduction. Additionally, hernias may present with features of bowel involvement, such as obstructive symptoms, which are usually absent in cases of isolated dialysate leakage. (13)

Compared to a primary hydrocele, which is usually a painless, fluctuant swelling with positive transillumination due to the presence of clear fluid within the tunica vaginalis, scrotal edema secondary to dialysate leakage may initially transilluminate but can vary in consistency depending on the amount and pressure of fluid leaking. Furthermore, in dialysate leaks, the volume of swelling may fluctuate noticeably with dialysis sessions, which is not characteristic of a primary hydrocele. Recognizing these distinguishing features through careful history-taking and physical examination is critical for early diagnosis, enabling appropriate management strategies to be implemented before serious complications arise. (14)

CONCLUSSION

Scrotal swelling in patients undergoing Continuous Ambulatory Peritoneal Dialysis (CAPD) should prompt consideration of dialysate leakage as a potential underlying cause, particularly in the presence of a patent processus vaginalis. Early recognition, appropriate imaging, and timely multidisciplinary management are critical to prevent complications and preserve peritoneal dialysis access. Temporary suspension of CAPD and transition to hemodialysis, alongside surgical consultation when indicated, offer effective strategies for managing this complication. This case emphasizes the importance of vigilance for mechanical complications in CAPD patients and the need for individualized, patient-centered care to optimize long-term outcomes. Beyond its clinical implications, this case also highlights the importance of patient education and proactive surveillance in the long-term management of peritoneal dialysis. Educating patients on the early signs of dialysate leakage—such as new-onset swelling or discomfort following exchanges—can lead to earlier reporting and intervention, potentially avoiding severe complications. Furthermore, this case reinforces the need for institutional protocols that integrate surgical, nephrology, and nursing teams to promptly address mechanical complications. A collaborative approach not only improves clinical outcomes but also supports the sustainability of peritoneal dialysis as a home-based, patient-empowering therapy.

REFERENCE

Çakır B, Kırbaş İ, Çevik B, Ulu EMK, Bayrak A, Coşkun M. Complications of continuous ambulatory peritoneal dialysis: evaluation with CT.

Stuart S, Booth TC, Cash CJC, Hameeduddin A, Goode JA, Harvey C, et al. Complications of Continuous Ambulatory Peritoneal Dialysis. RadioGraphics. 2009 Mar;29(2):441–60.

Khan SF. Updates on Infectious and Other Complications in Peritoneal Dialysis: Core Curriculum 2023. American Journal of Kidney Diseases. 2023 Oct;82(4):481–90.

Doley P. WCN23-1084 EARLY COMPLICATIONS OF CAPD: A RETROSPECTIVE SINGLE CENTRE STUDY FROM NORTH EAST INDIA. Kidney International Reports. 2023 Mar;8(3):S410.

Tao W, Kang O, Yung G, Mansberg R. Peritoneal-scrotal dialysate leakage demonstrated on SPECT/CT imaging in a patient on peritoneal dialysis. Radiology Case Reports. 2022 Aug;17(8):2643–6.

Mobark A, Eltahir J, Mahir O, Ali H, Hummieda M, Khalid S, et al. Successful Conservative Management of Scrotal Edema Resulting from Uncomplicated Peritoneal Fluid Leak. Arab J Nephr Trans. 2010 Sep 1;2(2):51–4.

Sánchez, P, Pérez, C. Genital oedema in peritoneal dialysis. Nefrología. 2009;29(5):498–9.

Connolly SS, Govender P, Ellanti P, Flynn R. Acute scrotal oedema complicating peritoneal dialysis. Scandinavian Journal of Urology and Nephrology. 2008 Jan 1;42(6):558–9.

Millán I, Sirvent AE, Francisco Ramón J, Díez M. Patent processus vaginalis in peritoneal dialysis. Kidney International. 2013 Sep;84(3):628.

Young-Peart S, Rn SC, Bitzan M. Scrotal swelling in infant receiving peritoneal dialysis: a diagnostic challenge.

Sherlock DJ, Smith S. Complications resulting from a patent processus vaginalis in two patients on continuous ambulatory peritoneal dialysis. Journal of British Surgery. 1984 Jun 1;71(6):477–477.

Lin MY, Wu CC. Hydrocele in a Peritoneal Dialysis Patient: Hernia or Leakage. Intern Med. 2011;50(24):3047–8.

Alabama College of Osteopathic Medicine, Dothan, AL, USA., Kareem R, Oussama RA, The Virtual Nephrologist, Inc., Lynn Haven, FL, USA., Sidra S, Alabama College of Osteopathic Medicine, Dothan, AL, USA. Peritoneal dialysate leak mistaken as Fournier's gangrene. Open J Clin Med Images [Internet]. 2021 Nov 11 [cited 2025 Apr 29];1(1). Available from: https://jclinmedimages.org/articles/OJCMI-v1-1005.html

Conn HO. Sudden Scrotal Edema in Cirrhosis: A Postparacentesis Syndrome. Ann Intern Med. 1971 Jun 1;74(6):943–5.