

Laparoscopy to Evaluate Scrotal Edema During Peritoneal Dialysis

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ABSTRACT

Background: Acute scrotal edema is an infrequent complication in patients who undergo continuous ambulatory peritoneal dialysis (CAPD), occurring in 2% to 4% of patients. Inguinal hernia is usually the cause, but the diagnosis is sometimes confusing. Imaging modalities such as computed tomographic peritoneography are helpful but can be equivocal. We have used diagnostic laparoscopy in conjunction with open unilateral or bilateral hernia repair for diagnosis and treatment of peritoneal dialysis (PD) patients with acute scrotal edema.

Technique and Cases: Three patients with acute scrotal edema while receiving CAPD over the span of 7 years had inconclusive results at clinical examination and on diagnostic imaging. All patients underwent diagnostic laparoscopy that revealed indirect inguinal hernia, which was concomitantly repaired using an open-mesh technique.

Results: Diagnostic laparoscopy revealed the etiology of the scrotal edema 100% of the time, with no complications, and allowed concomitant repair of the hernia. One patient had postoperative catheter outflow obstruction, which was deemed to be unrelated to the hernia repair.

Conclusion: Diagnostic laparoscopy is helpful in confirming the source of acute scrotal edema in CAPD patients and can be performed in conjunction with an open-mesh repair with minimal added time or risk.

Key Words: Scrotal edema, Peritoneal dialysis, Laparoscopy, Hernia, Processus vaginalis.

INTRODUCTION

Acute scrotal edema is an infrequent but described complication in patients receiving continuous ambulatory peritoneal dialysis (CAPD), occurring in as many as 4% of patients.^{1,2} Although the most common cause is fluid extravasation from an indirect hernial sac or patent processus vaginalis (PPV),¹ other causes include peritoneal tears¹ and leaks around the dialysis catheter.² It may manifest shortly after CAPD is instituted or several months or years later. Diagnosis of the etiology can be difficult. The diffuse edema and often small hernia size make the physical examination unreliable. A number of diagnostic imaging measures have been tried, including peritoneal scintigraphy,³⁻⁶ ultrasonography,⁷ computed tomographic (CT) peritoneography,^{2,8-15} and, most recently, magnetic resonance peritoneography,¹⁶ all with varying degrees of success. However, when planning an operative approach, the surgeon must be confident that the pathology is an inguinal hernia or PPV and be able to differentiate whether it is located right, left, or bilateral. Therefore, we began using diagnostic laparoscopy (DL) in conjunction with open unilateral or bilateral hernia repair to evaluate and manage CAPD patients with acute scrotal edema.

Technique

Three patients who presented with acute scrotal edema while receiving CAPD over the span of 7 years had inconclusive results at clinical examination and on diagnostic imaging. They consented to diagnostic laparoscopy for possible unilateral or bilateral inguinal hernia repair. The patients received prophylactic antibiotics 30 minutes before incision. After general anesthesia was induced, the patient was prepped and draped in the usual sterile fashion. The PD catheter may be prepped into the field or excluded with a plastic drape. In our patients, access was gained via a supraumbilical incision and Veress needle. A blunt 5-mm trocar was then placed off the midline to minimize the chance of postoperative fluid leak. A 5-mm laparoscope was used to inspect the abdomen and pelvis. Once the diagnosis of unilateral or bilateral inguinal hernia or PPV was confirmed, the trocars were removed and an open inguinal hernia repair was performed with high

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ligation and excision of the hernia sac or PPV, followed by onlay mesh, as described by Lichtenstein and Shulman.¹⁷

Cases

Patient 1 was a 41-year-old man with hypertension, diabetes, and chronic renal failure who had been receiving CAPD for 1 month when he presented with severe bilateral scrotal and penile edema. Dialysis was halted for 1 week and the edema resolved. It was resumed at lower volumes, but he again developed scrotal swelling. CT scan after infusion of PD fluid revealed fluid located around both testicles. The right side was larger, raising the possibility of a right inguinal hernia. DL was subsequently performed, revealing no inguinal hernia on the left but showing a PPV on the right. The PD catheter was visualized entering the pelvis and covered with intestine. A concomitant open repair of this right indirect inguinal hernia with mesh was performed, and the recovery was unremarkable. The patient resumed CAPD 1 month after his hernia repair and had no further scrotal edema.

Patient 2 was a 70-year-old man with hypertension, diabetes mellitus type II, and chronic renal failure who had been receiving CAPD for ~1 year before he presented with acute onset of pain with urination and bilateral scrotal swelling and pain lasting 2 days. His physical examination revealed a massively swollen scrotum and palpable and mildly tender testes, with no physical evidence of inguinal hernia. Scrotal ultrasonography and CT scan findings were negative for obvious hernias. Peritoneal dialysis was stopped for 3 days and the swelling partially subsided. The patient resumed dialysis at low volumes and the swelling recurred. He underwent DL, which revealed an obvious right inguinal hernia and no left inguinal hernia. Concomitant open right inguinal hernia repair with mesh was performed. One month after his hernia repair, the patient resumed CAPD without scrotal swelling. He did have persistent outflow obstruction and underwent laparoscopic repositioning of the catheter, which was buried in the right lower abdomen where several adhesions were present. It was not clear whether these adhesions resulted from the hernia repair or were idiopathic. The patient was able to resume CAPD 2 weeks after catheter repositioning and had no further problems or scrotal edema.

Patient 3 was a 55-year-old man with progressive renal failure who was receiving CAPD that had been started ~6 weeks after his peritoneal dialysis catheter was placed. He almost immediately developed acute bilateral scrotal edema. An inguinal hernia was not palpable on physical

examination. A CT scan of the abdomen and pelvis using oral and intravenous contrast agents showed no evidence of inguinal hernia. Repeat CT scan, this time with nonionic contrast mixed with his dialysate and infused via his peritoneal dialysis catheter, revealed "a small amount of peritoneal fluid identified within the tunica vaginalis on the right side of the scrotum," consistent with a PPV. There was also the suggestion of a PPV on the left. Because of the inconclusiveness of the radiological reading, we performed a DL, which confirmed a hernia on the right but none on the left. The patient then underwent an open right inguinal hernia repair with mesh. He recovered well, resumed CAPD after a 4-week recovery, and has done well since then, without complications.

DISCUSSION

Acute scrotal edema in patients receiving CAPD is disruptive to the patient. If it occurs early after surgery, the cause may be leakage around the catheter or a peritoneal tear. However, the more common etiology is inguinal hernia or a PPV. Hernias are common in CAPD patients because of anatomic, hydrostatic, and metabolic factors.^{18,19} The greater the fluid volume instilled, the greater the pressure and the higher the incidence of hernias.²⁰ Therefore, diagnosis and repair of existing hernias before instituting CAPD is essential. This requires a high index of suspicion and thorough preoperative physical examination. However, indirect inguinal hernias develop from a congenital PPV, present in ~13% of men without clinical hernias.^{21,22} A true hernia is likely to manifest in these patients after starting CAPD, and present with acute scrotal edema. The exact mechanism of fluid escape is not known but is thought to be the result of a leak in the processus vaginalis or by hydrostatic and/or osmotic pressure.

Patients present with the complaint of rapid persistent swelling of the scrotum and sometimes the penis. There is usually discomfort, but minimal pain, and no urinary or gastrointestinal symptoms. At physical examination, bilateral scrotal swelling and skin edema without redness or tenderness are often found. Although acute scrotal edema is not harmful to the patient, it does cause considerable distress and discomfort. The edema will usually greatly improve or resolve if the patient is directed to low-volume CAPD and uniformly resolves after discontinuation of CAPD. However, the patient's lifestyle is severely disrupted by going through hemodialysis. Making a rapid and accurate diagnosis of a hernia is paramount so it may be repaired with little or no disruption in PD. We have found that during the period of severe edema the physical

examination is difficult and inaccurate because scrotal swelling is usually bilateral, even in patients with unilateral hernias, and small hernias or PPV are not palpable. Several diagnostic measures have been tried, including peritoneal scintigraphy,^{3–6} ultrasonography,⁷ CT peritoneography,^{2,8–15} and, most recently, magnetic resonance peritoneography,¹⁶ all with varying degrees of success. Deshmukh and colleagues used peritoneal scintigraphy to diagnose a PPV in 3 patients with acute scrotal edema.⁵ However, peritoneal scintigraphy is not used uniformly in the United States thus many departments have limited experience with this technique. It has been largely replaced with CT after instillation of peritoneal contrast (CT peritoneography). Several studies have confirmed its utility in providing an accurate diagnosis of contrast extravasation around the catheter, peritoneal tear, and hernias.^{2,12,13} Compared with the other imaging studies, CT peritoneography provides greater spatial resolution and more anatomic detail and should be considered the test of choice.⁷ However, as our cases show, occult hernias and PPV can result in equivocal findings.

If the source of scrotal edema is from a peritoneal tear or a leak around the catheter, healing should occur in 2 to 4 weeks and CAPD can be restarted. If CT peritoneography findings have ruled out a peritoneal tear or catheter leak, we then use diagnostic laparoscopy (DL) to make the definitive diagnosis and to accurately differentiate bilateral from unilateral inguinal hernias. We believe this is important because the rate of PPV on the opposite side in patients with unilateral hernias approaches 25%,^{23,24} and failure to identify this will result in recurrent scrotal edema and the need for reoperation. The accuracy of DL approaches 100% and has a <1% complication rate.^{25,26}

Our technique uses traditional laparoscopic equipment and trocars. We are now using the catheter to insufflate the abdomen when possible and placing the first trocar off the midline in an attempt to reduce the possibility of fluid leak. The diagnosis should be made by inspection with occasional manipulation with additional instruments if there are adhesions or bowel obstructing the view of the internal ring. Once the diagnosis is confirmed, laparoscopy is converted to open hernia repair. Extraperitoneal repair is favored because the integrity of the peritoneal membrane is vital to CAPD.²⁷ The Lichtenstein tension-free repair has been proven successful in CAPD patients, allowing early return to dialysis with no recurrence in one series.²⁸ There is a wide range of opinion regarding the optimum healing time, varying from 1 day to 8 weeks^{27–29} CAPD was stopped in our patients for 4 weeks after this operation, but others have described hernia repair with-

out discontinuation of CAPD.^{30–32} More recently we have developed a protocol of low-volume CAPD to allow the edema to resolve, followed by surgery and 2 weeks of low-volume CAPD if the patient can tolerate that in an attempt to avoid hemodialysis altogether. Further investigation is required to validate this protocol.

CONCLUSION

For patients in whom acute scrotal edema develops while they are receiving CAPD, diagnostic laparoscopy is accurate in confirming the etiology of inguinal hernia or PPV. It can be performed in conjunction with an open-mesh repair with minimal added time or risk and should be considered in these patients, especially when CT peritoneography is equivocal.

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