Dialysate Leakage Complicating Peritoneal Dialysis: the Diagnostic Value of Computed Tomographic Peritoneography

WEN-JEN TSAI, KWOK-KUEN PANG, FENG-CHI KUO, MING-JONG BAIR

Division of Nephrology, Department of Medicine, Department of Radiology, Division of Gastroenterology, Department of Medicine, Mackay Memorial Hospital, Taitung branch

The leakage of dialysate is an uncommon complication in peritoneal dialysis. Rarely, does this disease become progressive and require surgical intervention. Imaging findings of computed tomographic (CT) peritoneography may be of great diagnostic value. Here we report a case of dialysate leakage and the findings of CT peritoneography.

CASE REPORT

A 56-year-old man with uremia on continuous ambulatory peritoneal dialysis (CAPD) presented with an episode of acute and severe scrotal swelling. He had been under CAPD treatment for two months with a daily exchange of eight liters of dialysate divided into four times of exchange. Anti hypertensives during the previous two months included oral sustained release doxazosin 8mg/day and sustained release diltiazem 180 mg/day. He had been hurried to fill two liters of dialysate into the peritoneal cavity in a very short time one day prior to admission. Two hours later, he had gotten more and more swelling in his penis and scrotum. Significantly elevated blood pressure, increased abdominal girth, reduced ultrafiltration and weight gain of two kilograms happened within one day.

The patient was 168 centimeters tall and weighed 87 kilograms. His temperature was 37.2°C, pulse rate 66 per minute with a regular rhythm, respiratory rate 21 per minute, and blood pressure 180/100 mmHg. On chest auscultation, no basal crackle was heard. There was painless swelling of the penis and scrotum without discoloration, local heat or palpable mass. Clinically, there was no evidence of infectious sign or edema in the abdominal wall and extremities. The rest of physical examination was unremarkable.

His white cell count was $8.4 \times 10^9$ /L with 70.1% neutrophils and the hemoglobin level was 6.08 mmol/L. Initial biochemical tests showed serum glu-
cose 9.73 mmol/L, blood urea nitrogen 32.5 mmol/L, serum creatinine 1176 μmol/L, serum sodium 142 mmol/L, serum potassium 4.0 mmol/L, serum calcium 2.38 mmol/L, and serum phosphate 2.00 mmol/L. The urinalysis displayed a normal urine sediment. The electrocardiogram and chest x-ray film were normal. On a plain x-ray of the abdomen, there was no strong evidence of malposition of the peritoneal catheter. For demonstration of the possible dialysate leakage, 140 milliliter of nonionic, iodinated and low osmolar contrast medium (ULTRAVIST®) was infused through peritoneal catheter slowly and the patient had been asked to change position for 15 minutes. CT peritoneography without and with contrast infusion study showed the intraperitoneal contrast medium leaked into an incompetent left inguinal canal. For demonstration of the possible dialysate leakage, 140 milliliter of nonionic, iodinated and low osmolar contrast medium (ULTRAVIST®) was infused through peritoneal catheter slowly and the patient had been asked to change position for 15 minutes. CT peritoneography without and with contrast infusion study showed the intraperitoneal contrast medium leaked into an incompetent left inguinal canal (Fig. 1).

After two days of absolute bed rest in Tredelenburg position and intravenous injection of diuretics with furosemide of 40 milligram daily, the scrotal swelling improved much without interventional procedure. Automated peritoneal dialysis (APD) had been instituted with incremental increase in the amount of dialysate over the next two months. Our patient has tolerated APD well and the scrotal edema did not recur during the next six months of follow-up.

DISCUSSION

The initial presentation of our uremic patient on CAPD was acute and severe painless swelling of his penis and scrotum. There was no infectious sign, no palpable mass and no suspicion of intestinal content in his scrotum. The clinical diagnosis seemed to be beyond scrotal hernia and infectious disease. The clues including the hush instillation of two liters of peritoneal dialysate, significantly elevated blood pressure, increased abdominal girth, reduced ultrafiltration and weight gain of two kilograms within one day pointed to a non-infectious, mechanical complication of peritoneal dialysis: dialysate leakage.

The diagnosis of dialysate leakage could be difficult because its symptoms and signs may mimic hernia, hematoma or abscess [1]. Ultrasound study may provide information in a few cases anyway the findings of ultrasound is not diagnostic. CT peritoneography is an efficient tool in the diagnosis of dialysate leakage. The indications of CT peritoneography include poor ultrafiltration, difficulty with dialysate exchange, recurrent peritonitis, abdominal wall or genital edema, localized bulging of the abdomen [2]. It could provide fruitful information, not only to evaluate the leakage involving the abdominal wall, catheter-related problems, loculated peritoneal fluid collection, but also the underlying anatomical defects, the possible peritoneal recess and an intra-abdominal abscess [1-7]. Our patient was proven to have an incompetent left inguinal canal. The turnica vaginalis around testes is an extensional part of the peritoneum. The dialysate fluid could leak into penis and scrotum through an incompetent processus vaginalis and spread from the Scarpa’s fascia to the Colles’ fascia [2]. Sudden increase of the intraperitoneal pressure was the most likely culprit attributing to the dialysate leak into the penis and scrotum through an incompetent inguinal canal [7]. The dialysate appears as a contrast medium on a T2-weighted, turbo spin-echo sequence magnetic resonance imaging (MRI), which can be an alternative to CT peritoneography [8]. It could be of great benefit to patients with history of allergic reaction to contrast media and it can avoid the exposure to radiation and iodinated contrast medium. However,
the disadvantages of peritoneal MRI include its cost, time consuming, and less accessibility.

The genital swelling can improve after absolute bed rest in Tredelenburg position, which is helpful to reduce intraperitoneal pressure. At first, our patient was treated with nocturnal intermittent peritoneal dialysis (NIPD) and he received a nocturnal exchange by a cycler machine of seven and a half liters of dialysate with the peritoneum left dry during the day. To reach the effect of dialysis, the management had been shifted to continuous cyclic peritoneal dialysis (CCPD) over the next two months. The CCPD modality contained a nocturnal exchange of twelve liters of dialysate by a cycler and an extra-exchange of two liters of dialysate during the day. Automated peritoneal dialysis, including NIPD and CCPD, is a form of dialysis using a cycler at the night in order to reduce the elevated intra-abdominal pressure which was present in our patient. Our patient tolerated APD well and the genital edema did not recur during the following six months.

In conclusion, CT peritoneography is of great value to evaluate dialysate leakage complicating peritoneal dialysis, and it warrants proper decision-making before intervention.

REFERENCES

腹膜透析併發透析液滲漏：腹膜腔顯影的電腦斷層掃描的診斷價值

蔡文仁¹ 彭國權² 郭針吉¹ 白明忠³

馬偕紀念醫院台東分院 腎臟科¹ 放射科² 腸胃科³

腹膜透析併發腹膜透析液滲漏是腹膜透析一個不常見的併發症。一個經良好訓練的醫療團
队使用腹膜腔顯影的電腦斷層掃描檢查是有高診斷價值且不會併發不良反應。一位 56 歲尿毒
症患者進行連續性可攜帶性腹膜透析（CAPD）治療發生了嚴重的急性下腹部腫脹。在入院前
一天，他一次將兩公升的腹膜透析液在非常短的時間內注入到腹膜腔內。之後他在一天內，發
生了明顯血壓上升，腹圍增加，腹膜透析的脫水量減少以及體重增加了兩公斤的情形。此外並
無發現感染或是腹壁水腫、肢體腫脹的情形。腹膜腔內電腦斷層掃描檢查使用了含碘的非離子
性低滲透壓的顯影劑（ULTRAVIST®），我們發現顯影剎經由腹膜腔向左側閉鎖不全的腹膜溝
管滲漏。病人在以頭低腳高姿勢的完全臥床休息兩天後，下腹部腫脹在未經手術處理下獲得良
好的改善。後來我們成功地採用在夜間以機器協助換液的自動性腹膜透析（APD）的方式來減
少病人的腹內壓力以進行透析治療，並慢慢地增加病人腹膜透析液的量。下腹部腫脹的情形在
之後的六個月追蹤並沒有再發生。腹膜腔顯影的電腦斷層掃描針對腹膜透析的併發透析液
滲漏的合併症可以正確地診斷透析液發生滲漏的病理機轉，是具有高價值的診斷工具。