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### **Maintenance of peritoneal dialysis despite subcutaneous leakage: a case report**

(Maintien de la DP malgré une fuite sous-cutanée en dialyse péritonéale : à propos d'un cas)

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#### Summary

Subcutaneous dialysate leakage is a rare mechanical complication of peritoneal dialysis (PD). It requires an individualized, multidisciplinary approach for effective management. We report the observation of a 33-year-old male patient with end-stage chronic renal failure who developed a subcutaneous leak 4 months after starting PD. Intra-peritoneal pressure was elevated to 22 cm H<sub>2</sub>O. An abdominal computed tomography (CT) scan without injection confirmed diffuse infiltration of the abdominal wall. A CT scan with Gastrografin injection showed extravasation of Gastrografin along the catheter path, locating the dialysate leak at its peritoneal entrance. The management of this leakage was based on reducing the intra-peritoneal injection volume with automated PD, and the evolution was favorable.

**Keywords:** peritoneal leakage, peritoneal dialysis

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#### Résumé

La fuite sous-cutanée de dialysat représente une complication mécanique rare en dialyse péritonéale. Elle nécessite une approche multidisciplinaire et individualisée pour une gestion efficace. Nous rapportons l'observation d'un patient de 33 ans en insuffisance rénale chronique terminale qui a développé une fuite sous-cutanée quatre mois après le début de la DP. La pression intrapéritonéale était élevée, à 22 cm H<sub>2</sub>O. Le scanner abdominal sans injection a confirmé une infiltration diffuse de la paroi abdominale ; le scanner pratiqué avec injection de Gastrographine a montré une extravasation de la Gastrografine le long du trajet du cathéter, objectivant la fuite de dialysat au niveau de son entrée péritonéale. La gestion de cette fuite a consisté à diminuer le volume d'injection intra-péritonéal en dialyse péritonéale automatisée, et l'évolution a été favorable.

**Mots-clés :** fuite sous-cutanée, dialyse péritonéale



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## Introduction

Peritoneal dialysis (PD) is a renal replacement therapy for patients with end-stage renal disease (ESRD). However, as with any treatment, there are complications specific to the method that can be a cause of failure. Subcutaneous leakage is one of the rare mechanical complications specific to PD. It corresponds to a loss of seal in the peritoneal cavity [1]. It often occurs at the start of PD management. The diagnosis is evoked clinically and may be confirmed by specific radiological explorations, such as peritoneography by CT or MRI, or peritoneal scintigraphy [2]. With this in mind, we report the observation of a peritoneal dialysis patient with a subcutaneous leak of dialysate fluid.

## Clinical case

This is a 33-year-old overweight patient (weight: 65 kg; height: 1.62 m; body mass index: 27 kg/m<sup>2</sup>) with chronic end-stage renal failure due to undetermined nephropathy. Initially started on hemodialysis in 2011, he was transferred to Automated Peritoneal Dialysis (APD) due to vascular port exhaustion. The patient benefited from a left PD catheter placement on 2/03/2023, unused for 10 months due to logistical problems and the unavailability of a medical team to start learning the technique in the area where he lives. The patient has benefited from hemodialysis sessions thanks to his latest vascular approach, which is a left femoral tunneled catheter.

On January 15, 2024, we decided to remove PD's KT, which was non-functional due to fibrin obstruction. Mechanical attempts to clear the obstruction with a syringe were unsuccessful. A second PD KT was placed laparoscopically on the right, and we started automated peritoneal dialysis 15 days later.

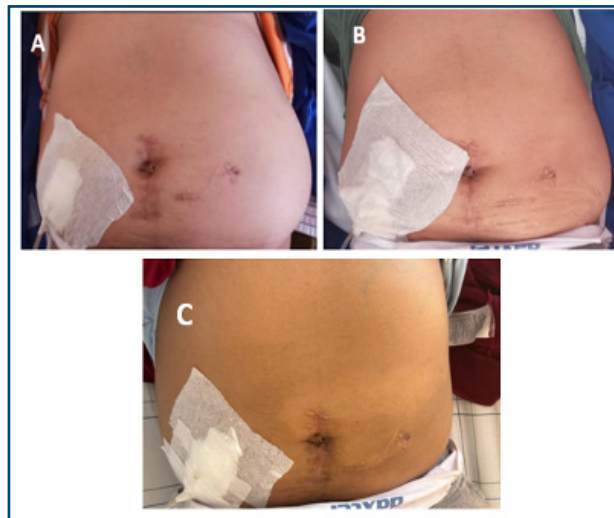
Dialysate volumes were gradually increased over one week with a final prescription as follows:

- Total volume: 9L500
- Duration: 10 hours
- 4 cycles of 2H02min
- Injection volume: 2000ml
- Volume of last injection: 1500ml, using dialysate concentrations of 2.27%

We initially started with isotonic bags, but the patient developed arterial hypertension with edema of the lower limbs, and insufficient ultrafiltration volumes; this led us to change dialysate concentrations to 2.27% bags.

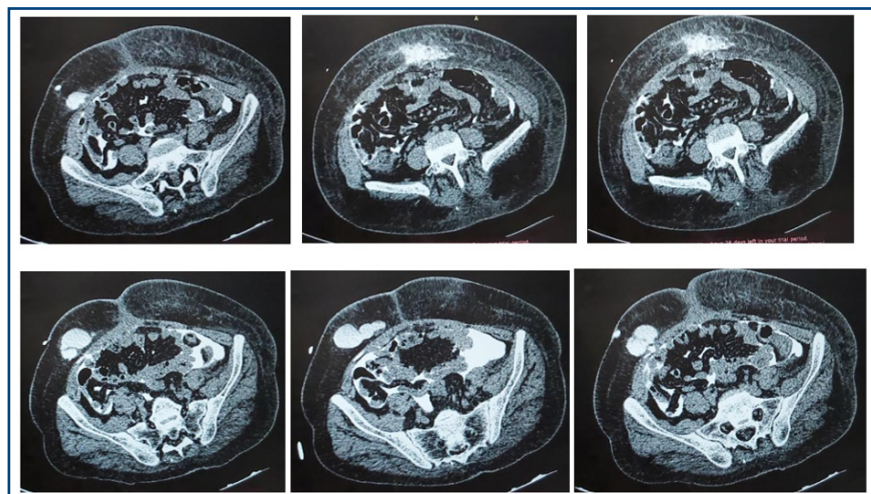
Progress was marked by an improvement in the patient's clinical condition, with no overload and satisfactory ultrafiltration volumes, a KT/V of 1.4 and a weekly creatinine clearance of 50 liters/week/1.73 m<sup>2</sup>.

Four months after the start of exchanges, the patient presented with abdominal distension with loss of ultrafiltration (*Figure 1A*). Clinical examination revealed a distended, soft, asymmetric abdomen, with a palpable, painless left lateral mass opposite the old left laparoscopic scar, with no leakage at the current emergence site on the right. Intraperitoneal pressure was elevated to 22cmH<sub>2</sub>O.



← Figure 1. Image A showing left abdominal parietal infiltration, image B showing clear regression of this infiltration after 01months, image C showing improvement of the infiltration after 3 months

Abdominal ultrasound was unremarkable. A complementary non-injected abdominal CT scan was ordered, showing edematous infiltration of the subcutaneous cellulo-fatty tissues of the abdominal wall lateralized to the left. We supplemented this examination with CT peritoneography with injection of Gastrografine (350 mg/ml) in a volume of 100 ml, diluted in 500 ml of isotonic dialysate fluid and injected intraperitoneally 30 minutes prior to the examination, to confirm subcutaneous leakage. The CT scan showed extravasation of Gastrografine along the catheter on the right, related to a subcutaneous fistula, with diffusion into the cellulo-fatty tissues of the abdominal wall on the left, testifying to a peritoneal seal defect along the path of the new catheter (Figure 2).



← Figure 2. CT peritoneography sections of the abdominal floor showing the subcutaneous leak path on the right after injection of iodinated contrast medium, with infiltration of subcutaneous tissue on the left

The diagnosis of subcutaneous leakage of dialysate fluid was accepted. As the patient had no vascular access and was anuric, we decided to maintain the PD technique, increasing the PD duration to 14 hours and the number of cycles, and decreasing the APD injection volume to 1,300 ml with an empty stomach during the day.

The final prescription was as follows:

- Total volume:91500
- Duration: 2 pm

- 7cycles of 1h38min
- Injection volume: 1300ml
- Volume of last injection:200ml, using dialysate concentrations of 2.27%

The evolution was favorable after one week, with progressive regression of the left abdominal infiltration (*Figure 1B*).

The patient was seen in consultation three months after the change to the PD program. He was clinically euvoletic, in good general condition, with systolic blood pressure at 120 mmHg and diastolic at 70 mmHg, and stable weight. A mean daily ultrafiltration of 1 l, good purification quality with KT/V at 1.3, weekly creatinine clearance at 51 liters per week per square meter, with no hydroelectrolytic disorders and improved left abdominal infiltration (*Figure 1C*).

### Discussion

Peritoneal dialysis is one of the most widely used renal replacement therapies for patients with chronic end-stage renal disease. Among the mechanical complications of this technique is leakage of dialysate fluid, which is rare, with multiple localizations, particularly at the emergence site, which is the most frequent localization. [2]

In a study carried out in the nephrology and dialysis department at CHU Ibn Sina in Rabat between 2006 and 2011 on 62 PD patients, the prevalence of mechanical complications was 37%, of which leaks accounted for 8.7%. (3) In another study carried out in Tunisia on 90 APD patients, the prevalence of mechanical complications was 18.8%, of which leaks accounted for 2.2%. [4] On the other hand, subcutaneous leakage of dialysate fluid remains rare, and exposes the patient to the risk of infection and withdrawal from the technique [2]. We have encountered only one case of subcutaneous leakage since the opening of our peritoneal dialysis center in 2006, out of a total of 239 patients.

Subcutaneous leaks in PD may be discovered in a variety of circumstances, such as weight gain, loss of ultrafiltration, the appearance of an abdominal mass or subcutaneous edema [5].

Diagnosis of certainty is based on specific imaging examinations, notably peritoneography by CT scan with iodinated contrast injection or MRI with gadolinium injection [6], which enable a precise lesion assessment to be made [5,7]. Peritoneal scintigraphy can also be useful for diagnosis, but is not sensitive, and cannot rule out the diagnosis in the absence of leakage images [8].

The main pathogenic mechanism explaining the development of a subcutaneous leak in PD is intra-abdominal hyperpressure, which will exert excessive stress on the abdominal wall, thus favoring leak formation, especially in corpulent patients. A study carried out in 2007 on 61 PD patients demonstrated a positive correlation between PIP and BMI [9]. Another study carried out in 2017 on 49 PD patients demonstrated a positive correlation between a high PIP and the appearance of leaks [10].

Risk factors for the development of subcutaneous leaks in PD include obesity, fragility of the abdominal wall following surgery or the presence of hernias [11]. In addition, tunnelitis and

emergence-site infections can compromise the integrity of the abdominal wall and also contribute to the development of leaks.

In our case, subcutaneous leakage can be explained by a peritoneal seal failure after the two laparoscopic PD KT placements, favored by the early onset and high intraabdominal pressure.

The management of subcutaneous leaks in PD must be individualized according to each patient's specific clinical characteristics and risk factors. In cases of moderate leakage, conservative measures such as suspension of PD with temporary transfer to hemodialysis may be beneficial [12,13]. However, in more severe or refractory cases, surgical cures may be necessary. It has been shown that reducing dialysate volumes can allow recovery from PD leaks, and avoid temporary or permanent transfer to hemodialysis [13].

In our patient, who had exhausted his vascular accesses, we were unable to suspend PD, so we decided to reduce APD injection volumes to lower intraperitoneal pressure. The evolution was marked by the regression of subcutaneous infiltration, with a good clinical and paraclinical evolution. This can be explained either by the persistence of peritoneal tightness, but without clinical repercussions thanks to the modification of the dialysis program and reduction of the dialysate volume, or by the fact that the peritoneum closed spontaneously.

### Conclusion

Subcutaneous leakage in PD is a complex and often underestimated mechanical complication of this treatment modality. A proactive approach to the prevention and management of subcutaneous leakage can help improve clinical outcomes and quality of life for patients treated with PD. Further studies are needed to better understand the pathogenic mechanisms and to develop more effective prevention and management strategies.

### Conflicts of interest

*The authors declare that they have no conflicts of interest in connection with this article.*

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