Pleuroperitoneal Leak in a Patient on Automated Peritoneal Dialysis

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A forty-year-old Bahraini female with a known case of End Stage Renal Disease (ESRD) on Peritoneal Dialysis (PD) presented with a complaint of shortness of breath. She was found to have right side pleural effusion on a chest X-ray. The effusion was managed initially with Intercostal Drainage (ICD) insertion. The patient was investigated for the cause of the effusion and she was found to have hydrothorax secondary to pleuroperitoneal leak. She was initially treated with pleurodesis and temporary cessation of PD. However, this maneuver failed and the patient had to be shifted to hemodialysis as a permanent solution.

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In End Stage Renal Disease (ESRD), the kidneys cease functioning completely and the patient must be started on renal replacement therapy. Peritoneal Dialysis (PD) is a form of therapy to such patients. There are two types of PD: Continuous Ambulatory Peritoneal Dialysis (CAPD) and Automated Peritoneal Dialysis (APD). There are multiple infectious and non-infectious complications of such therapy including peritonitis, outflow failure, abdominal wall herniation and electrolyte imbalance. Another relatively uncommon complication is a pleuroperitoneal leak.

The reported incidence of an acute leak in patients on PD is approximately 1.6%-10%[1]. The pleural effusion usually occurs early in initiating the PD. The presence of pleural effusion without other signs of heart failure and peripheral edema should be an alert for the presence of pleuroperitoneal leak particularly if it was only right-sided. It is mostly due to congenital defects between the pleura and peritoneum. The combination of negative intrathoracic pressure and high intra-abdominal pressure induced by the installation of the dialysate leads these defects to open up and the fluid flow through to the pleura[2]. Pleuroperitoneal leak is uncommon and could be easily missed due to misinterpretation of the symptoms.

The aim of reporting this case is to increase the awareness of such possible complication and methods of diagnosis and management.

THE CASE

A forty-year-old Bahraini female was a known case of ESRD secondary to multiple myelomas on APD. She was started on hemodialysis for a few months and then shifted to PD as she preferred to do home dialysis than attending the hospital three times a week. The peritoneal catheter was inserted on 20 October 2013, followed by training for two weeks. On 12 November of the same year, six cycles PD was initiated dependent wholly on the patient. She was regularly complaining of shortness of breath and abdominal pain with the last fill of 1.7 L; due to that, the last fill was reduced to 1.5 L and she was more comfortable. She continuously had negative ultra filtration with concentrate of 1.3-2.2% (varying with each cycle). Bone marrow biopsy in December 2013 revealed no evidence of multiple myelomas; the chemotherapy was terminated.

She presented to the PD unit on 9 January 2014 with intermittent turbid color peritoneal fluid after each dwell. The fluid was analyzed and she was diagnosed to have peritonitis with white cell count of 110 with left shift in the peritoneal fluid. According to the guidelines of International Society of Peritoneal Dialysis (ISPD 2010), she was treated with intraperitoneal antibiotics (Vancomycin 1 g every fifth day and Cefepime 1.5 g daily) for two weeks. In view of this, the last fill volume was increased to 2 L to allow the administration of the medication and the fluid concentrate was changed to 2.2%.

After the fourth day of administrating the antimicrobials, the patient complained of significant shortness of breath. Examination revealed reduced air intensity on the right side of the chest and dullness on percussion. Her room air oxygen saturation was 94%.

A chest X-ray showed significant pleural effusion and most of the right lung was collapsed, see figures 1A, 1B and 1C. ICD was inserted under general anesthesia in the operating room. Drainage of 1700 ml was achieved on the first day.

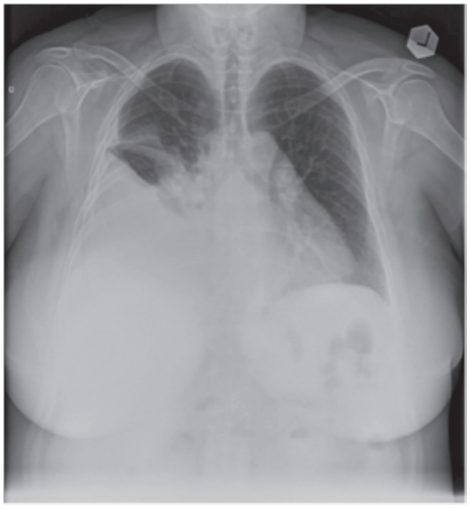

Figure 1A: CXR Showing Pleural Effusion on the Right Side

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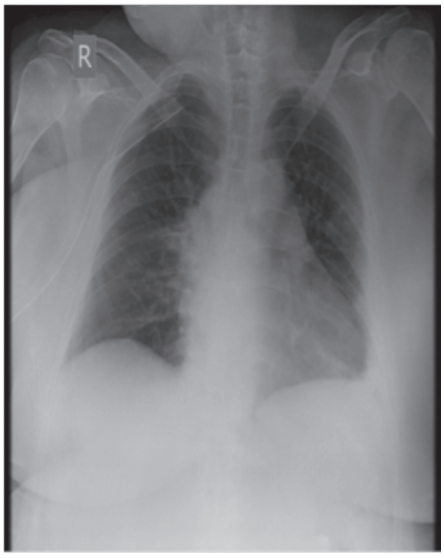

Figure 1B: Expanded Right Lung after Insertion of the Intercostal Drainage

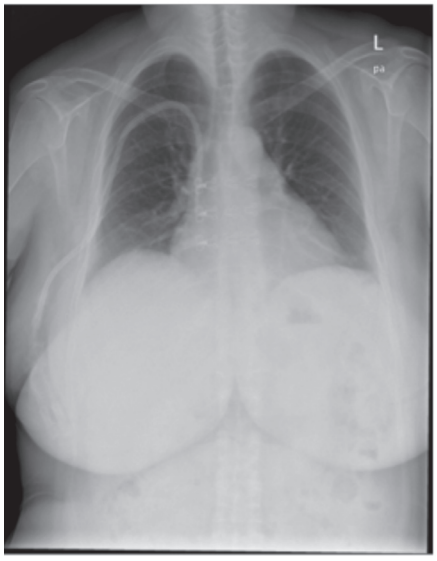

Figure 1C: Post Pleurodesis and Resumption of PD. The Tunnel Catheter for HD is in Place

The pleural fluid was sent for cell count and biochemistry analysis: white cell count 190% with 57% polymorphs, red cell count 16000%, glucose 10.2 mmol/L (plasma glucose 4.8 mmol/L), protein 2 g/L and culture was sterile.

As the above results suggest a transudate fluid in respect to the protein count, sterile cultures (the patient was still receiving antibiotics for her peritonitis) and the fluid glucose was higher than the plasma (high glucose concentration of the dialysate), it was then decided to confirm further the leak possibility. Peritoneal scintigraphy was done. Five millicuries of technetium 99 m per 2 L of dialysis solution was injected into the abdominal cavity. Multiple images were taken and showed a clear leak from the peritoneum to the right side of the pleural cavity, see figures 2A and 2B.

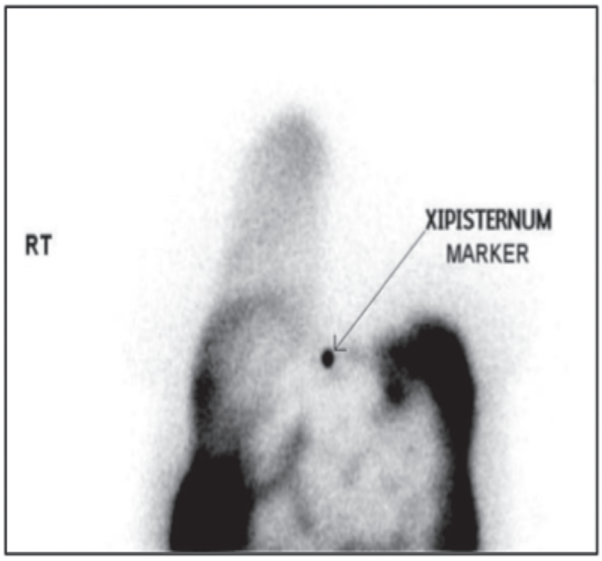

Figure 2A: First Isotope Scan Using Tc99m Performed to Diagnose the Condition. Taken 15 Minutes Delayed, Showing Clear Leakage of the Isotope to the Right Pleura

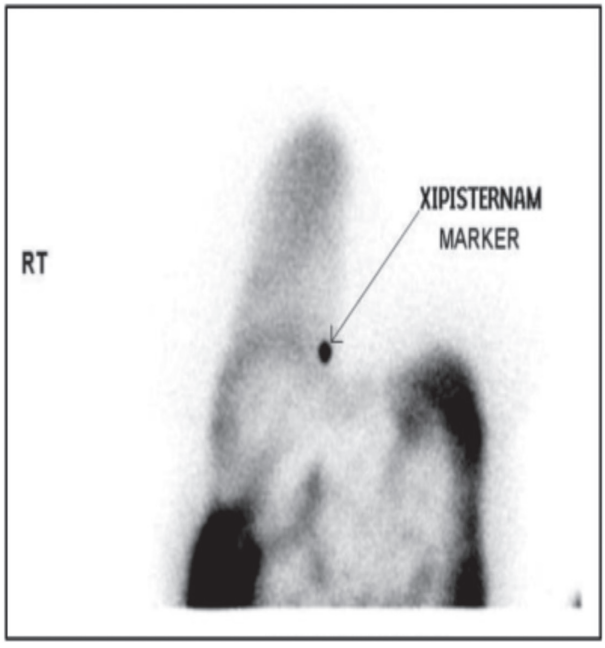

Figure 2B: First Isotope Scan Using Tc99m Performed to Diagnose the Condition. Taken 30 Minutes Delayed, Showing Clear Leakage of the Isotope to the Right Pleura

The PD was temporarily stopped. A tunnel catheter was inserted in the right internal jugular vein to resume hemodialysis three times a week.

Thoracoscopy to repair any diaphragmatic defect was performed; the right lung completely collapsed; no macroscopic diaphragmatic defects or leakage points were found.

Thoracoscopic-guided pleurodesis was performed through 10 mm working port, using 30 gm of Bleomycin mixed with 1% Xylocaine. The Bleomycin was spilled over the right

hemidiaphragm, where the leakage of peritoneal fluid is likely to be. Finally, 24 F chest tube was inserted and clamped for 6 hours in order for the Bleomycin to remain.

Fourth day postoperative, the chest tube was removed and the patient was discharged. PD tube flushing on alternate days was performed. The amount of fluid which was flushed into her peritoneum was withdrawn and the patient was asymptomatic. After two weeks of the pleurodesis, isotope scan was repeated, no leak from the peritoneum to the pleura was detected on either side of the lung, see figures 3A and 3B. The patient resumed PD with full volume of 1.5 L and 2.2% dialysate concentration with six cycles. After three days, a chest X-ray was repeated and the lungs were fully expanded with no evidence of effusion. Two weeks later, she was re-evaluated with no symptoms and good ultrafiltrate.

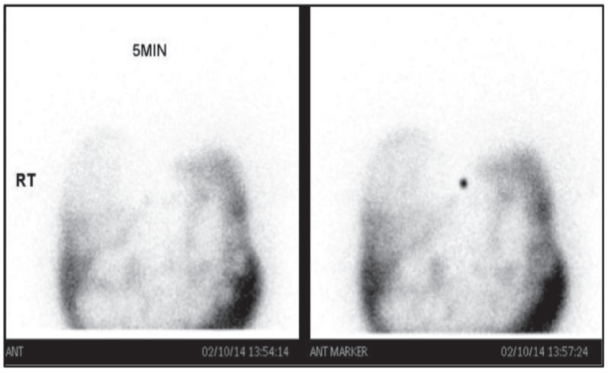

Figure 3A: The Isotope Scan Post Pleurodesis Showing No Leak to the Right Pleura. The Black Dot Refers to the Xiphisternum

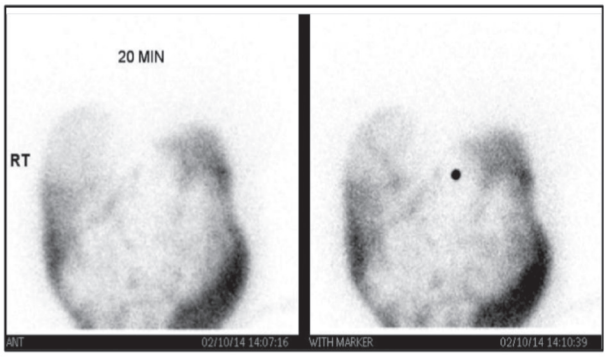

Figure 3B: The Isotope Scan Post Pleurodesis Showing No Leak to the Right Pleura. Black Dot Refers to the Xiphisternum

Unfortunately, after four weeks of the pleurodesis, she started complaining of shortness of breath during the PD. A chest X-ray was done and showed evidence of a new leak to the right pleura. Therefore, it was decided to discontinue PD permanently and shift the patient to hemodialysis through a temporary Vas Cath until an arteriovenous fistula is created.

DISCUSSION

The first reported case of a pleuroperitoneal leak in a patient on PD was reported in 1967[3]. The incidence of the pleuroperitoneal leak is noticeably increased in patients with polycystic kidney disease. This is most probably attributable to the high intra-abdominal pressure in those patients and high pleuroperitoneal pressure gradient. In addition, patients with a history of peritonitis are likely to have a leak due to the weakening the diaphragmatic tissue[4].

The hydrothorax in similar cases is known as "sweet hydrothorax" due to the accumulation of hypertonic, high glucose solution filling the pleura; in CAPD patients, it could only be due to pleuroperitoneal leak. An effort to treat what is wrongly diagnosed as fluid overload with more hypertonic solution could lead to catastrophic consequences. All other diagnostic tests are time-consuming, costly and not fully reliable[5].

A similar case report was published in a 75-year-old patient with a history of hypertension, dyslipidemia and chronic kidney disease stage V of unknown origin. Scintigraphy with Tc99m confirmed the suspicion of a peritoneal fluid leak in the pleural cavity. The condition resolved using the unloading treatment and suspending the peritoneal dialysis[6].

In another case study, a 43-year-old patient with a history of chronic kidney disease stage V of unknown origin, on renal replacement therapy with peritoneal dialysis. The patient was admitted due to dyspnea on minimal exertion after starting peritoneal dialysis technique. The suspected diagnosis of the diaphragmatic leak was confirmed by performing a scan with Tc99m. All other diagnostic methods are costly, invasive and time consuming[7].

Another form of peritoneal fluid leakage is the retroperitoneal leak. It usually occurs within the abdominal wall or pelvis. It could also accumulate as a localized collection in the abdominal wall, genitalia or perineum[8]. It has been reported that in more than 5% of patients on CAPD have a chance of dialysate leak. It could occur through the peritoneal catheter exit site, patent processus vaginalis, abdominal hernia or pleuroperitoneal communication. These leaks are usually easily detected clinically and do not mandate any particular imaging for the diagnosis[9].

CONCLUSION

This is the first reported case in the Kingdom of Bahrain diagnosed using Tc99m and pleurodesis as treatment for hydrothorax due to a pleuroperitoneal leak in a PD patient. It does not prove to be an effective form of therapy despite being associated with non-significant morbidity. The presence of pleuroperitoneal leak probably mandates to switch to HD as no effective therapy proved to be beneficial.

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