Clinical Case Report

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Thoracoscopic surgery for management of pleuroperitoneal communication complicating continuous ambulatory peritoneal dialysis

A case report

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Abstract

Rationale: Pleuroperitoneal communication (PPC) has been reported to complicate continuous ambulatory peritoneal dialysis (CAPD). However, cases of patients in whom the results of the methylene blue dye test and peritoneopleural scintigraphy were negative and treatment was thoracoscopic surgery have been rarely reported.

Patient concerns: A 58-year-old man with end-stage chronic renal failure who underwent CAPD presented with massive right-sided hydrothorax. The pleural fluid glucose level was high. Results of both the methylene blue dye test and peritoneopleural scintigraphy were negative.

Diagnosis: The presence of end-stage chronic renal failure and diaphragm defects amenable to repair, which were identified during thoracoscopic surgery, indicated a definite diagnosis of PPC complicating CAPD.

Interventions and outcomes: CAPD was performed twice after the defects were repaired during thoracoscopic surgery. There was no evidence that the repaired sites were leaking again, and the patient did not complain of any discomfort during the second CAPD.

Lesson: Although special methods such as the methylene blue dye test and peritoneopleural scintigraphy may not be useful in some cases, thoracoscopic surgery is still effective and reliable in diagnosing and repairing diaphragmatic defects.

Abbreviations: CAPD = continuous ambulatory peritoneal dialysis, HD = hemodialysis, HRCT = high-resolution computed tomography, PPC = pleuroperitoneal communication, Tc-99m MAA = technetium-99-labeled macroaggregated albumin, VATS = video-assisted thoracoscopic surgery.

Keywords: peritoneal dialysis, pleuroperitoneal communication, thoracoscopic surgery

1. Introduction

Continuous ambulatory peritoneal dialysis (CAPD) is a common and effective renal replacement therapy. Hydrothorax due to CAPD is a well-known yet rare complication, and it appears on the right side of the thorax in about 90% of cases.[1,2] CAPD-related hydrothorax is common in pleuroperitoneal communication (PPC) complicating CAPD. A high pleural fluid glucose level often suggests that PPC is complicated in peritoneal dialysis. The diaphragmatic defects may be demonstrable with the use of special methods such as the methylene blue dye test and peritoneopleural scintigraphy, which are often used to confirm PPC in CAPD.[3,4] Although there is no consensus concerning the best therapeutic method for the treatment of CAPD-related pleural fluid, thoracoscopic surgery is still considered as the first-choice treatment; however, it is also crucial to confirm the diagnosis with direct intraoperative inspection.[5]

We describe a patient with PPC complicating CAPD who was treated by thoracoscopic surgery, which was also used to confirm the diagnosis. Interestingly, the patient's preoperative results of the methylene blue dye test and peritoneopleural scintigraphy were negative.

2. Case report

A 58-year-old man with end-stage chronic renal failure started CAPD in July 2017 and had been receiving 1.5% glucose peritoneal dialysis fluid (2000 mL) twice a day. Five months later, he complained of cough and dyspnea. Chest roentgenography showed massive right-sided hydrothorax (Fig. 1A). We placed a drainage tube to relieve the patient's symptoms, and then, after a careful history taking and examinations, we determined that the hydrothorax did not have other etiologies, such as congestive heart failure, fluid overload, hypoalbuminemia, or tuberculous or malignant pleural fluid. Pleural fluid and serum glucose levels

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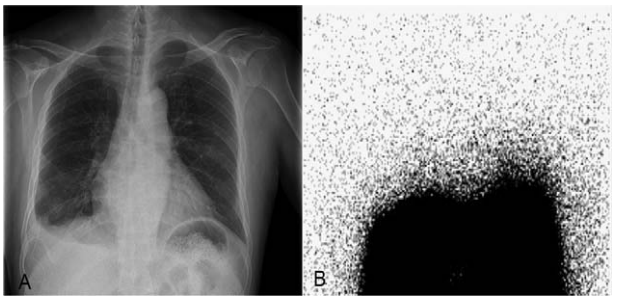

Figure 1. (A) Chest roentgenogram demonstrating an acute right-side hydrothorax. (B) The result of Tc-99m MAA was negative. Tc-99m MAA = technetium-99-labeled macroaggregated albumin.

were 6.80 and 5.64 mmol/L, respectively, suggesting that the pleural fluid originated from the dialysis fluid.

In order to confirm the diagnosis, we injected methylene blue into the dialysis fluid, and then infused it into the peritoneal cavity through a Tenckhoff catheter. Six hours later, the pleural fluid did not show a bluish discoloration. We also used technetium-99-labeled macroaggregated albumin (Tc-99m MAA), but the result was negative at 90 minutes (Fig. 1B).

At the patient's request and with his consent, we performed intercostal video-assisted thoracoscopic surgery (VATS) once. Multiple bleb-like defects were identified in the diaphragm and repaired (Fig. 2A). The postoperative pathological examination showed fibrous tissue, adipose tissue, and muscle tissue (Fig. 2B).

We switched his renal replacement therapy from CAPD to hemodialysis (HD) for 23 days postoperatively. His nephrologist resumed CAPD for the first time using the following peritoneal dialysis plan: 1000-mL 1.5% glucose peritoneal dialysis fluid, 4 times a day. When the plan was modified to 6 times daily 4 days later, the patient complained of shortness of breath, and we identified a massive right-sided pleural effusion and compressive atelectasis on a high-resolution computed tomography (HRCT) scan (Fig. 3A). The patient's CAPD was temporarily stopped and converted to HD once again. Since the patient preferred treatment by CAPD, his nephrologist resumed CAPD again with 2000-mL 1.5% glucose peritoneal dialysis fluid, 4 times a day at 2 months later. Although a small amount of right-sided pleural effusion was identified on an HRCT scan after restarting CAPD for 5 days (Fig. 3B), the patient did not complain of any discomfort during the period of CAPD treatment.

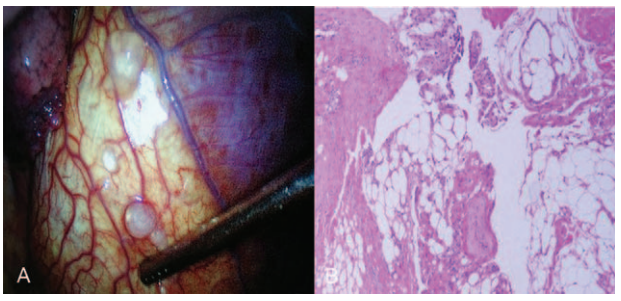

Figure 2. (A) Multiple bleb-like diaphragm defects were determined intraoperatively. (B) Postoperative pathological examination showed some fibrous tissue, adipose tissue, and muscle tissue.

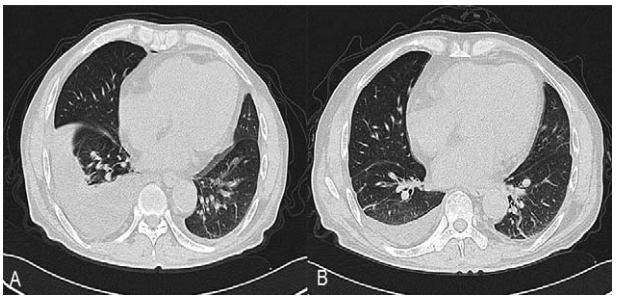

Figure 3. (A) The patient restarted PD initially, and massive right-sided pleural effusion and compressive atelectasis were subsequently noted on HRCT. (B) A small amount of right-sided pleural effusion was found on HRCT when the patient resumed PD the second time. HRCT = high-resolution computed tomography.

3. Discussion

Hydrothorax is a CAPD-related complication that is mainly due to PPC, which occurs in about 1.6% of patients receiving CAPD.[1,6] PPC is caused by pre-existing or acquired diaphragmatic defects because of increased intra-abdominal pressure during CAPD.[2] PPC is more common on the right side of the diaphragm, and it leads to pleural fluid within 30 days after beginning CAPD in about 50% of cases.[1] Usually, the diagnosis of PPC is definite, but it is sometimes difficult to diagnose when the patient has PPC due to other etiologies, such as congestive heart failure, fluid overload, hypoalbuminemia, or tuberculous or malignant pleural fluid.[4] Therefore, careful history taking and antidiastole of cardiovascular disease are necessary.

A high pleural fluid glucose concentration may indicate the diagnosis of PPC in CAPD, but the methylene blue dye test and Tc-99m MAA have been often utilized for making the definite diagnosis.[3,4,6] Additionally, successful diagnosis of peritoneal dialysis-related PPC by contrast-enhanced ultrasonography or computed tomography peritoneography has been reported.[7,8] Results of the methylene blue dye test and Tc-99m MAA were negative in the present case, and the reasons for this phenomenon may be as follows. The diaphragmatic defects may have leaked and then resealed because they were tiny. Multiple bleb-like defects in the diaphragm, like semipermeable membranes, may have stopped the particles of dyes and radioisotopes from flowing into the pleural cavity. The time points of the methylene blue dye test and Tc-99m MAA may have missed the optimal dyeing and imaging time points for shunt detection.[9] Therefore, VATS should be considered to make a definite diagnosis of PPC in CAPD.

The occurrence of PPC may be ascribed to the presence of pleuroperitoneal leaks at thin, loose sites of the diaphragm due to the increasing volume of the peritoneal dialysis fluid or changing of the patient's posture. Therefore, postoperative management of PPC still requires much caution. Although the time to resume CAPD is uncertain, pleurodesis as well as gradually increasing the peritoneal dialysate from low-volume exchanges to full-volume exchanges should be attempted in postoperative patients who are seated or propped upright.[10,11]

Hence, when the results of the methylene blue dye test and Tc-99m MAA are negative, VATS is safe and reliable in diagnosing and repairing diaphragmatic defects.[5] Additionally, VATS serves as a pathological examination to confirm other reasons (e.g., congenital defects, tumor, infection, or amyloidosis, etc.) for

the pathogenesis of PPC, and its results can be used to determine whether full-volume effective CAPD can be resumed as soon as possible.[12] Besides, careful postoperative reexamination and treatment are important. Since the advantages of VATS have been perceived gradually, a success rate of thoracoscopic intervention for PPC in excess of 90% has been demonstrated.[13] We recommend thoracoscopic surgery as an effective method for diagnosing and treating PPC in CAPD when the patient's preoperative results of the methylene blue dye test and peritoneopleural scintigraphy are negative.

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