Hydrothorax complicating continuous ambulatory peritoneal dialysis: successful management with talc pleurodesis under thoracoscopy

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Introduction

Hydrothorax is an unusual but serious complication of peritoneal dialysis, as it very often requires a switch to haemodialysis [1]. Its treatment is thus of considerable clinical importance. Recurrent scepticism on the value of therapeutic intervention [2] prompts us to report on two patients in whom talc poudrage under thoracoscopy resulted in successful pleurodesis and led to the uneventful resumption of CAPD.

Cases

Case 1

A 76-year-old woman with end-stage renal disease secondary to chronic glomerulonephritis was started on CAPD in April 1997. In August 1997, she complained of progressive shortness of breath. Despite the use of more hypertonic dialysate, she did not improve and was admitted to our hospital. Physical examination and chest X-ray disclosed a massive right pleural effusion. Pleural fluid content of protein, lactate dehydrogenase and lactate was normal. In contrast, glucose content was high (480 mg/dl) despite a normal fasting blood glucose level (92 mg/dl). A peritoneopleural communication was diagnosed. In order to further delineate the communication, 74 MBq ⁹⁹ᵐTc-Technetium sulphur colloid was injected directly into the empty peritoneal cavity via the catheter. Immediately after the injection, no radioactivity was detected in the thorax. The peritoneum was then filled with a 1.5 l dialysate bag and drained after 20 min. Again no radioactivity was observed in the thorax. Sixteen hours later, the radioisotope was massively present in the right pleural space (Figure 1). These observations suggest that the fluid had diffused into the pleural cavity only via the lymphatics. CAPD was interrupted and haemodialysis was performed for 2 weeks through a right jugular vein catheter. Subsequent resumption of peritoneal dialysis led to the recurrence of pleural effusion. Right thoracoscopy was therefore performed under sedation and local anaesthesia through a 9-mm diameter trocar inserted into the sixth intercostal space on the mid-axillary line. After complete evacuation of the pleural effusion no diaphragmatic defect was detected. Poudrage with 3 g sterile asbestos-free talc was performed; a pleural catheter was left in place for continuous pleural aspiration during 3 days. Chest pain was controlled by an epidural morphine sulphate administration over 4 days. Serum C-reactive protein rose transiently from 1.0 mg/dl to 16.5 mg/dl. CAPD was resumed after another 3 weeks on haemodialysis. Currently, 1 year later, the patient remains asymptomatic without recurrence of the pleural effusion. The right costo-diaphragmatic sinus is normal on X-ray.

Fig. 1. Scintigraphies performed 1 h (top left) and 16 h (bottom) after intraperitoneal injection of ⁹⁹ᵐTc-labelled sulphur colloid. The early image shows normal distribution in the peritoneal cavity without passage to the pleural space. This activity moves freely in the pleural space (bottom left, patient recumbent; bottom right, patient sitting).
Talc pleurodesis for hydrothorax complicating peritoneal dialysis

Case 2

A 67-year-old woman with end-stage renal disease of unknown origin and a history of rheumatoid arthritis was started on CAPD in December 1997 because of vascular access problems: right subclavian and jugular veins were thrombosed as were three successive arteriovenous fistulae. During the first week of CAPD, a peritonitis due to Staphylococcus aureus and Staphylococcus epidermidis was successfully treated by vancomycin and ciprofloxacin. Two weeks later the peritoneal catheter had migrated in the right upper quadrant of the abdomen and was repositioned by coelioscopy. After 1 week of haemodialysis via a left subclavian vein catheter, peritoneal dialysis was resumed. Three days later, the patient became short of breath. A massive right hydrothorax was diagnosed on clinical examination and confirmed by chest X-ray. Analysis of pleural fluid revealed a transudate with a glucose content of 387 mg/dl. Fasting blood glucose level was 111 mg/dl. A peritoneal scintigraphy was performed by injection of 74 MBq 99mTc sulphur colloid in 10 ml saline through the peritoneal catheter into an empty peritoneal cavity, followed by the infusion of 1 litre dialysate. The peritoneal cavity was drained 2.5 h later. Images taken immediately after the tracer injection and 7 h later showed no radioactivity in the thorax. No images were taken later. CAPD was interrupted and haemodialysis was reinitiated for 1 week. Peritoneal dialysis resumption led to the immediate recurrence of the right hydrothorax. Thoracoscopy with talc poudrage was performed the next day with the technique used for the first patient. Pain control was obtained by continuous i.v. infusion of fentanyl over 3 days. C-reactive protein increased to 11.8 mg/dl after the procedure. After 1 month on haemodialysis, CAPD was successfully resumed. Currently, 7 months later, the patient remains asymptomatic without recurrence of the hydrothorax; the chest X-ray is normal.

Discussion

Our two patients demonstrate that talc poudrage under thoracoscopy may cure the hydrothorax and allow resumption of peritoneal dialysis. Skepticism on the efficacy of pleurodesis has been recently expressed [2–4]. In 1991 Allen and Matthew [4] reviewed the literature on the treatment and outcome of hydrothorax complicating CAPD. In 23 CAPD patients, hydrothorax was treated by chemical pleurodesis: in only 13 of them (57%) CAPD was successfully resumed. On the basis of this review and of their success with the surgical closure of the pleuroperitoneal communication in three patients, Allen and Matthew advocate surgery [4].

The reasons for this discrepancy may be related to the nature of the pleuroperitoneal leak. Two different mechanisms may be involved. The first and most straightforward mechanism is a breach in the peritoneal—diaphragm barrier. Autopsy studies of cirrhetic patients have indeed revealed defects in the tendinous part of the right hemidiaphragm with areas where the pleura is lifted off the diaphragm, forming blebs or blisters [5]. Such blebs probably result from the elevated intra-abdominal pressure. They might also occur during peritoneal dialysis; their rupture might then lead to the invasion of the pleural cavity by the dialysate [1,5]. The second mechanism is related to an enhanced lymphatic transfer of the dialysate into the pleural cavity [2,6]. The preponderance of right-sided effusions [1,6–9] can be accounted for by both mechanisms: anatomical defects are more common on the right side, (the left-sided defects being possibly covered by the heart and the pericardium) [1], and the right hemidiaphragm has a more abundant supply of lymphatics [6], although a similar leak has been occasionally described between the peritoneal cavity and the pericardium [10]. As pointed out below a clear identification of the mechanisms leading to the pleuro-peritoneal effusions may prove of therapeutic importance.

In a CAPD patient with hydrothorax, the existence of a pleuro-peritoneal leak is demonstrated by pleural fluid analysis: a transudate with a high glucose content similar to that of the dialysate, together with a normal concomitant blood glucose concentration [1,7,8,11]. It can be confirmed by the injection of methylene blue in the peritoneum with subsequent pleural detection by thoracocentesis [1,6]. Nuclear imaging now provides a useful tool to identify which of these mechanisms is prevailing in individual patients. Intraperitoneal instillation of a nuclear isotope (technetium sulphur colloid or radiolabelled human serum albumin), in doses ranging from 3 to 5 mCi allows a more refined diagnosis of the peritoneo-pleural communication [7]. The radioisotope follows the dialysate, either through anatomical defects of the diaphragm or via the subdiaphragmatic lymphatics. In the former case the tracer is rapidly detected in the thorax, whereas in the latter case late imaging will be required to detect pleural radioactivity [1]. In our patients, early images showed no activity in the pleural cavity. Late images taken 16 h after tracer instillation in patient one revealed an accumulation in the right pleural space. This slow transfer of the tracer, independent of the abdominal pressure, suggests that enhanced lymphatic transfer was the cause of the pleuroperitoneal leak. The lack of radioactivity 7 h after tracer instillation suggests the same mechanism in patient two. It is possible that lymphatic-related leaks are more amenable to pleurodesis than diaphragm breaches.

The use of thoracoscopy to perform talc poudrage represents a significant progress [12] when compared to conventional chemical pleurodesis. Indeed it allows not only an accurate pleurodesis but also the visualization of potential diaphragmatic defects. This approach, although more demanding, was therefore proposed to our patients as both were motivated to pursue CAPD, the first one for personal reasons, the second because of the previous vascular access problems. The insufflation of 3 g of asbestos-free talc led to severe thoracic pain, fever and an acute-phase response. These com-
Complications resolved within a few days. They probably reflect a successful pleural symphysis.

Intrapleural asbestos-free talc appears to be the most effective and least expensive presently available agent [13]. Tetracycline, used for the past 20 years for chemical pleurodesis secondary to malignant effusions, is no longer available [9,14,15]. Autologous blood appears less effective as it induces a lower inflammatory reaction [3].

Conventional management of hydrothorax in CAPD is temporary interruption of peritoneal dialysis, although the use of small volume exchanges in a semi-sitting position has also been advocated [1,2,8]. The success rate is so low [2,4] that additional approaches, such as talc pleurodesis under thoracoscopy are needed if peritoneal dialysis is to be pursued.

Our results are encouraging since the procedure allowed both patients to resume CAPD without recurrence of pleural effusion. Such technique can therefore be recommended in well-informed patients who have a strong motivation to pursue CAPD. The efficacy of this approach in patients with anatomical breaches of the pleuro-peritoneal barrier should be evaluated. It is possible that in the latter cases, surgery may have a specific place.

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References


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