Peritoneopericardial communication after aortic valve replacement in a peritoneal dialysis patient

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Received: 20 August 2013 / Accepted: 30 April 2014 / Published online: 4 June 2014
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Abstract A 73-year-old male undergoing peritoneal dialysis (PD) for end-stage renal disease due to diabetic nephropathy was diagnosed with aortic stenosis and was admitted to our hospital in September, 2009. The patient underwent replacement of the ascending aorta with an artificial blood vessel plus aortic valve replacement without any notable complications. PD was restarted 3 days after the surgery and large amounts of light red fluid from the drain placed in the pericardium were observed just after resumption of PD solution. The patient was diagnosed with peritoneopericardial communication. PD was discontinued and hemodialysis was performed only with intermittent lavage of the peritoneal cavity. The amount of drainage was spontaneously decreased, and on the 17th day after surgery, PD was resumed. The patient is undergoing PD without recurrence of peritoneopericardial communication, 59 months after the onset of symptoms. Peritoneopericardial communication in a patient with PD developing after open-heart surgery is rare because such a case has been documented in only one case report. However, since massive pericardial effusion may cause severe cardiac problems, we consider that the communication between the peritoneal cavity and the pericardium needs to be checked for in patients with PD after cardiac surgery.

Keywords Cardiomy · Aortic stenosis · Hemodialysis · Pericardium · Diaphragm

Introduction

Peritoneopericardial communication is a rare complication of open-heart surgery in patients with peritoneal dialysis (PD). However, this condition is important because it may cause severe cardiac problems due to massive pericardial effusion. We report here a case of peritoneopericardial communication following cardiomy, in which a PD patient temporarily required hemodialysis (HD), but could finally undergo PD with conservative treatment.

Case report

The patient was a 73-year-old male. His past history included, lung cancer at 65 years of age (treated with left upper lobe pneumonectomy), gastric cancer at 70 years of age (treated with gastrotomy), and early colon cancer at 72 years of age (treated with colonic polypectomy). He had no history of thoracic injury or pleuroperitoneal or peritoneopericardial communication. PD for end-stage renal disease as diabetic nephropathy was started in February, 2007. He was diagnosed with aortic stenosis by echocardiography and admitted to our hospital for aortic valve replacement in September, 2009. Findings on admission were as follows: height, 170.9 cm; weight, 67.0 kg; BMI, 22.9 kg/m²; body temperature, 36.2°C; blood pressure, 152/81 mmHg; pulse rate, 78/min; no rales in lung fields; grade III/VI systolic ejection murmur (Levine's classification) at the apex; no abdominal abnormality; no abnormalities at the PD catheter insertion site; and no edema. The laboratory test results on admission are shown in Table 1. Aortic stenosis (left

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ventricular outflow tract pressure gradient 57 mmHg; aortic valve area 0.96 cm²) and grade II aortic insufficiency were observed on echocardiography.

The operative procedure involved replacement of the ascending aorta with an artificial blood vessel plus aortic valve replacement. First, median sternotomy was performed, but it was difficult to pump blood into the aorta and to block the blood flow due to strong calcification of the ascending aorta. Next, blood was pumped into the right femoral artery and removal from the right atrium was performed to establish cardiopulmonary bypass, and then replacement of the ascending aorta (graft of 26 mm) was performed under deep hypothermia-induced circulatory arrest (Fig. 1). Extracorporeal circulation and aortic valve replacement (mechanical heart valve of 23 mm) were then

performed under cardiac arrest. Two drains (1 mediastinum and 1 pericardium) were inserted. No notable complications were observed during the operation.

PD was restarted 3 days after surgery. Large amounts of light red fluid from the drain were placed in the pericardium, but not that in the mediastinum were observed just after resumption of PD solution. The glucose level in the drainage fluid was increased after infusion of PD fluid: from 126 mg/dL before infusion to 600 mg/dL and above after infusion, and the patient was therefore diagnosed with development of peritoneopericardial communication following open-heart surgery. A chest X-ray on the same day (3 days after surgery) revealed that the cardiac size was enlarged without pulmonary congestion when compared with that before surgery, supporting the possibility of

Table 1 Laboratory data on admission

Blood count		Biochemical test	
White blood cell count	5700/ μ L	Low-density lipoprotein cholesterol	104 mg/dL
Red blood cell count	4.11×10^4 / μ L	Total protein	6.8 mg/dL
Hemoglobin	12.3 g/dL	Albumin	3.6 mg/dL
Hematocrit	38.2 %	Blood urea nitrogen	36 mg/dL
Platelet count	1.76×10^3 / μ L	Creatinine	8.35 mg/dL
		Calcium	9.4 mg/dL
		Na	138 mEq/L
		K	3.4 mEq/L
		Cl	98 mEq/L
		Blood sugar	162 mg/dL
		Hemoglobin A1c	5.1 %
		C-reactive protein	0.11 mg/dL

Fig. 1 Schemas of post-operative situation. **a** Aortic graft and drains. **b** Replaced aortic valves

Fig. 2 Chest X-rays before and after surgery

pericardial effusion due to peritoneopericardial communication (Fig. 2). PD was discontinued and HD was performed only with intermittent lavage of the peritoneal cavity. On the 5th day after surgery, drainage fluid of approximately 1100 mL in volume was collected from the pericardial drain just after the infusion of 1500 mL PD fluid. On postoperative day 7, the amount of drainage was decreased, and the drain was removed. On the 17th day after surgery, PD was resumed. No increase in pericardial fluid was observed on echocardiography after the infusion of peritoneal dialysate. At present, 59 months after the onset of symptoms, the patient can undergo PD without difficulty.

Discussion

Our patient developed peritoneopericardial communication just after the aortic valve replacement. This condition is considered to be rare, because only one case has been reported in which peritoneopericardial communication developed following the open-heart surgery in PD patients [1]; Senécal et al. reported this case, in which a patient developed peritoneopericardial communication following coronary artery bypass and gave up PD and was transferred to HD. In our case, HD was temporarily performed, and PD was resumed on day 17 after surgery. Although the difference in pathogenesis between their and our cases is unclear, we consider that the communication between the peritoneal cavity and the pericardium in our patient underwent natural closure because it was small.

Although the reason why peritoneopericardial communication occurred is unknown, there are several possible explanations for it. First, the cardiac drainage tube caused a direct communication between the peritoneal cavity and pericardial cavity, because the tube is placed underneath the abdominal fascia and in front of the peritoneum to

cause the diaphragm being separated from the sternal attachment. Second, peritoneopericardial communication appeared due to mechanical stretch applied to the connecting part of the parietal pericardium and diaphragm by median sternotomy. Third, gastrotomy which the patient underwent 3 years ago might have caused pericardioperitoneal communication due to inflammation, damages, and adhesion of the diaphragm. Fourth, the diaphragm was already vulnerable before the operation because of increased intra-abdominal pressure by intra-abdominal accumulation of PD fluid.

Investigations to elucidate the mechanism to develop it, proper surgical procedure to prevent it, and treatment strategy for it are required.

Conclusion

We experienced a patient who developed peritoneopericardial communication following aortic valve replacement, to whom cure was obtained with conservative treatment alone. Peritoneopericardial communication after open-heart surgery in a patient with PD is rare because such a case has been documented in only one case report. However, since massive pericardial effusion may cause severe cardiac problems, this condition needs to be checked for in patients with PD after cardiac surgery.

Conflict of interest None to declare.

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