

Brief Report

Terminal right heart failure due to complex congenital cardiac disease successfully managed by home peritoneal drainage

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Abstract A man, aged 32, who had undergone surgical correction of complex congenital cardiac disease, had chronic severe right heart failure. Increasing reliance on diuretics led to deteriorating renal function, and he was rejected as a candidate for cardiac transplantation. By inserting a Tenckhoff catheter, and training him to drain his ascites at home, we achieved a dramatic improvement in both his cardiac and renal function. As far as we can ascertain, this is the first time this technique has been used for such a patient. We discuss the mechanisms of improvement, and suggest that other such patients with congenital cardiac disease might benefit from similar management.

Keywords: Renal failure; Tenckhoff catheter; adult congenital heart disease

CHRONIC RIGHT VENTRICULAR FAILURE IS NOT uncommon in surgically treated patients with complex congenital cardiac disease associated with obstruction in the right ventricular outflow. It leads to severe incapacity. Use of large doses of diuretics to overcome oedema and ascites can lead to grossly deranged renal function. Peritoneal dialysis is a well-established modality of renal replacement therapy, and an accepted treatment for heart failure in its own right.^{1–3}

We describe here a patient with severe right heart failure, present over 10 years and worsening, but with adequate left ventricular function. Repeated drainage of ascites using a peritoneal dialysis catheter, without resorting to dialysis exchanges, resulted in a decreased requirement for diuretics, and an improvement in both cardiac and renal function.

Case report

Our 32-year-old laboratory technician was born at full term by normal delivery. He had cyanotic attacks

as a neonate, and was found to have a double outlet left ventricle with the aorta positioned anteriorly, pulmonary and subpulmonary stenosis, and ventricular and atrial septal defects. He had a Rashkind septostomy at 10 days, and at 7 years he underwent radical repair of the double outlet left ventricle, an aortic homograft being inserted as a conduit between the transected pulmonary trunk and the right ventricle. The septal defects were closed. When he was 13, 18, and 21 years, he required reconstruction of the right ventricular outflow tract with new homografts, the previous ones having obstructed and calcified. The right ventricle had become severely hypertrophied, but was smaller than usual. After the last operation, he developed atrial fibrillation, which failed to convert with electrical cardioversion. By 1999, he was short of breath and oedematous. His ability index fell, and he could no longer work.

In 2001, his right heart had dilated, and there was now severe tricuspid regurgitation, extraordinary oedema, and ascites. The pulmonary arterial pressure was 27 over 12 mmHg, with a mean level of 16 mm. The right atrial “A” wave was measured at 21 mm, the “V” wave at 20 mm, with a mean of 16 mm, and right ventricle pressures were measured at 33 over 14 mmHg. The concentration of creatinine in the serum had 399 µmol/l, with urea at 48.6 mmol/l. An ultrasonic abdominal scan showed kidneys of

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Accepted for publication 16 June 2003

normal size. He was rejected for cardiac transplantation because of poor renal function, and continued to deteriorate. Protein losing enteropathy was excluded since the concentrations of albumin in the serum remained above 40 g/l. He was being treated with 4 mg of bumetanide daily, along with a daily dose of 2.5 mg of metolazone.

It was decided to attempt to ameliorate the right heart failure, and manage the renal failure, by initiating continuous ambulatory peritoneal dialysis. Thus, we inserted a Tenckhoff catheter, of flexible silicone rubber, into his peritoneal cavity under local anaesthesia.

Through the catheter, it proved possible to drain 1500 mm of ascites daily, and it soon became clear that dialysis exchanges, involving the instillation of hypertonic glucose solutions into the peritoneal cavity to achieve fluid removal, would not be necessary. The patient underwent a standard 3-day programme of training for inpatient peritoneal dialysis to learn the strict aseptic techniques required to connect and disconnect drainage bags, and to care at home for the site of exit of the Tenckhoff catheter.

His needs for diuretics fell to 1 mg of bumetanide, and 25 mg of Spironolactone, given daily. Eight months after starting peritoneal drainage, his renal function has improved and stabilized. The concentration of creatinine in the serum is now 107 $\mu\text{mol/l}$, and the concentration of urea in the blood is 5.7 mmol/l, corresponding to a rate of glomerular filtration of 68 ml/min, the normal range being from 80 to 120 ml/min. Sequential echocardiography has shown a reduction in size, and improvement in function, of the right ventricle. Approximately 1 l of ascites is still drained through the catheter each day, and he has some ankle oedema, but his abdomen is soft. He has been able to return to work, and enjoys a normal life. He does not now wish to be considered for transplantation.

Discussion

Our patient was severely incapacitated by right heart failure and, as demonstrated, the increased use of diuretics led to grossly deranged renal function. This was a major factor in his rejection for cardiac transplantation.

Home peritoneal drainage has resulted in dramatic clinical improvement. It has off-loaded the right heart, which has progressively reduced in size, and right ventricular function has improved. His renal failure was predominantly pre-renal as a consequence of depleted intravascular volume. The ensuing decreased reliance on diuretics to manage his peripheral oedema and ascites has largely corrected his renal impairment.

Tenckhoff catheters have an excellent proven long-term safety record in suitably chosen patients undergoing continuous ambulatory peritoneal dialysis.⁴ Their use for home drainage of refractory ascites has also been shown to be safe in the short-term.⁵

Peritonitis is a major complication of peritoneal dialysis,⁶ and patients need reasonable manual dexterity, eyesight, and intelligence to manage the aseptic techniques. Should there be a potential problem with infection, the diagnosis is usually made before symptoms become apparent from the cloudy appearance of the drainage bags. Should there be infection, management is usually simple and effective with intraperitoneal antibiotics.⁷ It does not usually require hospital admission, nor termination of the peritoneal dialysis.^{8,9} The standards of the Renal Association call for rates of peritonitis within renal units to be less than 1 episode per 18 patient months, and are widely achieved.¹⁰

For several reasons, we would expect lower rates of infection in patients purely draining peritoneal fluid without undergoing dialysis. Firstly, they only open the Tenckhoff catheter once daily, not 4 or more times a day. Secondly, fluid only leaves the peritoneum, cleaning away bacteria associated with the tip of the catheter. Thirdly, patients undergoing dialysis usually instil hypertonic solutions of glucose, that make excellent culture media.

Even though our experience is confined to a solitary patient, we suggest that we have shown peritoneal drainage at home using a Tenckhoff catheter to be safe, and that it might benefit similar patients with predominantly right-sided cardiac failure as a consequence of congenital cardiac disease.

Acknowledgment

We thank Professor Jane Somerville for her advice and help in the management of our patient.

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