Although peritoneal dialysis (PD) has been advocated as a suitable substitution therapy in patients with failure of hemodialysis (HD) blood access, documentation of the performance of PD in such patients is limited. Here, we present an elderly patient with total failure of HD blood access who has had a remarkably successful course on PD.

A 78-year-old man with several comorbidities started continuous ambulatory PD after a 3.5-year course of HD complicated by repeated vascular access infections and clotting episodes. These access complications resulted in 8 hospitalizations and led to inability to ambulate following a right femoral shaft fracture sustained in a fall secondary to confusion during an episode of access sepsis, and to superior vena cava (SVC) syndrome following SVC thrombosis after internal jugular catheter insertion. Over approximately 3 years, PD has been very successful in this patient, with 2 early routine episodes of peritonitis and 1 early episode of exit-site infection, control of hematologic and biochemical values, no hospitalizations in the 2.5 years before the time of writing, and good quality of life. A dedicated spouse performing the PD tasks has been a major factor in the success of PD in this patient.

Peritoneal dialysis (PD) offers an alternative method of renal replacement and has been advocated as a replacement for HD in patients with HD blood access failure (7). Here, we present a case of sustained success of PD in an elderly patient with HD access failure and severe comorbidities.

Key words
Hemodialysis access failure, superior vena cava syndrome, elderly patients

Introduction
In patients on chronic hemodialysis (HD), vascular access complications create substantial morbidity and mortality (1–6). Impending vascular access failure is one of the conditions that justify placement of HD patients at the top of lists of patients awaiting renal transplant. However, comorbid conditions and a lack of availability of donor kidneys severely restrict the number of patients receiving renal transplants. Peritoneal dialysis (PD) offers an alternative method of renal replacement and has been advocated as a replacement for HD in patients with HD blood access failure (7). Here, we present a case of sustained success of PD in an elderly patient with HD access failure and severe comorbidities.

Case report
A man born in 1927, who has end-stage renal failure secondary to membranous nephropathy, commenced HD in October 2000. His (dominant) right arm had previously been amputated below the elbow because of a swanoma. Other significant comorbidities included coronary artery disease, obstructive lung disease from smoking, and peripheral vascular disease with claudication.

This patient’s HD course was characterized by repeated blood access failures. All attempts to create arteriovenous fistulae or grafts failed, and he was dialyzed using a series of acute and chronic HD catheters complicated by repeated episodes of line sepsis, clotting, bleeding, and surgical procedures.
In January 2004, this patient developed superior vena cava (SVC) thrombosis (Figure 1) secondary to a right internal jugular chronic (cuffed) HD catheter, and SVC syndrome. After January 2003, he exhibited a fluctuating level of consciousness, with episodes of severe confusion coinciding with episodes of line sepsis. During one episode of confusion in March 2004, he fell at home and sustained a right femoral shaft fracture that required surgery. Since that episode, he has had to use a wheelchair.

In April 2004, the last remaining femoral vein dialysis catheter failed because of line infection. After extensive discussions, his spouse, who was making the medical decisions at that time because of the patient’s altered mental status, decided that a trial of PD should be attempted. (When the patient’s mental status later cleared, he concurred with that decision.)

The PD schedule chosen was continuous ambulatory peritoneal dialysis (CAPD) using 4 daily exchanges, 2.5-L fill volume, and alternating 1.5% and 2.5% dextrose exchanges, with infrequent temporary increases in the use of 2.5% dextrose solution for fluid gains. This CAPD schedule has remained unchanged.

The CAPD exchanges are performed by the patient’s spouse, who is in control of all aspects of the patient’s everyday life. Despite the patient’s pronounced medical handicaps and the fact that he has reached his 81st year, this patient has achieved a sustained improvement in quality of life since starting CAPD. His mental status improved almost immediately after initiation of CAPD, and he has remained lucid.

During the HD period (3.42 years), he was hospitalized 12 times (8 times for HD vascular access problems), yielding a rate of 3.51 hospitalizations per year. During the PD period (2.88 years so far), he has been hospitalized just 2 times (0.69 hospitalizations per year), once for peritonitis and once for pneumonia. Both hospitalizations occurred in the first 4 months of PD. In the HD period, hospitalization days were 119 (34.79 per year). In the PD period, hospitalization days dropped to just 4 days (1.39 per year). The rate and the days of hospitalization were both significantly lower in the PD period ($p < 0.05$).

In the HD period, monthly measurements of Kt/V urea were below 1.20 in 43.2% of cases (75% in the last 12 months of HD), but in the PD period, with the patient being virtually anuric, weekly peritoneal Kt/V urea has so far fluctuated between 1.57 and 1.78. Despite the marginal levels of peritoneal Kt/V urea, the patient remains free of uremic symptoms and has a satisfactory appetite. Serum albumin varied between 1.6 g/dL and 4.0 g/dL in the HD period; in the PD period so far, it has varied between 3.0 g/dL (at the beginning of PD) and 3.7 g/dL. In the 2 years of PD immediately preceding the time of writing, the patient’s weight has varied between 68 kg and 71 kg, with minor fluctuations from fluid gains. Control of blood pressure has been satisfactory.

In the HD period, blood hemoglobin ranged between 6.9 g/dL and 16.3 g/dL, with 15.2% of the values being lower than 10 g/dL. Several red cell transfusions were required, and erythropoietin use was continuous. In the PD period, blood hemoglobin has ranged between 12.3 g/dL and 15.9 g/dL, with no transfusions required and no erythropoietin use within 10 months of the time of writing. Serum

![Computed tomography venographies. (A) Study of the patient presented in this case report. A large clot is evident in the superior vena cava (arrow), as is collateral venous flow in the internal mammary vein (m), the right axillary veins (a), and the lumbar veins (l). (B) Study of a different patient with lymphoma and large lymph nodes, but no venous thrombosis. The superior vena cava has no clots (arrow). Collateral veins are not seen.](image-url)
phosphorus in the HD period was 1.5 – 7.8 mg/dL (mean: 3.9 ± 2.6 mg/dL), with 27.3% of the values in the hyperphosphatemic range (>5.0 mg/dL) and 19.7% of the values in the hypophosphatemic range (<2.8 mg/dL). In the PD period, serum phosphorus has been 2.5 – 5.1 mg/dL (mean: 3.2 ± 0.8 mg/dL), with just one value each in the hyperphosphatemic and hypophosphatemic ranges (together, 2.9% of measurements). Similarly, 12.1% of the patient’s serum calcium levels were in the hypocalcemic range and 6.5% were in the hypercalcemic range during the HD period, but all measurements of serum calcium have been within the normal range during the PD period to date. Mean serum parathormone in the PD period has been 215 ± 15 pg/mL (normal range: 11 – 54 pg/mL). Serum electrolytes have also been better controlled in the PD period than in the HD period. A peritoneal equilibration test (8) has shown high-average transport.

In the first 4 months of PD, this patient had 2 routine episodes of peritonitis, 1 with methicillin-sensitive Staphylococcus aureus requiring a 2-day hospitalization, and 1 with methicillin-sensitive S. epidermidis treated on an outpatient basis. In month 5 of PD, he developed 1 episode of exit-site infection that responded to ciprofloxacin. Appearance of the exit-site has been perfect in last few outpatient visits preceding the time of writing.

The major clinical issues for this patient during his last clinic visit were sequelae of his HD period and included inability to ambulate and manifestations of SVC syndrome, including modest dyspnea at rest, continuous use (since the SVC clotting) of nasal oxygen, pronounced edema and cyanosis of the face and neck, engorgement of the neck veins, hoarseness, and extensive venous collateral pattern in the anterior chest and abdomen. Clinical issues related to the treatment with PD have been absent for more than 2 years preceding the time of writing.

Discussion

This case suggests that PD can be successful in elderly patients severely handicapped by failed HD vascular access and other comorbidities. Failure to create a functional arteriovenous fistula or graft leads to the use of acute or chronic dialysis catheters. In addition to problems related to placement and mechanics (bleeding; perforations of central veins, cardiac chambers, or arteries; dysrhythmias; hemothorax, pneumothorax, and air embolism; pericardial tamponade; and underdialysis from poor blood flow), these catheters are associated with severe long-term medical complications—primarily clotting of the central veins (2,4) and life-threatening infections including bacteremia (3), endocarditis (5), and remote infectious foci (1).

In U.S. patients on chronic HD between 2001 and 2003, vascular access failure accounted for 0.9 deaths per 1000 patient–years overall (6). This death rate varied with age, being 2.5 deaths per 1000 patient–years in children 5 – 9 years old, 0.3 deaths in adults 30 – 39 years old, 1.4 deaths in patients 70 – 79 years old, and 2.5 deaths in patients more than 80 years old (6). The choice of PD by a number of pediatric nephrologists as the preferred method of dialysis before transplantation is based partly on the high frequency of HD access failure in children. The finding that patients more than 80 years of age have a death rate from HD access failure equivalent to that in children between 5 and 9 years of age raises the question of whether PD should be offered to larger numbers of elderly patients with advanced renal failure.

In a previous report, prolonged survival, good biochemical control, and an acceptable (for that period) rate of PD catheter-related infections was noted in 5 patients who were placed on PD because of HD access failure (9). The new feature in the present case report is the advanced age of the patient, who, in 3.5 years of HD, was hospitalized 8 times for complications of central venous catheters, culminating in SVC thrombosis after placement of a chronic internal jugular catheter. Although the incidence of venous clotting appears to be less with internal jugular than with subclavian catheters (10), internal jugular catheters are not free of the complication of central venous thrombosis, with its important clinical consequences. In addition to demonstration of PD success, this case report demonstrates the importance of having a dedicated family member take charge of the PD procedure in incapacitated elderly patients.

In elderly as well as younger patients with failure of HD blood access, PD can be successful as a renal replacement therapy. However, overall evaluation of the place of PD in the management of such patients will require systematic studies with large numbers of subjects, rather than case reports or small series. Large studies of PD outcomes in patients with HD access failure are needed.
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References

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