Current problems in continuous ambulatory peritoneal dialysis

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SUMMARY

In spite of multiple problems, continuous ambulatory peritoneal dialysis is now an acceptable alternative treatment for end-stage renal failure. With proper care and attention to detail, many of its problems can be reduced or eliminated. It is particularly suitable for the very old, the very young and the patient living a long distance from the centre, and it is the treatment of choice for diabetes mellitus prior to transplantation.

INTRODUCTION

Continuous ambulatory peritoneal dialysis was commenced in the Meath Hospital, Dublin, in January 1980. The experience and complications noted from many other centres with the development of CAPD prompted us to establish our own protocol. From the onset, a nurse (G.G.) with responsibility solely for the training and follow-up of CAPD patients was appointed in the renal unit. It was planned to employ further nursing personnel as numbers increased.

PATIENTS AND METHODS

During the period January 1980 to July 1984, 68 patients were treated with CAPD and 37 patients are currently being treated. Patients chosen for CAPD initially were high-risk patients not suitable for haemodialysis; but subsequently all patients were given the option to choose CAPD provided the nephrologist and the CAPD nurse considered them suitable candidates.

Initiation of CAPD involved the insertion of a chronic Tenckhoff catheter into the peritoneal cavity and this was undertaken by the consultant urologist. Following insertion of the catheter under general anaesthetic in the operating theatre using the open technique, the patient returned to a general medical ward and the catheter was flushed with small volumes of fluid to ensure patency. The volume was gradually increased to the required amount. CAPD was commenced when the blood urea and serum creatinine levels reached acceptable levels. Most of the patients were maintained perfectly well on three bag exchanges per day, using Travenol System 1 solutions (Spike System), but those who had negligible or no endogenous renal function or whose body weight was too large required four exchanges daily. The training period of the patients took ten to fourteen days. Patients were reviewed at the renal clinic on a monthly basis. The connector tubing was changed every six weeks to two months. Patients received a mean protein intake of 80-100 g per day with moderate restriction in salt and phosphorus. Fluid intake was not restricted unless ultrafiltration problems arose.

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Most of the patients treated peritonitis at home and every patient's training included instruction in the early recognition of peritonitis and its treatment. The importance of sending samples of peritoneal effluent, properly taken as soon as the symptoms occurred, was stressed. All debilitated patients and patients with severe peritonitis were admitted to hospital.

RESULTS

Peritonitis was the most serious problem associated with CAPD, because, if septicaemia resulted, life could be threatened, ultrafiltration decreased and the efficacy of dialysis reduced. Peritonitis was diagnosed when a patient had two of the following symptoms: cloudy effluent, abdominal pain or fever, and a positive bacterial culture.

The differential diagnosis included infective peritonitis (when the patient had cloudy effluent with or without abdominal pain and a positive bacterial culture); aseptic peritonitis (when the patient had cloudy effluent and abdominal pain but negative bacterial cultures); eosinophilic peritonitis (when the patient had cloudy effluent showing eosinophils, but no pain or negative bacterial cultures). Other causes of cloudy effluent included constipation, diarrhoea, menstruation, cholecystitis, pseudomembranous colitis and coeliac disease. Causative organisms found in the Meath Hospital were mainly gram-positive cocci — staphylococcus albus, staphylococcus aureus and streptococcus species. Gram-negative organisms which were usually hospital-acquired included acinetobacter, pseudomonas species, serrata species, enterobacter species, and escherichia coli. Fungi were mainly candida.

Treatment of peritonitis was based on three fast exchanges with heparin added, a loading dose of antibiotics intraperitoneally, and a maintenance dose six-hourly intraperitoneally for seven days. Heparin was added to each bag for the seven days. First-line therapy was cefuroxime and cloxacillin; and second-line therapy was netilmicin. Resistant staphylococcus albus was treated with vancomycin intraperitoneally, and vancomycin was administered intraperitoneally as a first line treatment for patients known to have relapsing staphylococcus albus infections. Fungal infections were treated by hourly to four-hourly exchanges using small volumes of dialysate containing miconazole and heparin, until a positive fungal culture was obtained. The Tenckhoff catheter was then removed as early as possible and replaced immediately with an acute catheter. Rapid lavage was commenced immediately using small volumes of dialysate containing miconazole and heparin. Ketoconazole was also administered orally. The Tenckhoff catheter was replaced when fluid was microbiologically clear on three consecutive days. Persistent infections were treated by removing the Tenckhoff catheter.

Infection rates were as follows:

1980 — 1/6.3 patient months.
1981 — 1/8.1 patient months.
1982 — 1/5.1 patient months.
1983 — 1/9.0 patient months.
1984 to June — 1/10.1 patient months.

The high infection rate in 1982 may be accounted for by the change-over from System 1 (spike system) to System 2 (Luer lock system), and the change-over to single-line antibiotic therapy. The initial 'high-risk' patient complement was...
experiencing various serious problems. Prevention of peritonitis lies in the better selection and training of patients, revision of training at intervals, further improvements in equipment such as the Ultra Violet System (UV System) and more durable infusion sets; and a team who are interested in the treatment.

Catheter problems can be divided into early or late problems. Early dialysate leak was usually prevented by good catheter positioning and conditioning, but, if early leak occurred, it responded to a reduction in the fluid amount or suspension of the dialysis for 24 to 48 hours. Early two-way obstruction responded to flushing with heparin. Early one-way obstruction caused by omental wrapping usually resulted in catheter removal.

Late catheter problems included exit site infection. Omission of a suture around the catheter and frequent dressings during the first week helped to prevent this. Daily showers and washing of the exit site with povidone iodine were advised and the catheter was held in position with elastoplast. Weekly dressing with Opsite which held the catheter firmly in position was carried out on patients who preferred to have a dressing. If infection did occur, the exit site was dressed daily with antibiotic cream, and if the infection did not improve an appropriate oral antibiotic was commenced and continued for seven to 14 days. Tunnel infection may or may not be associated with exit site infection but, if it is, it may be curtailed by removing the subcutaneous cuff and the infected area from around the catheter, under strict sterile conditions in the operating theatre. Tunnel infection usually led to persistent peritonitis which necessitated removal of the catheter. Extrusion of the subcutaneous cuff was treated by shaving off the cuff in the operating theatre under strict sterile conditions. Late two-way obstruction responded to flushing with heparin. Late one-way obstruction was caused by kinking of the catheter or migration of the catheter from its original position. Repositioning of the catheter was attempted but catheter replacement was usually necessary. Late dialysate leak occurring around the catheter responded to a reduction in the fluid amount or suspension of dialysis for 24-48 hours. More serious were leaks into the pleural cavity, the vagina and the scrotum.

Lack of ultrafiltration may have been caused by a decrease in residual renal function as time on dialysis increased, but it was usually caused by severe prolonged peritonitis and its treatment, leading to hypoalbuminaemia, rapid glucose absorption and fluid overload. Treatment consisted of 3.86% dextrose solutions with long dwell times with an occasional two-hourly exchange of 3.86% dextrose to allow for better ultrafiltration. High protein diet was encouraged, fluid and salt were restricted and in some cases high doses of frusemide were used.

Three patients developed an acute confusional state while on fast exchanges which reversed on return to normal dialysis regimen. Two of these patients had evidence of widespread atherosclerosis. Some patients developed postural hypotension caused by dehydration and antihypertensive treatment. Treatment consisted of the introduction of salt and increased fluids. Hypotensive agents and fast exchanges were discontinued.

Three patients developed radiological evidence of renal osteodystrophy:
C.B. age 69 years — CAPD for four years.
B.R. age 70 years — CAPD for three years.
A.M.H. age 45 years — CAPD for one year; had previously been on haemodialysis.

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Hernias which were caused by extra fluid load in the abdomen were repaired surgically without interruption of CAPD. Intestinal obstruction in one patient was caused by adhesions around the dacron cuff.

Two patients developed right-sided pleural effusions. They were significant in that both were right-sided and a radio opaque dye injected into the peritoneal cavity appeared in the pleural fluid. In addition, the biochemical composition of the pleural fluid was similar to the drained dialysate. Both were treated by pleurodesis, one remaining on CAPD without interruption and the other returning to haemodialysis for one week. Two patients developed hyperlipidaemia.

Hypoalbuminaemia was caused by fast exchanges and malnutrition, and by peritonitis and its treatment. Treatment consisted of curtailing fast exchanges and encouraging high protein diet. Minor problems included low back pain, shoulder pain, constipation, cramps, bleeding, gastric problems such as reflux oesophagitis and hiatus hernias, sexual problems which were usually associated with the catheter, and equipment problems.