Introduction

Continuous ambulatory peritoneal dialysis (CAPD) was introduced as a new technique for dialysis in 1976 [1]. Until then intermittent peritoneal dialysis (IPD) was the only alternative to chronic intermittent haemodialysis. Despite safe indwelling catheters and the development of more or less sophisticated machines for automatic peritoneal dialysis, favouring IPD as a treatment at home, peritoneal dialysis remained far behind haemodialysis in the treatment of chronic renal failure. Under usual operating conditions (one or two 2-litre exchanges per hour) the urea clearance is only 20 ml/min or less. Because of this low clearance, on a weekly basis 30–50 dialysis hours were necessary to equal 12 h per week of haemodialysis [2]. Furthermore, protein loss during dialysis and peritonitis were regarded as a major drawback of IPD. In 1977 all over the world a total of 789 patients on IPD could be traced [3]. A publication of the National Institutes of Health in 1978 showed that less than 3% of patients with dialysis were managed on IPD [4].

In 1976 Popovich, Moncrief and co-workers submitted an abstract to the American Society for Artificial Internal Organs which was entitled ‘The definition of a novel portable–wearable equilibrium peritoneal technique’ [1]. They described a method for permanent peritoneal dialysis during which the patient performed normal activities. Except for five daily periods of drainage and instillation of a fresh dialysis solution, 2 L dialysate was continuously present in the abdominal cavity. In 1978 they published the promising results of this new treatment in nine patients [5]. The name of the procedure was changed and continuous ambulatory peritoneal dialysis was born. In the same year Moncrief reported the results in even more patients and summed up the desirable features of CAPD [6, 7]. Nolph discussed the theoretical and practical implications of CAPD [8] and in the Toronto Western Hospital the CAPD technique was improved by the introduction of plastic bags instead of cumbersome bottles [9]. As the empty bags remained connected to the abdominal catheter until the next exchange, the number of disconnections could be minimized and this resulted in a reduction in the incidence of peritonitis. A questionnaire showed that in July 1978 in Canada already 165 patients were being treated with CAPD [10]. In 1979 other promising reports were published. Moncrief and co-workers discussed the combined clinical experience of 75 CAPD patients from three centres [11]. The first studies concerning peritoneal clearances during CAPD were published [12, 13]. Oreopoulos and co-workers presented the results of CAPD in the Toronto Western Hospital [14, 15]. Because of technical improvements the infection rate could be reduced to one peritonitis episode every 10.5 patient-months. Their experience indicated that ‘CAPD was superior to IPD in controlling the biochemical abnormalities’. In June 1979 the 16th EDTA meeting was held in Amsterdam. Several investigators reported the results of CAPD in the treatment of end-stage renal failure. These results were very encouraging. The same conclusion could be drawn from symposia on peritoneal dialysis which were held in the autumn of 1979 in New York and Paris. From 1980 on the numbers of patients treated with CAPD increased rapidly all over the world.

In 1997 worldwide 115,000 patients were being treated with chronic peritoneal dialysis. Between 1993 and 1997 the annual growth rate was 7.4%. The difference between countries with regard to the utilization of peritoneal dialysis is substantial (Fig. 1). In most countries where dialysis is performed this modality is still a minority, whereas in other countries the majority is treated by peritoneal dialysis.

At the introduction of CAPD, more than 20 years ago, it could not be expected that this new dialysis...
Continuous ambulatory peritoneal dialysis (CAPD) was developed as an alternative to hemodialysis, offering patients the ability to perform dialysis at home. This modality would spawn an entirely new industry to manufacture and distribute the materials required to safely deliver this form of home dialysis. The International Society for Peritoneal Dialysis has been organized and a new international journal, Peritoneal Dialysis International, has been developed for the dissemination of scientific information. Worldwide many symposia are dedicated to the research projects associated with this broad, expanding therapeutic system.

**Principles of CAPD**

**The concept of CAPD**

In peritoneal dialysis the peritoneal membrane is used like a capillary kidney in hemodialysis. Transport of water and solutes occurs between capillaries in the peritoneal membrane and dialysis fluid in the peritoneal cavity. For low clearance systems such as urea removal in CAPD, Popovich and Moncrief have demonstrated that body fluids can be considered as a single well-mixed pool [16]. For peritoneal dialysis they defined the clearance as

$$K_D = \frac{V_D}{t} \frac{C_D}{C_B}$$

where $V_D$ is the drained dialysate volume with a mean BUN concentration $C_D$ over a total time period $t$ and a blood urea concentration $C_B$. With prolonged dwell periods as used in CAPD, for urea an equilibrium can be assumed for the urea concentration in blood and dialysate, resulting in $C_B = C_D$. In this situation equation (1) is reduced to

$$K_D = \frac{V_D}{t} = Q_D$$

where $Q_D$ is the dialysate flow rate.

This simplified model has directly led to the clinical CAPD protocol. This theory predicted that an anephric patient will maintain a steady BUN concentration of approximately 80 mg/L if 10 L of dialysis fluid were allowed to equilibrate with body fluids on a daily basis. With an usual infusion volume of