

Is the underutilization of peritoneal dialysis in relation to hemodialysis, as renal replacement therapy, justifiable worldwide? Yes or No

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Abstract

Peritoneal dialysis is the most important home dialysis treatment for end stage renal diseases and needs personal involvement, and support from the family. Peritoneal dialysis presented a number of discouraging technical problems and led to the belief that PD was not an appropriate renal replacement therapy, for patients with end stage renal disease. Despite the improvement of the method its rate remain low (11%) worldwide. The factors affecting the choice of PD are multiple and explain the disparity in the use of peritoneal dialysis in different countries and different parts of the same country. Dialysis costs and reimbursement structures are significant in decisions about the rates and modalities of renal replacement therapy. Late referral and the health care system seems to be very important factors that influence the dialysis modality choice. After the initiation of peritoneal dialysis we can see other factors that influence the survival of the method. The rate of peritonitis and the peritoneum function seems to be important issues. Hippokratia 2011; 15 (Suppl 1): 13-15

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The development of peritoneal dialysis (PD) in early 1900 s as form of renal replacement therapy was made possible by progress in medicine that took place in the nineteenth century. The discovery of laws of diffusion of gases (Graham's law: the rate of diffusion of a gas is inversely proportional to the square root of its molecular weight), the investigation of osmotic force and the separation of chemical or biological fluids by dialysis were the most important works by Thomas Graham (1805-1869) and represents the theoretical foundation upon which clinical dialysis could later develop¹. First experiments were performed in animals by Abel, Rowntree and Turner in 1913-1914. The first human hemodialysis (HD) was done in 1924 in Germany by G. Haas². Also in Germany, Heinrich Necheles was searching for a better dialysis membrane for his dialyzers and his work with goldbeater's skin which was a commercial preparation of visceral peritoneum from calves' abdomen must have stimulated Ganter to perform peritoneal dialysis³. In 1923 Georg Ganter, published his only paper entitled "On the elimination of toxic substances from the blood by dialysis" in humans and animals. He noted improvement in the animal's uremic symptoms after peritoneal lavage: In order to perform fluid exchanges he used drainage tubes implanted in the peritoneal cavity and instilled saline solutions in volumes of approximately 50ml which were left in the peritoneal cavity for about 3 h⁴.

Historical Data

As we can see from the Historical data the two methods of dialysis, in order to treat the end stage of renal

diseases (hemodialysis and peritoneal dialysis) were presented at the same time but, they don't have the same application despite the improvement of both methods.

It's true that peritoneal dialysis presented a number of technical problems that was discouraging and led to the belief that PD was not an appropriate renal replacement therapy, for patients with end stage renal disease (ESRD). In 1976 Popovich et al presented successful clinical experience in nine patients, at two centers in the United States, treated with ambulatory peritoneal dialysis (CAPD)⁵. A major innovation early on was the introduction of sterile plastic bags for dialysate by Oreopoulos et al in 1978⁶. Later the double-bag Y-set device introduced by Buoncristiani in Italy decreased the rate of peritonitis and this was confirmed in several other centers and it is now the system of choice for PD (90%)^{7,8}. Also the automated peritoneal dialysis employing a cyclor to perform the dialysis exchanges presents very important innovation, in order to improve the quality of life of these patients⁹.

During the 1980 a rapid growth in the utilization of PD occurred. This rapid growth continued between 1990 and 1995 with annual growth rates reaching 15%⁸.

In 1997 the population on PD was 115,000 worldwide representing 14% of the global dialysis patients. Unfortunately the next years a lower rate were presented with only 11% and 149000 patients on PD in 2004 (total patients on dialysis 1.371000)¹⁰.

Factors Affecting the Choice of PD

Peritoneal dialysis is the most important home dialysis treatment for ESRD and needs personal involvement,

and familiar support. The factors affecting the choice of PD are multiple and explain the disparity in the use of peritoneal dialysis in different countries and different parts of the same country. So we can see very low rates 2-4% such as Chile, about 5-11% in France, Germany and United States and Greece, 20-30% in the Scandinavian countries, Australia, Canada and more than 75% in Mexico and Hong Kong. In Italy the disparity in use of PD among regions has increased varying from 0 to 55%¹⁰⁻¹².

It is clear that the choice of PD, as the modality for renal replacement therapy is influenced by a number of factors. Dialysis costs and reimbursement structures are significant in decisions about the rates and modalities of renal replacement therapy. Li PK and Chow KM report that the annual cost of PD is greater than the per-capita gross national income. Thus most patients with renal failure can be expected to have problems accessing PD therapy in developing countries in Asia¹³. Except the economic factors that includes the cost of peritoneal dialysis fluids, the health care system, physician /facility reimbursement, and resource availability, other factors

such as medical and psychosocial seem to play important role in the utilization of PD. The nature of patient education is dependent on the physician bias and in nonurgent situation the decisions of patients depend mostly on the information provided by the doctors. In the Dialysis Morbidity and Mortality Study only 25% of the patients who chose HD reported that PD was discussed with them whereas 68% of the patients who chose PD reported that HD was discussed with them¹⁴. An incomplete presentation of treatment options is an important reason for home dialysis therapies under utilization.

The aim of the NECOSAD Study Group was to determine the influence of different factors on long term dialysis modality choice. So of 1347 included patients 36% had a contraindications to either PD or HD therapy. Eighty percent of all contraindications were directed to PD therapy. The most important contraindication was a social one such as, the expected incapability of patients to perform PD exchanges themselves. Patients with contraindications were older had more co morbidity, and lived alone more often. Older age increased the odds of choosing HD¹⁵.

Late referral and the health care system seems to be very important factors that influence the dialysis modality choice. Van Biesen et al in their study about the European perspective and the ESRD therapy reports that 30% of patients were referred to a nephrologists less than 1 month before the start of dialysis. This had an impact of the modality choice, as 77% of late versus 51% of early referrals, were started on HD¹⁶.

Except the economic factors and the physician bias, the medical contraindications and the patients preference as mentioned above, have an important impact on the small number of the patients on PD.

Factors Affecting the Duration of PD treatment

After the initiation of the therapy we can see other

factors that influence the survival of the method. The rate of peritonitis and the peritoneum function seem to be important issues. Among PD patients many complications are related to the catheter such as early or late pericatheter leak, exit –site infections, cuff extrusion or herniation at the peritoneal tunnel¹⁷. There is variability in peritonitis rates by both program and by individual patients. The incidence of peritonitis is still high and remains a major complication of PD, despite the improvement of the technique. A multicenter analysis conducted by Imada et al, in Japan demonstrated a peritonitis rate of one episode per 53,4 patient- month (0.22year). The data were derived from 1428 patients who were treated in 25 dialysis units; each unit managed over 40 PD patients¹⁸. Peritonitis account for 15-35% of hospital admissions and is the major cause of transfer to hemodialysis^{19,20}. Szeto et al, reported that about 32% of patients on PD, need to transfer to HD because of peritonitis, 28% died during the treatment and 7% died 4 weeks after catheter removal²¹. The organism involved is mainly coagulase-negative Staphylococcus though diphtheroids Corynebacterium and Bacillus are also seen²².

However not only the peritonitis transfer patients to hemodialysis. The ultrafiltration failure is also another important cause. The clinical definition of peritoneal ultra filtration failure (UFF) refers to the inability to attain volume homeostasis despite the use of more than two hypertonic bags per day (4,25%/3,86% dextrose/glucose)²³. Fluid overload is a significant problem in PD especially when residual urine production is absent. It may be caused by a high fluid intake, inappropriate PD prescription noncompliance or by a low drained volume. The low drained volume can be due to mechanical problems such as catheter dislocation or subcutaneous leakages or to peritoneal membrane failure. The most frequent cause of peritoneal ultrafiltration failure is the presence of a large vascular surface area, which lead to high absorption rates of low –molecular –weight osmotic agents and therefore to a rapid dissipation of the osmotic gradient²³.

Although peritoneal UFF can be occur in any stage of peritoneal dialysis, it usually develops after a sustained period on PD. The proper incidence of ultrafiltration failure is difficult to determine. Prevalence as high as 31% to 51% have been reported for patients on PD for more than 6 year²⁴⁻²⁶.

Conclusions

A number of factors determine the underutilization of peritoneal dialysis in different parts of the world. Economic, psychological and medical ones seem to be the most frequently encountered. Despite the improvement of the method, peritonitis and ultrafiltration failure are also two main causes that increase the discrepancy. So, regarding the question: Is the underutilization of peritoneal dialysis in relation to Hemodialysis, as renal replacement therapy, justifiable worldwide? Yes or No, the answer is: Yes.

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