French peritoneal dialysis registry (RDPLF): Outline and main results

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The Registre de Dialyse Péritonéale de Langue Française (RDPLF Registry) is a non-profit association that has been set up to assist physicians and nurses in evaluating their practical experience and results regarding peritoneal dialysis (PD). Five French-speaking and two Spanish-speaking countries have participated in this initiative (which includes 21 000 patients). In France, 82% of all PD patients are included in the registry and the main results for the period from 1995 to January 2006 form the basis of this report: of 11 744 incident patients with a median age of 71 years, 21.5% were over 80 years of age and 56% were not able to perform PD treatment at home without assistance. Eighty-six percent of the latter group received external assistance from a private nurse and 14% were aided by their family. The overall average rate of peritonitis was one episode every 29 months. The probability of being peritonitis-free appeared to be better for patients on automated PD (59.4% at 2 year) than for those on continuous ambulatory PD (55.3%), but this finding requires further validation. The average waiting time before transplantation was about 2 years. In patients who had undergone transplantation, the peritonitis rate was one episode per 42 months before transplantation compared to one episode per 29 months for patients who had not received a transplant. Eighty-three percent of patients had a hemoglobin level greater than 11 g%. Catheter survival was 92% at 2 years post-insertion and 85% at 5 years, with 94% being implanted by experienced surgeons. In conclusion, the RDPLF results demonstrate that PD may be successfully prescribed for older patients who receive assistance either from their family or from a nurse. Further, a larger number of younger patients should also be prescribed this technique in France. Patients eligible for transplantation and on short-term PD have the lowest risk of developing peritonitis; PD before transplantation may help prolong residual renal function, and initial treatment by PD may also help to preserve vascular access for the future.

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RDPLF is an acronym for the Registre de Dialyse Péritonéale de Langue Française (French Language Peritoneal Dialysis Registry). It was set up in September 1988, with data retrospectively collected from 1986 and then prospectively and continuously recorded. Peritoneal dialysis (PD) teams from France, French territories, and six foreign countries (Algeria, Argentina, Belgium, Switzerland, Tunisia, and Uruguay) have participated in this registry. 21 000 patients have been included since 1986. Completeness of reporting varies from one country to another. In France, 82% of all PD patients have been included in the RDPLF. For the purposes of this study, to obtain a homogeneous population we decided to focus on metropolitan France only. Our aim was to present an overview of the RDPLF results on the outcome of French PD patients over the past 10 years, and to describe the PD patient population currently being treated in France.

REGISTRY MANAGEMENT

Administration of the RDPLF

The administration of the RDPLF is the responsibility of a non-profit association whose members are directly involved in its financial and organizational management and in that of its computer database and security. A committee known as the Good Practices Committee is made up of 12 nurses and physicians, three of whom are permanent members (the president, treasurer, and secretary of the RDPLF) and nine of whom are elected by the participating centers from among their collaborators. The Good Practices Committee acts as the intermediary between the participating centers and the RDPLF and rules on all issues dealing with database use, contacts with sponsors, ethical issues, RDPLF projects, and requests to participate. The RDPLF keeps the Good Practices Committee informed twice a year about its decisions, projects, and financial management, and asks its advice regarding each major decision.

Centers participate in the RDPLF on a voluntary basis, and there is no legal obligation involved. A charter describing the relation between the RDPLF and the centers in question is available on the website. Centers who participate provide exhaustive information on all their patients and update this information at least every 3 months. In return, the RDPLF undertakes to send back each center the updated standard statistics and to return each personal request on the database

within 15 days. Participation in the RDPLF is free of charge and is entirely sponsored by private companies and medical non-profit associations.

Database management and structure

The RDPLF database is divided into different categories, each covering different aspects of PD. Only the first module is mandatory for centers wishing to participate in the RDPLF, the other categories being optional. The description of the different modules and their frequency of updates are summarized in Table 1. All modules are interconnected within the database, so that cross-studies may be performed between modules.

Medical staff and nursing teams from each center are issued special forms on which all items to be recorded for each of the different modules have been listed. The personnel are required to complete the form, indicating any change that takes place in the patient's status, and send it back to the RDPLF. The RDPLF then updates its database and issues a new form with the updated statistical results for the center. There is thus a continuous process of updating, with no delay of over 3 months being allowed.

Quality control

Quality control is checked as follows: (1) automatically by the computer during input; (2) by a secretary who has been specially trained for the purpose; and (3) by a nephrologist who also randomly checks the data. In some cases, we may ask the nephrologists and nurses from the center in question to carry out a final check once they have received their results and their updated forms.

Cross-control with other registries

Recently, some basic data such as age, sex, diabetic status, and duration of dialysis have been compared with data included in the register of the French Society of Nephrology, the Renal Epidemiology and Information Network[1] and have shown a high degree of agreement.

In addition, in 2003 an exhaustive inquiry was performed in France by the Institute of Health (Caisse Nationale d'Assurance Maladie) to evaluate the total number of PD patients treated in the country. By comparing the number of patients under treatment in the RDPLF and in the CNAM enquiry for the same time period, it was found that the number of patients assessed via the RDPLF represented around 82% of the total PD patients in the entire country. Therefore, data from module 1 constitute a minimum of 82% representativeness, both for the total number of PD patients and for the number of PD centers. Of course, although this representativeness is lower in the optional categories, at least 20 different centers are participating in each optional module.

Material and software

The database functions on a Macintosh computer using OS X and 4th Dimension® database management software. Statistical analyses are performed with JMP® statistical analysis software.

Data extracted from module 1 and previously rendered anonymous are also available online through the internet with information on statistical procedures to allow nephrologists and nurses from each center to perform their own statistical analyses (http://www.rdplf.org).

RESULTS

Incident patients (1 January 1995 to 1 January 2006)

Patient profiles. A total of 11 744 incident patients were included for the period from 1 January 1995 to 1 January 2006. The mean age was 66.4 ± 16.8 years with a median of 71 years. The study population consisted of 56% males and 44% females. Of these, 2561 patients (21.5%) were over 80 years of age.

Fifty-six percent of patients were considered as being unable to perform their therapy on their own and needed some degree of assistance; 7% were aided by their family, 45% by a private nurse, and 3% received other undefined forms of assistance. In summary, more than 86% of all assisted patients living at home were aided by a private nurse.

During the past 10 years, a progressive increase in the rate of diabetes with age has been observed as summarized in Table 2. In diabetic patients receiving insulin, the subcutaneous route was the most frequently used. Use of

Table 1 | The different categories of the French language PD registry

Category	Updates	Parameter	Main variables recorded
1[a]	Every 3 months	Survival and infection	Patient and center identification, sex and age, nephropathy, previous renal replacement therapy, metabolic status (diabetic or not), autonomy (autonomous, help by family or through a nurse), Charlson comorbidity index, transplantation status
2	Once at start of PD	Nurse availability	Psychosocial profile, type of training
3	As required, but at least every 6 months	Nutrition and PD adequacy	Dialysis dosage, clearance, K_t/V, solution, anemia, lipids, diet assessment, nutritional parameters
4	At catheter implantation or when there is exit site infection	Catheter	Catheter type, surgical technique, antibiotic prophylaxis, exit-site infections
5	Every 3 months	Anemia	All anemia-associated items (Hb, iron, vitamins, CRP, EPO, etc)

CRP, C-reactive protein; EPO, erythropoietin; Hb, hemoglobin; PD, peritoneal dialysis.
All categories are interconnected.
[a]Only category 1 is mandatory, the others are optional.

the intraperitoneal route decreased from 5.9% in 1995 to 1.5% by January 2006.

Survival and dropout rate. *Overall results for patient survival and technique survival.* The overall survival results for the past 10 years are shown in Figure 1. Patient survival was $63 \pm 1\%$ and technique survival amounted to $48 \pm 1\%$ at 24 months. Diabetic status and age were found to have a highly significant influence both on technique survival and patient survival, as shown in Table 3.

Influence of the Charlson comorbidity index. Table 4 shows the actuarial dropout rate for patients and the type of dropout in relation to the Charlson comorbidity index. As this index was not introduced until recently, we studied only the 3-year probability of dropout. Both the probability of transfer to hemodialysis (HD) and that of undergoing transplantation were found to have a tendency to decrease, as the index of comorbidity increased owing to high rate of death.

Causes of dropout. A total of 10 138 patients have stopped continuous ambulatory PD (CAPD) over the past 10 years; 15.6% underwent kidney transplantation, 1.7% recovered residual renal function compatible with conservative treatment, 51.8% died, and 31% were transferred to HD. In 73.9% of cases, the cause of death was unrelated to PD itself. Peritonitis was responsible for 3.3% of deaths and poor nutrition for 6.4%. The two main causes of transfer to HD were peritonitis (22.2% of transfers) and underdialysis (23.8%). Loss of ultrafiltration was a minor cause (5.1%), with a lower percentage than that recorded before 1995 (8.6%).

PD systems used and peritonitis rate. During the past 10 years, the use of automated PD (APD) increased from 23% in 1995 to 36% in 2005. During the study period, 31.4% of patients were treated by APD. Patients treated by APD and CAPD differed in age, degree of autonomy, and type of home assistance.

During the past decade, the rate of peritonitis amounted to one episode every 29 months for patients on CAPD and to one episode every 35 months for those on APD. We observed a significantly lower risk of developing peritonitis for those patients on APD compared to those on CAPD (Figure 2). The probability of being peritonitis-free was $59.4 \pm 1.8\%$ for

Table 2 | Age and frequency of diabetes mellitus in PD patients

	1995	2000	2006
Age (years)	65.3	67.6	68.7
Diabetics (%)	24	26	29

PD, peritoneal dialysis.

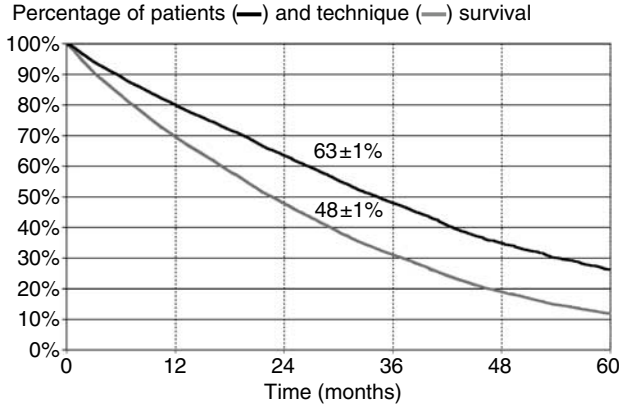

Figure 1 | Patient survival and technique survival of incident patients who started PD between January 1995 and 2006; all techniques, ages, and comorbidities included.

Table 3 | Three-year survival rate for patients by age and diabetic status

	Three-year patient survival (%)		Three-year technique survival (%)	
Age (years)	Non-diabetics	Diabetics	Non-diabetics	Diabetics
16–30	89	85	45	48
30–40	93	72	59	50
40–50	85	77	54	40
50–60	74	59	50	34
60–70	65	41	43	26
70–80	42	30	29	21
>80	25	10	20	15

Table 4 | Actuarial survival rate for patients and technique, and probability of being transferred to HD or of undergoing transplantation at 3 years in terms of the Charlson comorbidity index

Charlson comorbidity index (patient number)	Patient survival (%)	Technique survival (%)	Probability of transfer to HD (%)	Probability of transplantation (%)
2–3 (*n*=1102)	94.5	47.4	49.7	68.3
4–5 (*n*=1046)	72.7	40.3	44.5	35.3
⩾6 (*n*=3324)	29.6	19	35.8	3.1

HD, hemodialysis.

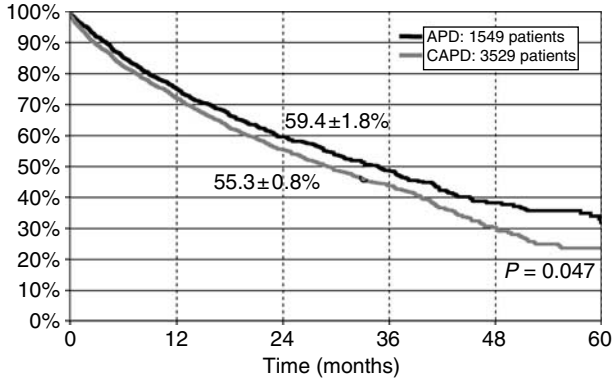

Figure 2 | Probability of being peritonitis-free in incident patients on APD and CAPD between 1995 and 2006. Curves were adjusted for comorbidity.

patients on APD and 55.3±0.8% for those on CAPD at 24 months ($P=0.047$). There was no significant difference in the rate of peritonitis in patients for whom the first treatment was PD, those who had previously been treated by HD, or those who started PD after a kidney transplant failure (43.3, 44.9, and 46.7%, respectively, at 3 years).

The overall bacteriological findings were 55.1% Gram-positive streptococci for patients on CAPD and 52% for those on APD, 18.8% Gram-negative bacilli for patients on CAPD and 24.8% for those on APD. No bacterial growth was observed in 14% of cases of CAPD peritonitis and in 10.3% of cases of APD peritonitis. The bacteriological results have changed during the past 10 years: for the period 1995–2000, Gram-negative-associated peritonitis represented 20% of all episodes, whereas for the period 2000–2005 more than one of every three episodes of peritonitis was due to Gram-negative bacteria; this evolution was associated with a lower rate of peritonitis.

Types of dialysis catheters. Of 2246 catheters included in the registry, 192 catheters (8.5%) were implanted using the Moncrief technique;[3] the time before exteriorization ranged from 3 days to 387 months, with an average time of 122 days and a median of 55 days.

We were not able to demonstrate any difference in the survival of catheters implanted by the conventional technique and those implanted using the Moncrief technique then later exteriorized. The actuarial survival rate of catheters was 92.2±1% at 24 months and 85.1±1.5% at 60 months (Figure 3).

It should be noted that at each center, 94.6% of all catheters inserted are always implanted by the same surgeon or physician. Moreover, 93.8% are double-cuff catheters and only five centers have been using single-cuff catheters.

Prevalent PD patients (1 January 2006)

Patient profiles. The distribution of patients by age and sex clearly shows the selection of older patients for PD treatment: 54% of males and 59% of females are over 70 years of age (Figure 4).

Twenty-nine percent of patients currently on PD are diabetic and are treated either with insulin (21%) or with diet and/or oral medication (8%).

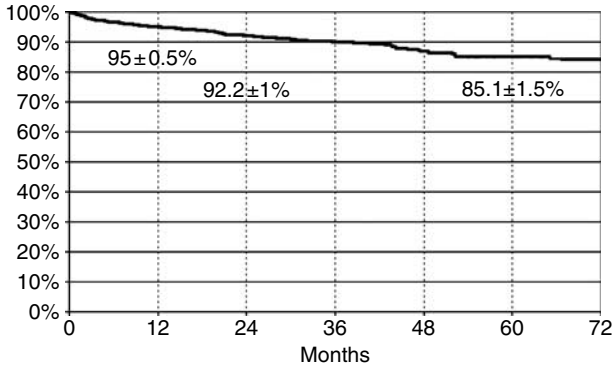

Figure 3 | Catheter survival.

As a large number of patients need assistance in performing PD, we have analyzed the influence of age on patient autonomy and type of assistance (Figure 5). There is a high prevalence of private nurses assisting patients over 80 years of age compared to family-assisted patients. For assisted patients over 90 years of age and living at home, it was found that they are almost exclusively (87%) assisted by private nurses.

PD systems used. The choice of system depends on the degree of patient autonomy and the type of home assistance (Figures 6 and 7). Patients assisted by nurses are mainly (60.7%) on an ultraviolet (UV) non-disconnect system;

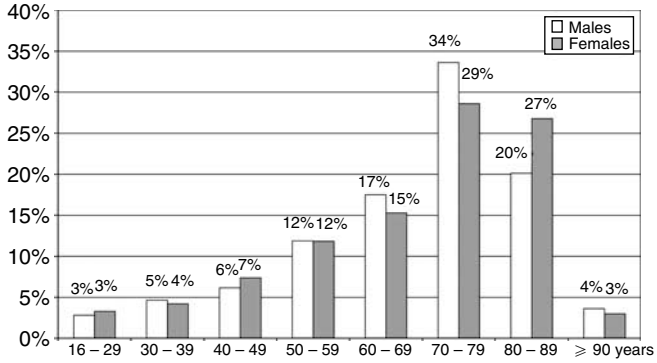

Figure 4 | Age of patients currently on PD in January 2006.

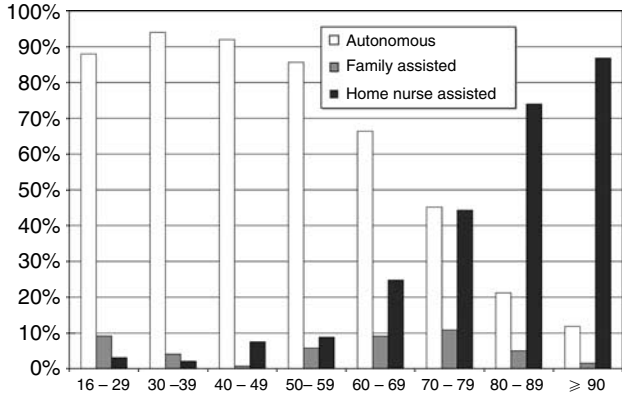

Figure 5 | Autonomy of PD patients and type of home assistance in relation to age.

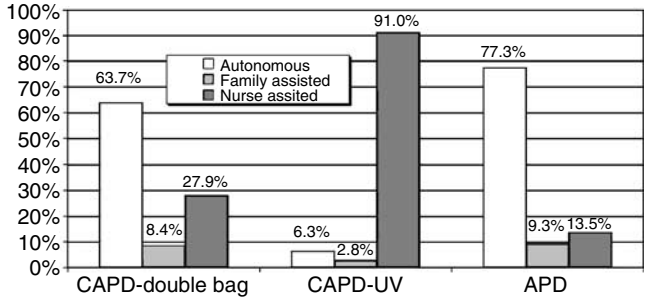

Figure 6 | PD system used in relation to autonomy and the type of home help for assisted patients.

91.0% of the patients on a UV non-disconnect system are assisted by a nurse, whereas in those on APD 77.3% are autonomous, 13.5% are nurse-assisted, and 9.3% are family-assisted.

Influence of comorbidity on patient autonomy and type of assistance. The Charlson comorbidity index was related to the degree of autonomy: autonomous patients had an average Charlson index of 4.8 ± 2.2 (median = 5), those assisted by their family 6.6 ± 2.2 (median = 6), and those assisted by a nurse 7.6 ± 1.9 (median = 7).

Transplantation status

A total of 69.2% of patients have a contraindication for transplantation owing to age and/or comorbidity, 2.5% could be on a waiting list but do not wish to undergo transplantation, 19% are currently undergoing a pre-transplantation checkup, and 8.7% have already completed the checkup and have been placed on the waiting list. Moreover, it should be noted that 66% of patients who have undergone transplantation during the past 5 years only received PD treatment for less than 2 years and 38% for less than 1 year.

Nutritional status and adequacy. Data on 1865 patients from 62 different centers with a total of 6283 evaluations made of their nutritional status and dialysis adequacy were analyzed. For the purposes of this study, we selected the last evaluation made of the patients currently under treatment. Table 5 provides a summary of total creatinine clearance, Kt/V and residual renal function. Patients maintained on PD who were anuric were found to more frequently be female and to have a lower weight, so that the average Kt/V and creatinine clearance levels met with the general guidelines.

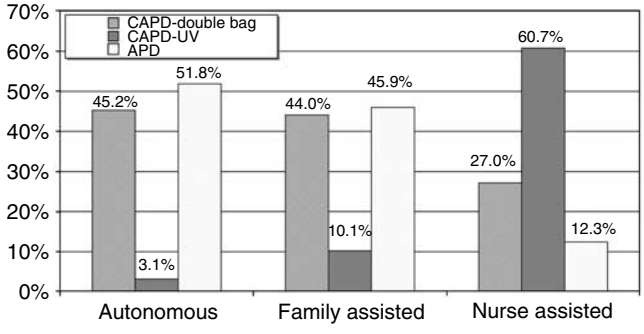

Figure 7 | Percentage of autonomous patients, family-assisted patients and private nurse-assisted patients for the PD systems available in France.

PD patients on therapy during the period 2005–2006 had the following characteristics: body weight, 67.8 ± 13.4 kg (median weight, 66 kg on CAPD and 69.1 kg on APD); body surface area, 1.74 m^2; albumin, 32.8 ± 5.5 g/l; urine volume, 757 ml/24 h $\pm$ 685 (19% of patients had a diuresis level below 100 ml, 22% between 100 and 500 ml, and 59% over 500 ml); normalized protein catabolic rate, 0.95 g/kg/24 h ± 0.42; weekly total K_t/V (renal + peritoneal), 2.28 ± 0.67; weekly total creatinine clearance, 86 ± 60 l (median = 85 l); protein intake evaluated by diet enquiry, 1.07 ± 0.4 g/kg actual body weight/24 h; and caloric intake evaluated by diet enquiry, 23.3 ± 7.9 cal/kg actual body weight/24 h. Dietary protein intake was below 1 g/kg/24 h in 47% of patients and normalized protein catabolic rate was below 1 g in 62.5% of patients; conversely, only 32.5% had a dietary protein intake $\geqslant 1.2$ g/kg/day as usually recommended.

Protein intake tended to be higher in younger patients than the elderly. Protein intake was 1.17 g/kg and normalized protein catabolic rate was 1.08 g/kg for patients younger than 50 years, whereas after age of 70 years they were 1.02 ± 04 and 0.9 ± 0.3 g/kg, respectively.

Anemia management. A total of 66% of PD patients were treated by epoetin (40.8% on darbepoetin and 59.2% on epoetin beta). The average hemoglobin (Hb) level was 12 g/100 ml, with no difference found between APD and CAPD patients. Seventy-two percent of patients had an Hb concentration $\geqslant 11$ g and therefore met the international recommendations. In patients on darbepoetin, 52% had one injection every 15 days or less versus 17% of those on epoetin beta. Eighteen percent of PD patients had either ferritin levels of < 100 μg/l and/or an iron saturation level $< 20\%$.

DISCUSSION

The RDPLF was designed to help centers improve their current practice. This explains why it is divided into different modules of which only the first one is mandatory but 30% of centers participate in all modules. One explanation for this high percentage is probably due to the permanent contact that we maintain with the centers by phone, e-mail, or fax, and because they get immediate results when they send in their data. In addition, whatever the importance of the study, they may ask for and obtain it free of charge from the database usually within 15 days following their request. Finally, we have included on the RDPLF internet site access to anonymous information derived from the database which centers can use directly to perform their own statistical analyses.

Table 5 | Total K_t/V and creatinine clearance versus residual renal function (last evaluation of patients currently under treatment and included in the optional category, dialysis adequacy)

No. of patients	Diuresis (ml/24 h)	Females (%)	Weight (kg)	Kt/V total (renal+peritoneal)	Renal clearance (ml/min)	Total clearance (l/week)
60	<100	42	64	2.1	0.1	56
66	100–500	39	65	2.0	2.1	69
194	$\geqslant 500$	40	69	2.4	6.4	102

The representativeness of our data has been explored by comparison to other registries, notably the findings of the French ministry of health and the Renal Epidemiology and Information Network regional registry. The results confirmed a high degree of concordance and our data represent a large enough sample (>80% of patients) as to be considered highly representative. The main difference between our results and other French registries is the greater precision of our data with regard to PD submodalities (APD versus CAPD) delineation.

The most important aspect of the present results is related to patient selection in France. Most other countries have younger patients on PD. In Canada[4] for example, 35.6% of patients are older than 65 years and in the United States only 39% are over 70 years of age,[5] whereas in France about 55% are over 70 years of age. Younger patients in other countries such as the United States or European countries such as Belgium are also selected for PD. Older patients, who probably also have older spouses with dependency increasing with age, often require external aid, and this type of assistance may represent an unbearable burden for the elderly spouse to assume, whereas younger members of the family are usually not available owing to their professional activity. So in France, being able to have the assistance of a private nurse explains why it has been possible to maintain these PD patients at home. The choice of a non-disconnect UV system for these dependent patients is determined by the time the nurse is able to spend at a PD patient's home. With a double-bag system, the nurse has to connect the system, wait for 15 min for it to drain, then flush and fill, which again requires a minimum of 10 min, then disconnect and cap the extension line. The total time spent at the patient's home therefore amounts to between 30 and 45 min. With the UV non-disconnect system, the nurse can call the patient beforehand, and ask him to remove his bag for drainage. When she arrives, she then makes the connection to the new bag and can leave the patient alone while the dialysate is filling the peritoneal cavity. As the patient only has to fold the bag and keep it on him without taking the risk of opening the connection, the time spent by the nurse at the patient's home will only be 10–15 min, which leaves her more time to treat other patients. However, in some cases nurses accept spending more time at a PD patient's home and the treatment then used is usually a double-bag disconnect system. In France, there is some reluctance about using APD in dependent patients, as they may be unable to cope with unexpected events during the night; however, this attitude is not shared by all centers and in other European countries, APD is mostly proposed to patients who require external assistance. In fact, for patients on APD, the success of treatment outcome is dependent on the reliability of the machine. It should here be noted that APD is mostly used for young patients who want to maintain their autonomy during the day and keep on working.

The analysis of adequacy findings shows a satisfactory dialysis dose for most patients, in agreement with the international recommendations. However, a significant percentage of patients still have protein and caloric intake below the minimum required. This may be owing to the high proportion of elderly patients in France, who are usually more anorexic than younger patients. In addition, a proportion of patients are over their ideal body weight and dietary intake should ideally be expressed with ideal body weight instead of actual body weight. However, usual recommended intake of 1.2 g/kg has been argued,[6] as it may increase hyperphosphoremia and therefore 1 g/kg/day of dietary protein intake might be sufficient in a large number of patients. The more extensive use of solutions based on amino acids could help prevent malnutrition and hypoalbuminemia. In addition, as reporting adequacy and nutritional assessments amounts to no more than 30% of patients, it is difficult to conclude that they are representative of the entire French PD population.

There is no doubt that centers participating in the RDPLF are more motivated to offer freedom of choice to PD patients. At these centers, in 2003, 30% of patients were on PD, 30% on self-care dialysis, and 40% on center-provided HD. In contrast, PD represents only 9% of end-stage renal treatment approaches in France. There are large variations in PD use from region to region which are not justified by patient selection, but only by physician choice. Hence, when freedom of choice is left to the patients who receive pre-dialysis information, up to 45 or even 50% of individuals choose PD.[7]

Most dialyzed patients are followed in private clinics where nephrologists are much less well paid for treating PD patients than they are for HD patients. Therefore, the result is that there is less motivation to include patients in a PD program. The influence throughout the world of non-medical socioeconomic factors on the more widespread use of PD is well known.[8–11] Another reason is the lack of specific training given to the physician during his studies, but this drawback has recently been corrected. In addition, the French government has published new regulations to encourage the prescription of PD and increase its use by up to 15%.

The results obtained from centers which participate in the RDPLF are encouraging taking into account the high level of comorbidity in the selected patient population. They show that older patients may be maintained within the family environment, sometimes for several years, with assistance provided by a private nurse.

However, a greater number of young patients awaiting a kidney transplant who could benefit from PD treatment should also be included. There are a number of reasons for this, the first being the preservation of vascular access they might need 10 or 20 years later if they encounter a graft rejection. In the RDPLF, time before transplantation appears to be satisfactory in most cases, and we have previously demonstrated that the time spent waiting for a kidney graft was shorter than that for HD.[12] Even if this difference was due to a center effect, it demonstrated that the centers

involved in PD were probably those with a higher motivation to perform kidney transplantation as rapidly as possible. The short time spent awaiting transplantation (68% of patients undergo transplantation in under 2 years) usually allows the preservation of residual renal function. Owing to the relatively short time spent on PD, patients waiting for a kidney transplant have a lower risk of developing peritonitis or being exposed to adverse events than those who do not later undergo transplantation and who remain longer on the PD system.

There should not be any concerns about using PD after kidney graft rejection, as we have demonstrated no associated increased risk of peritonitis. In addition, it has also been previously shown that high technique success was achieved in patients who underwent PD after a failed kidney graft, which suggests that this technique may be prescribed safely in such cases.[13]

The probability of being peritonitis-free appeared to be better in our group compared to 0.53% at year 1 and 0.30 and 0.32% in the Medicare PD study in the US.[14] In addition, using a log-rank test, we found in incident patients adjusted for the Charlson comorbidity index a slight but lower risk of first-episode peritonitis for patients on APD compared to those on CAPD, as reported by other investigators.[15,16] At present, no reliable conclusion can be made as patient populations and PD systems used are different, as are the variables used for adjustment.

Our results demonstrate that there were bacteriological differences related to both region and time, and that the lower the peritonitis rate, the higher the proportion of Gram-negative organisms. This underlines the international recommendations that first-line antibiotic therapy should be adapted to local conditions. French centers have the opportunity to take this into account, as information on the peritonitis rate and causative organisms is available on the RDPLF internet site for each region, and for centers that query the online database.

Of the economic factors in favor of PD, we must note the lower frequency of use of epoetin (77% of patients) in comparison with patients on HD, and 83% of cases achieve the international Hb level guidelines.[17,18]

From our results, it appears that patient survival and technique survival cannot be compared to those from other countries if patients are not matched for age and comorbidity. However, it is interesting to use the Charlson comorbidity index to predict the outcomes of PD patients and plan the organization of a center in relation to their PD patient selection criteria.

Peritoneal access does not present a problem, and in most centers the 5-year catheter survival rate is well above the Kidney Disease Outcomes Quality Improvement recommendations.

Conclusion

The RDPLF constitutes an important database that is focused on PD. Its main aim is to help centers analyze and improve upon their technique but, owing to widespread participation, it also provides useful epidemiological information. Current treatment in France is characterized by the inclusion of a majority of elderly and comorbid PD patients, who are often unable to perform their exchange by themselves. Treatment at home is made possible owing to the availability of private nurses paid by the public health insurance system who visit the patients and help them to perform their exchange. In spite of this negative selection, the survival rate is satisfactory. In addition, excellent catheter survival, a low rate of peritonitis, especially in patients on the waiting list for transplantation, and a high rate of patient survival in those with a low Charlson comorbidity index, should in the future lead to the more extensive use of PD in younger patients, as is the case in other countries. The possibility of using the Charlson comorbidity index as a means of predicting outcome and the probability of switching patients to HD may also help the organization of the HD center, depending on the patient selection for PD. The adequate reimbursement of nephrologists and specific training are probably the limiting factors which prevent the more extensive use of PD in all age groups. However, if sufficient encouragement were given by the health authorities, this would probably help patients to have access to adequate information, prescription, freedom of choice, and vascular access prevention.

MATERIALS AND METHODS

Only PD patients undergoing treatment in metropolitan France were selected for this study. This report cannot cover the entire findings in the study and we have elected to restrict it to overall patient characteristics, outcomes and select aspects of care including adequacy, nutritional assessment, and anemia management.

Incident patients (January 1995–January 2006)

The French PD registry has recorded patient data since 1986. However, for the purposes of this paper and so that we could present the most recent results, we limited our selection to patients who started PD treatment after January 1995.

Patient profiles. The number of new patients, age, sex, and PD autonomy were assessed. Patient autonomy was divided into three groups: autonomous patients; patients assisted at home by their family; and patients assisted at home by a private nurse employed by the National Health Insurance.

Survival rate. Survival rate was calculated using actuarial survival data since the first day of PD treatment (we did not exclude the first 90 days, as is the case in the United States Renal Data Service Registry). For technical survival, data on death or transfer to HD were not censored whereas transplantation, loss to follow-up, and interruption of PD owing to the recovery of renal function were censored. As regards patient survival, death was not censored, whereas all other causes of PD interruption were censored.

Survival and patient dropout were analyzed in correlation with age and diabetic status. We also used the Charlson comorbidity index, as it has been validated for the assessment of PD.[2] However, as it was not introduced into the database until 2000, the results on dropout and survival in terms of the Charlson comorbidity index could only be evaluated for the past 3 years.

Peritonitis. The probability of being peritonitis-free was calculated by actuarial curves using the date of the first episode of peritonitis; for this calculation, patients were followed up as of the first episode of peritonitis, or up to the time they stopped PD or were lost to follow-up. Peritonitis rates were calculated by adding together all the periods of treatment on the PD systems studied and dividing this by the number of peritonitis episodes while on these systems.

Catheters. A survey of PD catheters is only available on a limited number of patients. Nevertheless 55 centers have participated in this module, and 2246 catheter cases have been followed up. We postulate that the number of centers participating in this module as well as the number of catheter cases analyzed may provide a fairly reliable estimation of the results.

Prevalent PD patients (January 2006)

All PD patients under treatment on January 2006 have been included in this study.

PD systems used. PD systems provided by three companies (Baxter France, Fresenius France, and Gambro France) are available in France, with different types of connections. They have been grouped as: all double-bag disconnect systems (CAPD), all automated cycler systems (APD); the non-disconnect CAPD UV system provided by Baxter has been analyzed separately as the design and the way in which it functions are different. The non-disconnect CAPD UV system incorporates a special device which sterilizes the connectors with a UV radiation generator during the bag exchange procedure. Between bag exchanges, the patient keeps the empty bag folded over his body after filling the peritoneum, whereas with the other systems the patient leaves the catheter capped and does not have to keep the empty bag.

The probability of being peritonitis-free was compared between patients on CAPD and APD using a log-rank test and a Cox proportional model after adjustment for the Charlson comorbidity index.

The Charlson comorbidity index. The influence on autonomy of the Charlson comorbidity index was also analyzed after having reduced the different level of comorbidity to three groups: group 1 (Charlson index 2 and 3); group 2 (Charlson index 4 and 5); and group 3 (Charlson index 6). Group 1 has fewest comorbidities and group 3 the most.

Transplantation. When centers update their information, they must indicate the patient's transplantation status using a five-group classification: (1) non-transplantable patients; (2) patients eligible for transplantation but who do not wish to undergo the procedure; (3) patients with a contraindication for transplantation; (4) patients currently being evaluated for transplantation; and (5) patients who have completed their pre-transplantation checkup and are on the waiting list. The date on which the patient is placed on the waiting list is recorded so that the waiting time before transplantation can be calculated.

Module 3 is an optional module that covers the different aspects of nutrition and PD adequacy. This information is completed by the center in question once at the beginning of PD treatment, that is, during the first 3 months, then every 6 months at the very least. However, depending upon patient status or the treating physician's choice, more frequent evaluations can be made and sent to the RDPLF to be recorded in the database. As this module is particularly useful for the adjustment of dialysis dose and diet, the results of this evaluation are usually sent back by fax.

To obtain the most recent data, we selected the nutrition and dialysis evaluations which were performed during the period from January 2005 to April 2006. During this period, 3076 evaluations were made in 976 patients from 28 different centers. For the purposes of this paper, we only analyzed the results from the last evaluation for each patient in order to prevent any bias which could have arisen owing to a different number of evaluations from one patient to another. Normalized protein catabolic rate was calculated using the actual body weight, whereas V used in the K_t/V formula was evaluated according to the Watson formula.

Module 5 has been included in the database since 2004, and covers the different aspects of anemia management. Four hundred and twenty-two patients from 22 different centers have been included in this module. Hb levels, ferritin, coefficient of saturation have been analyzed and compared with the European Best Practice Guidelines for anemia management.

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