

SURVIVAL OF CONTINUOUS AMBULATORY PERITONEAL DIALYSIS CATHETERS: AN EVALUATION OF SURGICAL AND NON-SURGICAL FACTORS (SINGLE CENTER STUDY)

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Abstract- Peritoneal dialysis is an established form of renal replacement therapy used in many patients with end-stage renal disease. The key to a successful chronic peritoneal dialysis is a permanent and safe access to the peritoneal cavity. This study was conducted in order to evaluate the catheter survival and its related factors in Imam Khomeini Hospital. A total of 80 catheters were inserted into 69 patients (52 men and 28 women) with end-stage chronic renal failure during a period of 84 months. Retrospectively the correlation between catheter survival (overall and event free) with demographic factors (sex and age), surgical factors (surgeons and surgical methods), nephrologic factors (the causes of peritoneal dialysis selection and the history of hemodialysis) and peritonitis factors (the history and number of peritonitis) has been evaluated. The mean age of the patients was 48.35 years (16 to 79 years). The overall survival of catheters or the probability of having a functioning catheter after one, two and three years was 53%, 41%, 22%, respectively. The event free survival of the catheter or the probability of having a functioning catheter without any problems after one year was 14%. It has been found out that among all factors in this study only history of hemodialysis had statistically significant effect on the overall survival of continuous ambulatory peritoneal dialysis catheter ($P = 0.04$). It seems that the overall survival of catheters is better when CAPD is started before any other attempts for hemodialysis.

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INTRODUCTION

Peritoneal dialysis (PD) is an established form of renal replacement therapy used in many patients with end-stage renal disease (ESRD). In particular,

since the introduction of the continuous ambulatory peritoneal dialysis (CAPD), in the present form in 1976, its popularity has increased greatly, mainly because of its simplicity, convenience, and relatively low cost. At the end of 1997, the estimated percentage of the patients world wide on peritoneal dialysis was about 15% of the total number of ESRD patients (1). The use of PD in treating patients with ESRD varies considerably from country to country (2). Based on unpublished reports, in Iran, less than one percent of the ESRD patients are treated through

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The overall and event free survival of CAPD

this modality (Kazemeyni SM. Head of Iranian center of dialysis, Personal communication).

The key to a successful chronic peritoneal dialysis is a permanent and safe access to the peritoneal cavity. The catheter survival of > 80% in one year is a reasonable goal (3). In order to evaluate the catheter survival and its related factors, this study was conducted in our center.

MATERIALS AND METHODS

The records of 80 peritoneal dialysis catheters being inserted during a 84 month period (13 November 1996 to 13 November 2003) was reviewed in 69 patients (59 one time, 9 two times, 1 three times) in our center (Imam Khomeini Hospital, Tehran, Iran).

All catheters were two-cuff with different types (Tenckhoff straight and coiled, Swan neck Missouri catheter). All procedures were done in the operating room by different surgeons, but majority of them were accomplished by three surgeons (surgeon A 28 cases, surgeon B 19 cases, surgeon C 26 cases). We obtained informed consent from all patients.

The operation technique was open (69 cases) or laparoscopic (11 cases). The open procedures were accomplished by means of a small transverse incision in the right or left para-umbilical area over the rectus muscle, and the laparoscopic procedures were done with the two or three port technique.

After assuring the proper positioning and functioning of the catheter (with abdominal X-ray and irrigation), the patients were discharged and readmitted two weeks later for optimal training in taking care of the catheter. They were instructed to call the specialized nurse in order to solve the potential problems of the catheter. Event of concern included in problems such as peritonitis or catheter malfunctioning that potentially affect their survival. The overall survival was defined as an interval between the insertion of the catheter and its removal due to complications such as peritonitis or malfunctions or when the patients were transplanted or else died. The correlation between the catheter survival (overall and event free) with demographic factors (age and sex), surgical factors (surgical methods and surgeons), nephrologic factors (the

history of hemodialysis and the cause of PD selection) and peritonitis factors (the history and the number of peritonitis) has been evaluated.

For the analysis of the data and the survival time, Kaplan–Meyer methods and Log rank test were used for comparison of survival in subgroups. A *P* value of less than 0.05 was regarded as significant. The data were analyzed using the SPSS software.

RESULTS

A total of 80 catheters were inserted into 69 CAPD patients. The mean age of the patients was 48.35 years (16 to 79 years) with males constituting 65% of patients (52 men, 28 women).

The PD was selected because of contraindication for hemodialysis due to cardiac problems in 26 cases (38.3%), cardiac problems and diabetes mellitus (DM) in 16 cases (23.4%) and the inability to find a venous access in 11 cases (16.2%). The PD was performed in 15 cases (22.1%) for patients' preference. The history of hemodialysis was positive in 37 cases (58.7%) and negative in 26 cases (41.3%). In the negative group, in 16 patients PD was the first option due to the basic cardiac problems and in 10 patients, PD was opted for by the patients. A history of peritonitis was positive in 50 cases and negative in 14 cases. The number of peritonitis was 1-2 times in 32 cases and 3-10 times in 18 cases.

The overall survival of the catheters or the probability of having a functioning catheter was 53%, 41% and 22% after one, two and three years respectively. The median survival was 448 days. The event free survival of the catheter or the probability of having a functioning catheter without any problems after one year was 14%. The probability of having a functioning catheter without peritonitis in one year was 15% and in the first 4 months, 50% of the cases experienced peritonitis.

Based on the results of this study (Tables 1 and 2) age and sex had no effect on the overall and the event free survival. In surgical methods, the laparoscopy technique in comparison to the open technique was better in one-year overall survival (87% vs. 48%) and the event free survival (23% vs. 13%) but it was not statistically significant. In the overall and event free survivals there was not any

difference between the three surgeons (P value 0.45 and 0.65, respectively). The overall survival in the patients who preferred PD to hemodialysis was better than the other groups, but the event free survival in the patients who preferred PD to hemodialysis was worse than the other groups. The overall survival in the patients who had a negative history of hemodialysis was better than those who had a positive history of hemodialysis, and it was statistically significant (P value 0.04). The event free survival in these two groups was not statistically significant (P value 0.86). The peritonitis factors, *i.e.* history and number, did not have any statistically significant effect on the overall survival.

DISCUSSION

The key to a successful chronic PD is the permanent and safe catheter with low complications. It is recommended that the catheter survival of > 80% at 1 year is a reasonable goal. Achieving this goal is multifactorial and many medical and non-medical factors can affect it.

In this study, the effect of some surgical and nephrologic factors on the survival of the catheters has been evaluated. It is shown, in this study, that the overall survival of CAPD catheters, in our center (1 year 53%, 2 years 41%, 3 years 22%) is lower than that in the other centers (4-7), and there are more

Table 1. The correlation between the overall survival of catheters and related factors

Variables	Overall survival		P Value
	Median (days)	1 year	
Sex			
Female	362	49%	0.96
Male	607	56%	
Age (year)			
< 30	448	53%	0.59
30-60	418	52%	
> 60	608	52%	
Surgical Methods			
Open	362	48%	0.32
Laparoscopy	448	87%	
Surgeons			
A	295	42%	0.45
B	607	61%	
C	338	48%	
Causes of PD Selection			
Cardiac	295	49%	0.9
Cardiac and DM	784	54%	
No access	448	54%	
Patient preference	608	71%	
History of hemodialysis			
Positive	338	46%	0.04
Negative	986	74%	
History of peritonitis			
Positive	784	66%	0.39
Negative	469	72%	
Number of peritonitis			
1-2 times	607	63%	0.69
3-4 times	784	71%	

Abbreviations: PD, peritoneal dialysis; DM, diabetes mellitus.

Table 2. The correlation between the overall survival of catheters and related factors

Variables	Event free survival		P Value
	Median	1 year	
Sex			
Female	66	10%	0.31
Male	70	16%	
Age (year)			
< 30	50	18%	0.89
30-60	70	13%	
> 60	99	11%	
Surgical Methods			
Open	66	13%	0.8
Laparoscopy	66	23%	
Surgeons			
A	79	12%	0.65
B	46	13%	
C	66	13%	
Causes of PD Selection			
Cardiac	79	23%	0.28
Cardiac and DM	100	12%	
No access	46	18%	
Patient preference	46	1%	
History of hemodialysis			
Positive	22	11%	0.86
Negative	92	19%	

Abbreviation: PD, peritoneal dialysis; DM, diabetes mellitus.

episodes of peritonitis and surgical complications in comparison with the other centers (4, 5, 7-9). In all centers with better survival, there was more catheter insertion in a month. While the number of catheters inserted in other centers ranged from 1.2-5.7 (4, 6, 8, 10), only 0.95 number of catheters were inserted in a month in our center.

One of the most important causes of the minimal extension of PD in Iran is an access to hemodialysis for all the patients throughout the country. Kidney transplantation in Iran is also common due to fine surgical techniques with a reasonable cost and the relative frequency of the living kidney donors. Thus patients' willingness for transplantation and hemodialysis is better than peritoneal dialysis, but due to the increasing incidence of ESRD patients, the modality of CAPD should be considered more commonly. A rise in the number of CAPD patients can increase public awareness about it and improve the medical, surgical and nursing management of

this method and indirectly decrease the complications and increase the survival of catheters.

In this study it is shown that in the catheter survival there is no statistical difference between the surgeons. It is due to the same surgical experience in CAPD catheterization. It is thought that if the CAPD catheters are inserted by an experienced team of surgery, the complications will be decreased and the catheter survival will be increased. Almost 60% of the patients had a positive history of hemodialysis, and in the majority of those who had a negative history of hemodialysis, the basic cardiac problems were the reasons for the primary selection of PD (61.6% vs. 38.4%), meaning thereby that PD was not selected by the patients. It has been found that the overall survival in patients with a negative history of hemodialysis was better than the patients with a positive history of hemodialysis. Thus, it is suggested that the patients must be selected for PD with a positive selection instead of the negative one.

The event free survival in one year was only 14% and others had, at least, one complication in the first year. It is believed that for increasing patients' willingness to opt for PD, this figure must be decreased. A prospective study with more patients can accurately determine the effect of history and the number of episodes of peritonitis on the survival of the CAPD catheters. The surgical method at the end of the study changed from the open to the laparoscopic one. Although the overall survival is better in the laparoscopic group, it is not statistically significant possibly because of the small number of patients. With an increase of the patients in the laparoscopic group, the positive effect of laparoscopy on the catheter survival may be considered.

In conclusion, this study showed that the overall survival of catheters is better when CAPD is started before any other attempts for hemodialysis. We assume that although the difference between overall and event free survivals was not statistically significant between different surgeons, a specially trained surgical team is an important factor for achieving catheter survival of > 80% in one year.

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Conflict of interests

We have no conflict of interests.

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