가

					. - .		-	 -			-		-	-		-	-		-		-	1
l.			· 				-	 -	-		-			-		-	-				-	4
П.							_	 	-		. -			-		-	-				-	7
1.			· 	. - -			-	 -	<u>-</u> .		-			-		-	-				-	7
2.							-	 -	-		-			-		-	-				-	7
	가.					•		 	-	- .		-					-	-		-		7
								-	-					-		-	-				-	8
						•		 	-			-		-		-	-	<u>-</u> .			-	8
				-				 	-			-		. -		-	-	-			-	9
								 -		. -	-		-	-		-	-		-		-	9
III.		-		. - -			-	 -	-		-			-		-	-	<u>-</u> .		-	1	0
1.										-	-		_	-		-	-		-	-	1	0
2.															-	-	-			-	1	2
3.																				-	1	4
4.												_		-		-	-			-	1	8
5.																						
							-	 -	-		-			-		-	-			-	1	8
6.																						
							-	 	-		_			-		_	_			-	2	0

IV.	22
V.	29
	32
	36

1.	_
	12
2.	14
3.	:60
	15
4.	:60
	15
5.	
	odds ratio 16
6.	17
7.	18
8.	21
9.	21

1.		11
2.		13
3.		
		19
4.		
	Cox	19
5.		20

가 가 1986 1995 10 229 59.3±8.9 가 1. 47.9±7.9 57.0±9.5 가 가 blood urea nitrogen (BUN) 가 91.1±32.9mg/dl 87.7±22.9mg/dl 71.3±26.4mg/dl 가 2. 가 70.3%, 77.4%, 68.0%가 가 24.4%

1

12%

8%

```
가
                                    가
 3.
                          . 1
                   76.3%, 77.8%, 92.3%
                                 28.8%, 19.8%, 72.0%
                                                , BUN
                                  가
                                              (
       odds ratio
                                                    60
     0.34,
               60
                          0.70)
        odds ratio
                                                    (
         1.19,
                          0.95,
60
                  60
                                      60
                                               0.78,
        0.97).
60
4.
                    (p<0.05)
          가
                  (p=0.059). 5
87.9%,
                     60.4%,
                                          74.6% .
                              가
 5.
                           (35.0%)
                   (
                                         57.1%).
                            41.0%,
                                         (30.0%)
                                         (
                                                  38.5%,
     42.8%).
 6.
Cox
                                    , BUN,
                              , 60
                            0.381, 1.017, 1.020, 2.376,
               odds
                     ratio
3.788
 7.
                                  가
```

< >

•

2 30 - 40% 20 - 30%

가 2000 the United States Renal Data System(USRDS) EDTA(European dialysis and transplantation association)registry

> 가 1991 13.2% 1997 34% 가

<u>.</u>

5 - 8

,

9,10

1980 cyclosporin

.¹¹ Nelson 가

12 Serkes 가 ¹³ Gentil

가 .¹⁴ Held 1725 2411

1

(83.3% vs. 85.4%) 2 54%, 64.6% 가 .¹⁵

가 . (technique survival) Serkes

(relative risk)가 4.66 $(\text{p<0.01})^{13}$ Gentil

.¹⁴ Lee 3 가 .¹⁶ 가

II.

1.

1986 1 1995 12

1 1 1

,

(censored data) .

. 75 , 128 ,

26

·

2.

가. (clinical characteristics)

, ,

), , blood urea nitrogen(BUN), (glycated hemoglobin) (patient cumulative survival) 가 가 (technique survival) 가 가

(censored date)

(morbidity)

2001 8

(statistical analysis)

package version 10.0 analysis of variance (ANOVA)

Kaplan

SPSS

- Meier method

Cox p 0.05

•

1.

1986 1995 10 229

59.3±8.9 가 57.0±9.5

47.9±7.9

(p=0.01). BUN

가 (p=0.02).

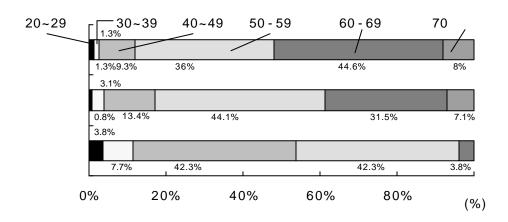
1

<u> </u>				
				p ³
(n)	75	128	26	
(/)	51/24 (68%/32%)	79/49 (60.9%/39.1%)	18/8 (69.2%/30.8%)	NS
()	59.3 ± 8.9	57.0 ± 9.5	47.9 ± 7.9	0.01
(cm)	163.0 ± 8.2	162.9 ± 8.1	164.5 ± 7.3	NS
(kg)	59.8 ± 9.7	58.9 ± 9.1	60.5 ± 7.9	NS
BUN(mg/dl)	87.7 ± 22.9	91.1 ± 32.9	71.3 ± 26.4	0.02
(mg/dl)	9.3 ± 3.2	10.1 ± 3.9	10.6 ± 2.9	NS
(ml/min/1.73m²)	7.6 ± 2.8	7.4 ± 3.3	7.3 ± 1.5	NS
(g/dl)	7.8 ± 1.5	7.5 ± 1.4	8.4 ± 1.9	NS
(g/dl)	3.2 ± 0.8	3.07 ± 0.5	3.4 ± 0.7	NS
() ²	15.7 ± 6.9	14.5 ± 5.9	15.7 ± 4.6	NS
(%)	7.6 ± 2.8	7.6 ± 3.2	7.3 ± 3.3	NS

¹ Creatinine	clearance	24	
creatinine			
2			

.

³ANOVA .



2.

,

(p=0.02).

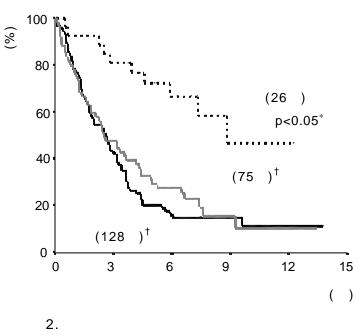
		(75)	(128)	(26)	p ⁷
1		52(70.3%)	96(77.4%)	8(68%)	NS
	2	9(12%)	30(24.4%)	2(8%)	0.03
	3	8(10.8%)	7(5.7%)	0	NS
(B	C)	4(5.4%)	3(2.4%)	2(8%)	NS
4		3(4.1%)	5(4.2%)	0	NS
5		3(4.1%)	1(0.8%)	0	NS
6		1(1.4%)	1(0.8%)	0	NS

1

140mmHg,

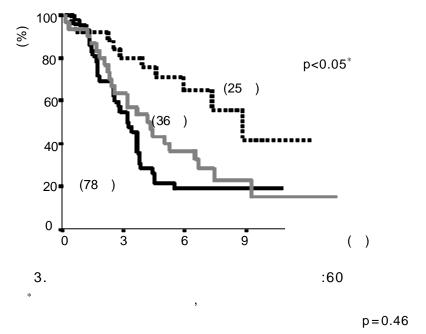
7 (p<0.05). (p=0.44) (
2). 1 76.3%, 77.8%, 92.3% 5 72%, 28.8%,

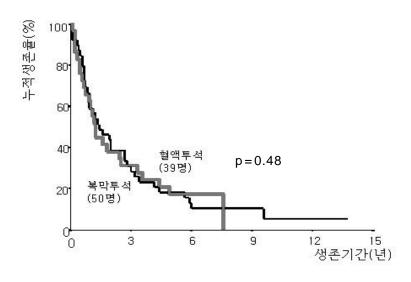
19.8% .



* (,

† p=0.44

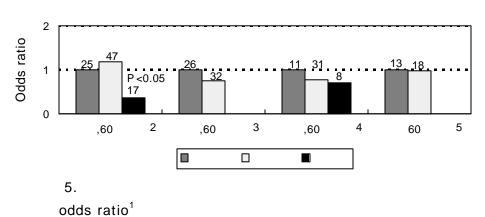




4. :60

60

60 가 (p<0.05).



(, BUN, .)

 2 Odds ratio = 1.19(NS) 0.34(p<0.05)

 3 Odds ratio = 0.95(NS)

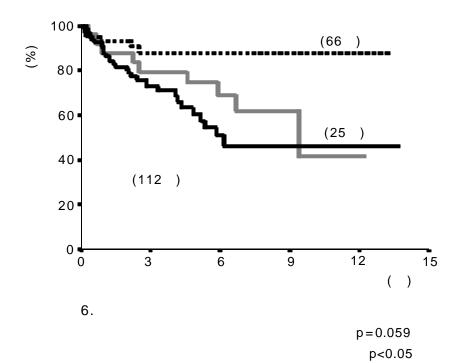
 4 Odds ratio = 0.78(NS) 0.70(NS)

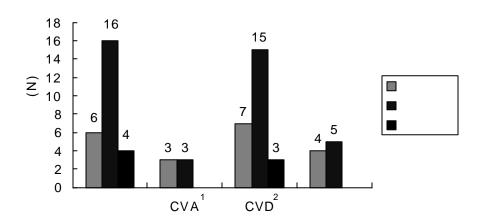
 5 Odds ratio = 0.97(NS)

NS 가 .

60 odds ratio 가 1.19

odds ratio .





7.

1 2

가 (41.0%, 57.1%)

(35.0%). (30.0%) (38.5%, 42.8%).

5.

Cox (univariate analysis)

3 . BUN, 60 , , ,

Cox 4 .

Cox , BUN,

, 60

3.

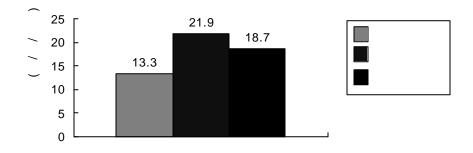
<u> </u>				
		Odds ratio	95%	р
		1.073	0.745 - 1.546	NS
		1.062	1.039 - 1.085	0.001
BUN		1.007	1.000 - 1.014	0.005
		0.936	0.875 - 1.001	NS
		0.557	0.875 - 1.001	0.001
		0.958	0.861 - 1.067	NS
		1.012	0.958 - 1.079	NS
		0.995	0.988 - 1.002	NS
		1.056	0.678 - 1.046	NS
		1.325	0.909 - 1.930	NS
		0.604	0.265 - 1.376	NS
		1.769	0.561 - 5.571	NS
		2.442	1.592 - 3.747	0.002
		1.857	0.998 - 3.457	0.049
		4.867	1.777 - 20.122	0.015
(60)	2.170	1.530 - 3.077	0.001
		1.014	1.010 - 1.018	0.002

4. Cox

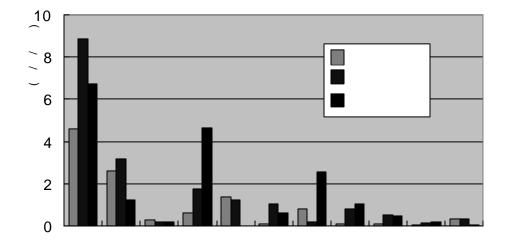
		Odds ratio	95%	р
		0.381	0.248 - 0.585	0.002
BUN		1.017	1.007 - 1.026	0.045
		1.020	1.014 - 1.026	0.001
		2.376	1.324 - 4.264	0.020
(60)	3.788	2.354 - 6.094	0.001

5.

```
7.20±18.35
                                   2.75±11.60
        2
                                    1.68±7.44
                                    1.12±7.93
            3
                                    0.68±4.06
                                    0.64±3.46
                                    0.45±3.55
                                    0.34±2.26
                                    0.29±1.52
                                    0.12±0.76
1
                                    ( / / )
                            \pm
2
3
     (delirium),
5
                        ( / / )
                      가
       13.3±33.2
                      가
                                                   18.0 \pm 21.9
                                                 (8).
                        21.9 ± 36.2
                                       가
```



가 . . (, ,)



9.

IV.

가 .^{12,15}

.17 .

가 .

. , 가 가 . ,

, 가 가 가 가 가

.^{19,20,21}

```
가
      1980
                                            가
            . Marcelli
     5
                28%
                .10 Serkes
          가
                               1990
                               .13
     1990
                                       . 1994 Held
   USRDS
                                      50
                        50
                                               가
   (1.34 vs. 1.11)
                                          가
                     가
                                              1999
Vonesh
         USRDS
              가
                            가
            1.38
                    가
                           가
                                          50
                     (0.84<
                                  <0.89).
(1.18<
              <1.19).
               Canadian registry
                                            Khanna
```

65 가 0.85 USRDS 가 Vonesh

60 .

. 가

(5 28.8% vs. 19.8%). 5 72%

.

1987 2 37% フト²⁶ 1999 4 40% フト¹¹

60 60 5 40.0%, 21.0%

. 5 70% . 60 60 5

17.2% 17.9% 가 . Khanna Canadian registry

65 60

가

가 odds ratio
(BUN, , 60 ,
) odds ratio
odds ratio
odds ratio
7
7
7
7
60 60
odds ratio

Khanna 가

가 . Vonesh 50 50

Collins 가

.²⁷ 60 (4).

AGE가 가

가 가 가 28,29 AGE가 (permeability) 가 .30 가 AGE 가 가 12.0%, 8.0% 24.4% , BUN, (60) Cox 60 60 3.78 가 가

AGE가

2.38 . 0.38 가 1g/dl 가 62% .

BUN 가 1mg/dl 가 1.7% 가

가 . BUN , , 가 가

() 가 .

1 가 2% 가 가

·

가 .

가 , ,

,

가 가 가 . (/ /) 기가 18±21.9 21.9±36.2 가 Serkes 1990

, 가 ,

•

가 ·

가

가 (cardiac arrest) 가

가 가 .

가

가 , ,

•

V.

	1986	1995			
	10			75	
	12	8			26
				71	
				가	
1.					59.3±8.9
가			57.0±9.5		
			47.9±7.9	가	
	,		, ,		,
,		DUN		7	가
		BUN 91.1 + 31	2.9mg/dl	フ 가	Γ
	71.3 ± 26	6.4mg/dl `			
2.		3	•		가
		,	,		70.3%,
77.4%,	68.0%가		•		
		가			24.4%
12.0%	8.0%				
,	0.0 /6		가	,	, ,
3.			•		
			가		
				. 1	
	, <i>E</i>	,		76.3%, 77	7.8%, 92.3%
	19.8%	72 0%	, 60		

```
가
                      가
                                    , BUN
         odds ratio
                                        odds ratio가 가
                                   60
 (odds ratio=1.19)
 odds ratio
4.
                               (p<0.05)
                                 (p=0.059). 5
                       가
                  87.9%,
                                           60.4%,
         74.6%
                                   가
5.
                                    Cox
                , BUN,
         , 60
                                                     odds
       0.381, 1.017, 1.020, 2.376, 3.788
 ratio
6.
                                   가
                                            ( / /
                                                     )
        21.9 \pm 36.2
                      13.3±33.2
 18.0 ± 21.9
                                                 가 가
               , BUN, 60
```

,

가 , ,

.

- 1. Epstein M, Sowers JR. Diabetes mellitus and hypertension. Hypertension 1992;19:403 18.
- 2. US Renal Data System: the USRDS 2000 Annual DATA Report: Atlas of End Stage Renal Disease in the United States. Am J Kidney Dis 2000; 36 suppl 2:S1 S239.
- 3. EDTA Registry Report. Figures from Annual Report on Management of Renal Failure in Europe, XXIV, Vienna 1993.
- 4. : 1999; 18:1 - 15.
- 5. Degoulet P, Legrain M, Reach I, Aime F, Devries C, Rojasp et al. Mortality risk factors in patients treated by chronic hemodialysis. Report of the Diaphane collaborative study. Nephron 1982; 31:103-10.
- 6. Bradley JR, Evans DB, Calne RY. Long-term survival in haemodialysis patients. Lancet 1987;1: 295 96.
- 7. Held PJ, Brunner F, Odaka M, Garcia JR, Port FK, Gaylin DS. Five year survival for end stage renal disease patients in the United States, Europe, and Japan, 1982 to 1987. Am J Kidney Dis 1990;15:451 57.
- 8. Rychlik I, Miltenberger Miltenyi G, Ritz E. The drama of the continuous increase in end stage renal failure in patients with type II diabetes mellitus. Nephrol Dial Transplant 1998;13 Suppl 8: 6 10.
- 9. Marcelli D, Spotti D, Conte F, Limido A, Lonati F, Malberti F et al. Prognosis of diabetic patients on dialysis: analysis of Lombardy Registry data. Nephrol Dial Transplant 1995; 10:1895 1900.
- 10. Koch M, Kutkuhn B, Grabensee B, Ritz E. Apolipoprotein A, fibrinogen, age and history of stroke are predictors of death in dialysed diabetic patients: a prospective study in 412 subjects.

- Nephrol Dial Transplant 1997;12: 2603 11.
- 11. Ekberg H, Christensson A. Similar treatment success rate after renal transplantation in diabetic and nondiabetic patients due to improved short and long term diabetic patient survival. Transpl Int 1996;9:557 64.
- 12. Nelson CB, Port FK, Wolfe RA, Guire KE. Comparison of continuous ambulatory peritoneal dialysis and hemodialysis patient survival with evaluation of trends during the 1980s. J Am Soc Nephrol 1992;3:1147-55.
- 13. Serkes KD, Blagg CR, Nolph KD, Vonesh EF, Shapiro F. Comparison of patient and technique survival in continuous ambulatory peritoneal dialysis (CAPD) and hemodialysis: A Multicenter study. Perit Dial Int 1990;10:15 9.
- 14. Gentil MA, Carriazo A, Pavon MI, Rosado M, Castillo D, Ramos B et al. Comparison of survival in continuous ambulatory peritoneal dialysis and hospital haemodialysis: A multicentric study. Nephrol Dial Transplant 1991;6:444 51.
- 15. Held PJ, Port FK, Turenne MN, Gaylin DS, Hamburger RJ, Wolfe RA. Continuous ambulatory peritoneal dialysis and hemodialysis: Comparison of patient mortality with adjustment for comorbid conditions. Kidney Int 1994;45:1163 9.
- 16. Lee HB, Song KI, Kim JH, Cha MK, Park MS. Dialysis in patients with diabetic nephropathy: CAPD versus Hemodialysis. Perit Dial Int 1996;16 Suppl 1:S269 74.
- 17. Van Biesen W, Vanholder RC, Veys N, Dhondt A, Lameire NH. An evaluation of an integrative care approach for end stage renal disease patients. J Am Soc Nephrol 2000;11:116 25.
- 18. Friedman EA. Dialytic Therapy for the Diabetic ESRD Patient; Comprehensive Care Essentials. Semin Dial 1997;10:193 202.
- 19. Amair P, Khanna R, Leibel B, Pierratos A, Vas S, Meema E et al. Continuous ambulatory peritoneal dialysis in diabetic with end stage renal disease. N Engl J Med 1982;306:625 30.

- 20. Scarpioni L, Ballocchi S, Scarpioni R, Cristinelli L. Peritoneal dialysis in diabetics. Optimal insulin therapy on CAPD: Intraperitoneal versus subcutaneous treatment. Perit Dial Int 1996;16 Suppl 1:S275 8.
- 22. O'Donoghue D, Manos J, Pearson R, Scott P, Bakran A, Johnson PD et al. Continuous ambulatory peritoneal dialysis and renal transplantation; A ten year experience in a single center. Perit Dial Int 1992;12:245 9.
- 23. Wolfe RA, Port FK, Hawthorne VM, Guire KE. A comparison of survival among dialytic therapies of choice: In center hemodialysis versus continuous ambulatory peritoneal dialysis at home. Am J Kidney Dis 1990;15:433 40.
- 24. Vonesh EF, Morgan J. Mortality in end-stage renal disease: A reassessment of differences between patients treated with hemodialysis and peritoneal dialysis. J Am Soc Nephrol 1999;10;354-65.
- 25. Khanna R, Oreopoulos DG. Peritoneal dialysis for diabetics with failed kidneys: Long term survival and rehabilitation. Semin Dial 1997;10:209 14.
- 27. Collins AJ, Hao W, Xia H, Ebben JP, Everson SE, Constantini EG et al. Mortality risks of peritoneal dialysis and hemodialysis. Am J Kid Dis 1999;34:1065 74.
- 28. Bucala R, Vlassara H. Advanced glycosylation end products in diabetic renal and vascular disease. Am J Kid Dis 1995;26:875 88.
- 29. Friedman EA. Management choices in diabetic end stage renal disease. Nephrol Dial Transplant 1995;10 Suppl 7:61 9.
- 30. Jörres A, Bender TO, Witowski J. Glucose degradation products

and the peritoneal mesothelium. Perit Dial Int 2000;Suppl 5:S19 - S22.

31. Passadakis P, Thodis E, Vargemezis V, Oreopoulos D. Long - term survival with peritoneal dialysis in ESRD due to diabetes. Clin Nephrol 2001;56:257 - 70.

Abstract

Comparative Study of Renal Replacement Therapy in Diabetic End Stage Renal Disease Patients

Sang Cheol Lee

Department of Medicine
The Graduate School, Yonsei University

(Directed by Professor Ho Yung Lee)

Diabetic nephropathy is the leading cause of end-stage renal disease world wide and develops in 30 - 40% of type I DM patients and in 20 - 30% of type II DM. The number of diabetic end stage renal disease(ESRD) patients has been increasing and death rates of diabetic patients on hemodialysis(HD), continuous ambulatory peritoneal dialysis (CAPD) and kidney transplantation have been remained still higher than death rate of nondiabetic ESRD patients on these renal replacement therapy. However, the outcome in elderly diabetic patients has not been specifically addressed and the optimal modality of treatment in this group is still disputed. Thus we tried to compare retrospectively the clinical characteristics, patients cumulative survival, and technique survival among three groups according to the mode of renal replacement therapy, and analyze the risk factors of mortality.

A total of 229 diabetic patients with end stage renal disease diagnosed between January 1986 and December 1995 at Severance Hospital who started dialysis or underwent kidney transplantation were included. The clinical characteristics such as age, sex, duration of diabetes mellitus, serum albumin, blood urea nitrogen, hemoglobin, glycated hemoglobin, creatinine clearance, and morbidity were retrieved from medical charts.

- 1. The mean age at the initiation of renal replacement therapy was 59.3± 8.9 years in the HD group and 57.0±9.5 years in the CAPD group. In the kidney transplantation group, the mean age was 47.9 ±7.9 years. It was lower than two other groups because kidney transplantation was not actively recommended to patients older than 60 years. There were no differences with respect to other clinical characteristics among groups.
- 2. Hypertension affected 70.3% in the HD patient group, 77.4% in the CAPD patient group, and 68.0% in the renal transplantation patient group at the initiation of renal replacement therapy. There was marked difference among three groups in the presence of cardiovascular disease and its frequency was the highest in CAPD group(24.4%) and lowest in kidney transplantation group(8%). There were no significant differences concerning cerebrovascular disease, hepatitis, liver cirrhosis, tuberculosis, and malignancy among three groups.
- 3. In the analysis of patient cumulative survival rate, the kidney transplantation patient group had a lowest mortality rate and it was not different between the CAPD patient group and the HD patient group. The 5 year patient cumulative survival rate was 28.8% in the HD patient group, 19.8% in the CAPD patient group, and 72.0% in the kidney transplantation patient group. No differences were observed in the patient cumulative survival rate between the HD patients group and the CAPD patients group when adjusted with age.

When the history of cardiovascular disease, serum albumin, blood urea nitrogen, sex and age were adjusted using a two level categorical variable in which patients were defined as younger than 60 years of age or age 60 years and older, the patient survival rate was not different between the HD patient group and the CAPD patient group. Although the result did not reach the statistical significance, the CAPD patient group showed slightly

better odds ratio, except male patients younger than 60 years of age.

- The analysis of the technique survival rate revealed better result in the HD group, but the limitation to investigate arteriovenous fistula function disturbed the accurate analysis of technique survival.
- 5. The multiple Cox regression analysis of patient survival showed that age (<60 years of age or ≥60 years of age), serum albumin, blood urea nitrogen, mean hospital days of year, the history of cardiovascular disease at the initiation of renal replacement therapy were associated with mortality and its odds ratios were 0.381, 1.017, 1.020, 2.376, 3.788 respectively.</p>
- 6. The most common cause of hospitalization was infection in the three groups. The CAPD patient group was hospitalized for 21.9 ±36.2 days, the kidney transplantation patient groups for 18.0±21.9 days and the HD patients groups for 13.3±33.2 days. There were no statistical significant differences in hospitalization days among the three groups.

In conclusion, kidney transplantation group had the best patient cumulative survival rate. Survival between the CAPD patient group and the HD patient group was not different. Therefore, kidney transplantation in diabetic ESRD patients should not be avoided if possible. The modality of dialysis should be determined according to the individual clinical characteristic, comorbidities, environmental factors, and performance.

Key words: Diabetic ESRD, Hemodialysis, Continuous ambulatory peritoneal dialysis, Kidney transplantation, Patient cumulative survival, Technique survival