

Study of survival factors in long-term chronic hemodialysis patients for over 30 years

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OBJECTIVES

Clearance rates of β_2 -microglobulin (β_2 M) decreased in patients undergoing hemodialysis (HD). β_2 M accumulates in blood and causes the formation of amyloid fibrils. Serum amyloid A (SAA) replaced apolipoprotein A I (ApoA-I) on high-density lipoprotein (HDL) particles in HD patients. The content of inflammatory SAA increases in HDL particles. HDL particles are modified "functional HDL" to "dysfunctional HDL". Chronic HD patients usually have lower plasma HDL-cholesterol (C) levels than healthy subjects. Achievement ratio of serum lipid management goals (SLMGs) in chronic HD patients is unclear. The aim of this study is to investigate the achievement ratio of SLMGs and serum β_2 M levels in long-term chronic HD patients.

CONFLICT OF INTEREST STATEMENT: None declared.

METHODS

(1) **SUBJECT** 6334 chronic HD patients

Group	Case	HD duration (years)
Group 1	4844	10 <
Group 2	1100	10 \geq ~ 20 <
Group 3	292	20 \geq ~ 30 <
Group 4	98	30 \geq

(2) **METHODS**

We retrospectively investigated the serum total cholesterol (TC), triglyceride (TG), low-density lipoprotein (LDL)-C, HDL-C, phosphate (P), calcium (Ca), intact parathyroid hormone (intact-PTH), β_2 M microglobulin (β_2 M), high sensitive CRP, serum albumin levels in chronic HD patients.

RESULTS

Case: A 67-year-old woman presented tongue disease and chronic renal failure. She started HD three times a week due to chronic glomerulonephritis in May 1973.

She gave birth to a boy in June 1977. This is the first successful pregnancy and delivery case in Japan. Dialysis amyloidosis plus positive HCV was accompanied with hypoalbuminemia. She still can walk on her feet and live on her own. It has been reported that serum HDL-C and exercise are related.

Amyloidosis

Macroglossia: deformation, hard, taste disorder

Laboratory data

(April 3, 2017)

WBC	7600 / μ L	Ca	8.2 mg/dL
RBC	330 x10 ⁴ / μ L	P	5.2 mg/dL
Hb	10.7 g/dL	intact PTH	8 pg/mL
Ht	34.7 %	ALP	237 U/L
Plt	24.7 x10 ⁴ / μ L	CRP	0.37 mg/dL
		AST	24 U/L
		ALT	11 U/L
Glu	100 mg/dL	T-cho	170 mg/dL
		TG	45 mg/dL
TP	8.4 g/dL	HDL-C	62 mg/dL
Alb	2.9 g/dL	LDL-C	96 mg/dL
SUN	57 mg/dL	Zinc	56 μ g/dL (standard value: 65-110 μ g/dL)
Crea	7.12 mg/dL		

(March 6, 2017)

	online	HDF	pre	post
β_2 M			17.8	→ 5.2
(standard value: below 30 mg/L)				
Serum amyloid A (SAA)			120 μ g/mL	
(standard value: below 8.0 μ g/mL)				
RLP-C	4.8 mg/dL			
(standard value: below 7.5 mg/dL)				
Kt/V	1.74			
Bone specific alkaline phosphatase (BAP)	15.3 μ g/mL			
(standard value: 3.8-22.6 μ g/L)				

(January 28, 2016)

lower lip: tumor (+), pain (+)

Skin biopsy: Amyloidosis

apolipoprotein E 5.5 mg/dL
 α_2 -macroglobulin 203 mg/dL

Chest X-P: CTR=47.2%

UCG: EF 63.4%

Baseline characteristics of patients

	Group 1	Group 2	Group 3	Group 4	HD duration (years)	Group 1	Group 2	Group 3	Group 4
	10 <	10 \geq ~ 20 <	20 \geq ~ 30 <	30 \geq	case	10 <	10 \geq ~ 20 <	20 \geq ~ 30 <	30 \geq
Case	4844	1100	292	98	4844	1100	292	98	98
Sex:					β_2 M (mg/L)	26.0 \pm 6.7	30.3 \pm 4.9	28.6 \pm 5.0	24.8 \pm 6.3
male	3384 (69.9%)	778 (70.7%)	169 (57.9%)	43 (43.9%)	under 30 mg/L	2797 (57.7%)	661 (60.1%)	212 (72.6%)	80 (81.6%) **
female	1460 (30.1%)	322 (29.3%)	123 (42.1%)	55 (56.1%)	CRP (mg/dL)	0.5 \pm 1.2	0.5 \pm 1.1	0.4 \pm 1.1	1.1 \pm 2.6
mean age (years)	67.3 \pm 12.8	64.4 \pm 12.5	63.7 \pm 10.9	65.2 \pm 6.1	albumin (g/dL)	3.7 \pm 0.4	3.7 \pm 0.4	3.7 \pm 0.4	3.6 \pm 0.4
mean age at HD start (years)	63.6 \pm 13.0	50.5 \pm 12.9	40.8 \pm 10.8	32.2 \pm 8.9		** P < 0.01 for the comparison with the Group 1, Group 2			
	(15 ~ 94)	(19 ~ 82)	(17 ~ 68)	(7 ~ 54)					

Serum β_2 M, high sensitive CRP, albumin levels

Primary disease of chronic HD patients

Case	Group1	Group 2	Group3	Group4	Group1	Group2	Group3	Group 4	
	4844	1100	292	98	4844	1100	292	98	
Chronic glomerulonephritis	612 (12.6%)	371 (33.7%)	158 (54.1%)	71 (72.4%)	LDL-C				
IgA nephropathy	179 (3.7%)	107 (9.7%)	25 (8.6%)	1	under 120 mg/dL	4344 (89.7%)	952 (86.5%)	236 (80.8%)	
Membranous nephropathy	42	5	2	0	under 100 mg/dL	3601 (74.3%)	755 (68.6%)	189 (64.7%)	
RPGN	51 (1.1%)	7	2	0	HDL-C				
Toxemia of pregnancy	14	9 (0.8%)	8 (2.7%)	9 (9.2%)	more than 40 mg/dL	3427 (70.7%)	872 (79.3%)	243 (83.2%)	
Unknown	703 (14.5%)	140 (12.7%)	34 (11.6%)	9 (9.2%)	TG				
Nephrosclerosis	658 (13.6%)	62 (5.6%)	12 (4.1%)	2	under 150 mg/dL	3638 (75.1%)	896 (81.5%)	239 (81.8%)	
Malignant hypertension	31	11 (1.0%)	0	0	non HDL-C				
Chronic pyelonephritis	21	17 (1.5%)	13 (4.5%)	2	under 150 mg/dL	4403 (90.9%)	984 (89.5%)	253 (86.6%)	
Lupus nephritis	17	8	2	1	under 130 mg/dL	3863 (79.7%)	965 (87.7%)	223 (76.4%)	
Hereditary nephritis	2	0	4	1		** P = 0.002 for the comparison with the group 1			
Polycystic kidney disease	210 (4.3%)	77 (7.0%)	19 (6.5%)	1		* P = 0.015 for the comparison with the group 2			
Renal hypoplasia	5	7	3	1					
Diabetic nephropathy	2230 (46.0%)	263 (23.9)	9 (3.1%)	0					
Renal cancer	14	6	1	0					
Gouty kidney	14	5	0	0					
Obstructive uropathy	33	5	0	0					
Amyloid nephropathy	8	0	0	0					

RPGN: rapidly progressive glomerulonephritis

Serum lipid levels

Case	Group1	Group2	Group3	Group4	Case	Group1	Group2	Group3	Group4
	4844	1100	292	98		4844	1100	292	98
TC (mg/dL)	155.1 \pm 33.7	160.4 \pm 35.9	165.9 \pm 35.3	163.7 \pm 35	P	5.2 \pm 1.4	5.4 \pm 1.3	5.3 \pm 1.3	5.2 \pm 1.2
LDL-C (mg/dL)	84.8 \pm 27.9	87.9 \pm 29.7	91.6 \pm 30.7	89.2 \pm 28.3	3.5 ~ 6.0 mg/dL	3292 (68.0%)	725 (65.9%)	207 (70.9%)	73 (74.5%)
HDL-C (mg/dL)	50.1 \pm 17.0	53.7 \pm 17.3	56.2 \pm 17.3	58.1 \pm 14.6	Ca	8.8 \pm 0.7	9.0 \pm 0.8	8.9 \pm 0.8	9.0 \pm 0.9
non HDL-C (mg/dL)	103.2 \pm 34.7	106.8 \pm 34.4	108.5 \pm 35.2	105.6 \pm 33.1	8.4 ~ 10.0 mg/dL	3308 (68.3%)	821 (74.6%)	217 (74.3%)	70 (71.4%)
LDL-C / HDL-C	1.8 \pm 0.9	1.8 \pm 0.8	1.7 \pm 0.8	1.6 \pm 0.7	intact-PTH	193.3 \pm 163.2	234.0 \pm 276.0	220.8 \pm 268.3	168.5 \pm 211.8
TG (mg/dL)	121.8 \pm 85.6	110.5 \pm 68.8	108.9 \pm 57.7	102.2 \pm 50.4	60 ~ 240 pg/mL	2776 (57.3%)	605 (55.0%)	162 (55.5%)	56 (57.1%)

P, Ca, intact-PTH levels

CONCLUSIONS

Achievement ratio of HDL-C and β_2 M in long-term chronic HD patients was high. HDL-C and β_2 M may be survival factors in long-term chronic HD patients.