Carnitine administration prevents the progress of arteriosclerosis by reducing advanced glycation end products in non-diabetic maintenance hemodialysis patients

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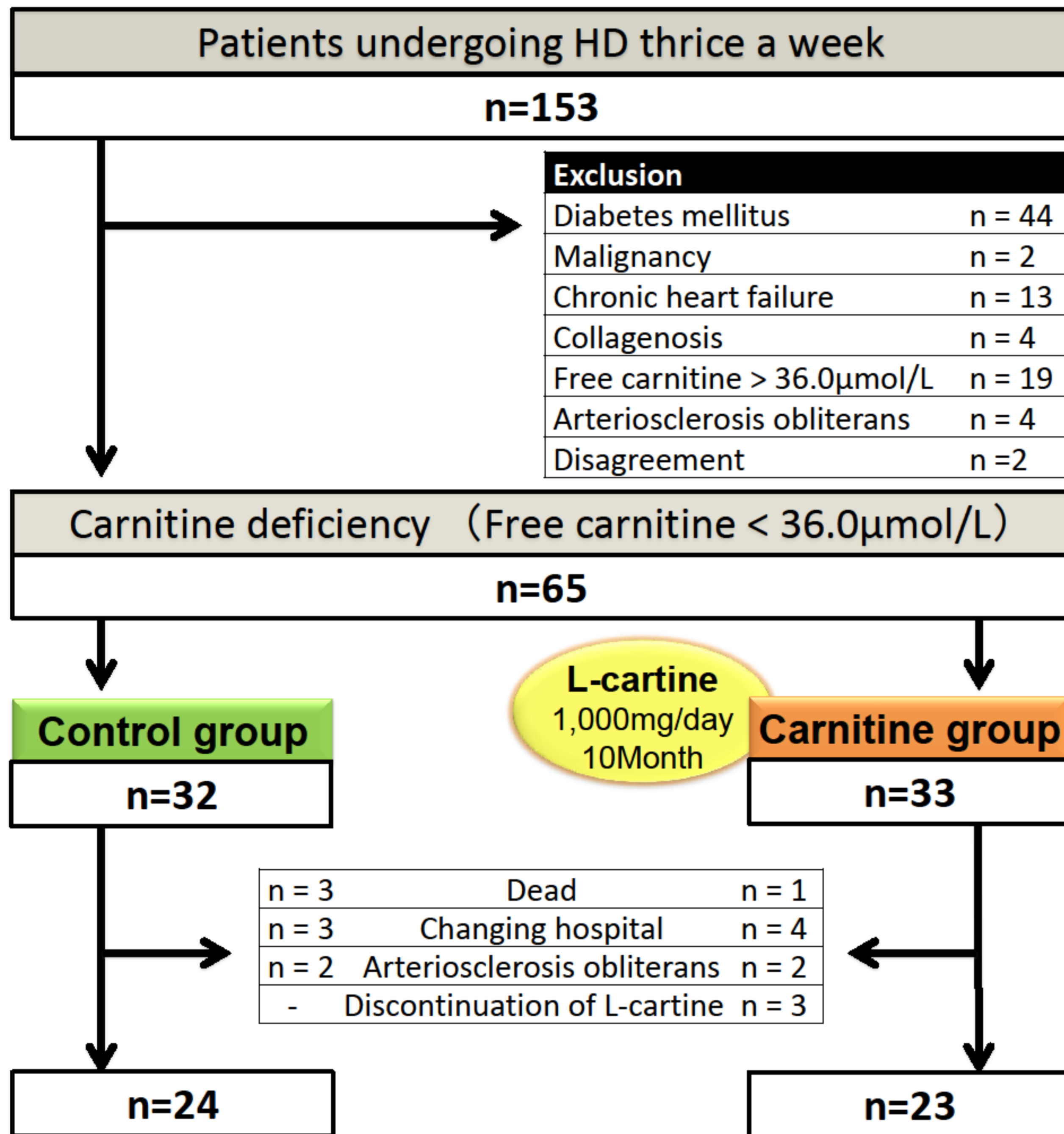
INTRODUCTION

Hyperglycemia and aggravated oxidative stress are well known to promote the production of advanced glycation end products (AGEs), which can lead to cardiovascular disease in patients with maintenance hemodialysis (HD). Carnitine, substantially reduced in HD patients, is reported to improve insulin resistance and reduce oxidative stress. We hypothesized that carnitine administration prevented the progress of arteriosclerosis effectively by reducing AGEs in HD patients.

PURPOSE

The aim of this study was to investigate the effects of carnitine administration on AGEs and arteriosclerosis in HD patients.

METHODS

■ Patients

Patients undergoing HD thrice a week
n=153

Exclusion	
Diabetes mellitus	n = 44
Malignancy	n = 2
Chronic heart failure	n = 13
Collagenosis	n = 4
Free carnitine > 36.0μmol/L	n = 19
Arteriosclerosis obliterans	n = 4
Disagreement	n = 2

Carnitine deficiency （Free carnitine < 36.0μmol/L)
n=65

L-cartine 1,000mg/day 10Month

Control group	Carnitine group
n=32	n=33

n = 3	Dead	n = 1
n = 3	Changing hospital	n = 4
n = 2	Arteriosclerosis obliterans	n = 2
-	Discontinuation of L-cartine	n = 3

Control group	Carnitine group
n=24	n=23

■ Measurements

Characteristics	Blood examination	
Gender	Carnitine	AGEs
Age	Free carnitine	Pentosidine
Duration of HD	Glucose metabolism	Others
Body mass index	Glycated albumin	Albumin
Systolic blood pressure	Hemoglobin A1c	Calcium
Diastolic blood pressure	Lipid metabolism	Phosphate
Heart rate	Triglyceride	parathyroid hormone
Intima-media thickness	LDL cholesterol	Albumin
	HDL cholesterol	C-reactive protein

AGEs	Arteriosclerosis
AGEs accumulation in the skin (Skin AGEs)	Cardio-ankle vascular index (CAVI)
AGE-reader; DiagOptics BV, The Netherlands	BP-203RPE, Omron Colin, Japan

Fig 1 AGE-reader

■ Statistical analysis

A two-way analysis of variance for repeated measures with post hoc Bonferroni test was used to analyze the changes in Skin AGEs and CAVI among the two groups vs the two stages before and after the treatment period.

RESULTS

Table 1 Characteristics & Blood examination

		Control Group		Carnitine Group	
		baseline	after the treatment	baseline	after the treatment
Patients (male/female)	(n)	24(11/ 13)		23(7/ 16)	
Age	(years)	60 ± 9		64 ± 12	
Duration of HD	(years)	8.2 ± 7.5		9.8 ± 7.7	
Body mass index	(kg/m^2)	19.8 ± 9.2	19.8 ± 7.5	20.9 ± 2.9	20.8 ± 2.8
Systolic blood pressure	(mmHg)	139 ± 18	143 ± 18	146 ± 24	137 ± 41
Diastolic blood pressure	(mmHg)	91 ± 13	93 ± 15	88 ± 15	87 ± 12
Heart rate	(beats/min)	77 ± 11	84 ± 16	79 ± 12	80 ± 13
Hemoglobin A1c	(%)	5.2 ± 0.4	5.2 ± 0.3	5.0 ± 0.4	4.9 ± 0.4[†]
Glycated albumin	(%)	15.6 ± 2.2	15.5 ± 2.0	15.1 ± 1.7	15.2 ± 1.8
Triglyceride	(mg/dL)	110 ± 103	120 ± 150	96 ± 41	110 ± 45
LDL-Cholesterol	(mg/dL)	96 ± 17	97 ± 29	89 ± 21	86 ± 20
HDL-Cholesterol	(mg/dL)	65 ± 23	66 ± 25	60 ± 16	58 ± 17
Albumin	(g/dL)	4.0 ± 0.3	4.0 ± 0.4	3.9 ± 0.3	3.8 ± 0.3[†]
Calcium	(mg/dL)	9.1 ± 0.4	9.2 ± 0.5	9.1 ± 0.4	9.2 ± 0.4
Phosphate	(mg/dL)	8.9 ± 0.5	9.1 ± 0.4	5.5 ± 1.4	5.4 ± 1.2
Parathyroid hormone	(pg/mL)	170 ± 111	165 ± 95	164 ± 133	154 ± 121
C-reactive protein	(ng/mL)	0.20 ± 0.40	0.10 ± 0.16	0.19 ± 0.44	0.18 ± 0.50
Free carnitine	(μmol/L)	24.2 ± 5.2	26.7 ± 5.7	22.3 ± 2.8	231.5 ± 50.8*[†]
Pentsidine	(pg/mL)	10.0 ± 3.2	9.7 ± 5.1	7.2 ± 2.2	7.7 ± 2.4
Intima-media thickness	(mm)	1.5 ± 0.7	1.6 ± 0.7	1.7 ± 0.6	1.9 ± 0.8

Data are presented as mean ± SD, ＊: P<0.05 vs baseline, †: P<0.05 vs Control group.

■ Control group   ■ Carnitine group

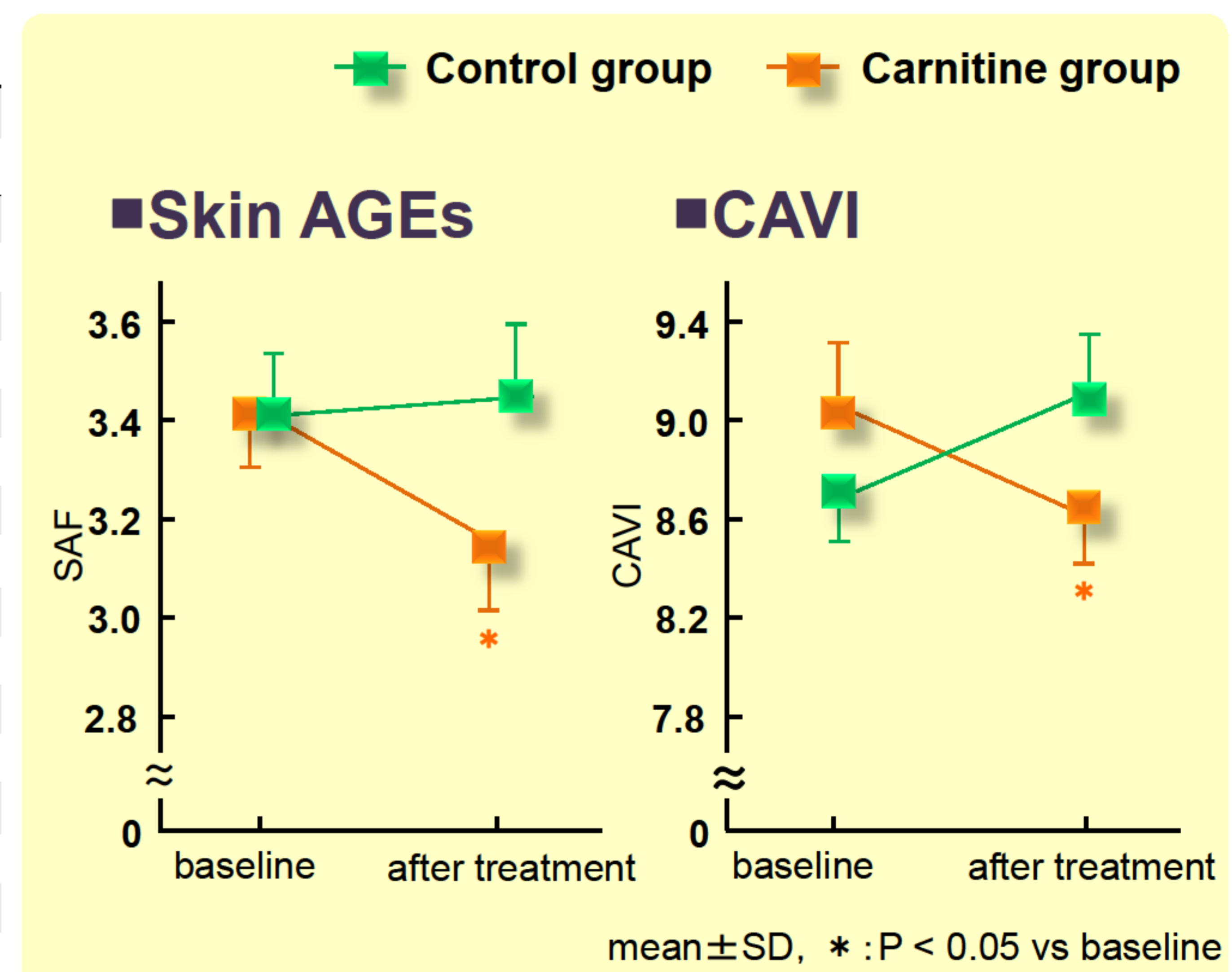■ Skin AGEs   ■ CAVI

mean±SD, ＊:P < 0.05 vs baseline

Fig 2 Changes in skin AGEs and CAVI among the two groups vs the two stages before and after the treatment period

CONCLUSION

Carnitine administration prevented the progress of arteriosclerosis by reducing AGEs in non-diabetic maintenance HD patients.