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Supplementary Table 1. Reasons for dropout from the study

1) Magnesium oxide arm	Magnesium oxide (n=63)	Control (n=60)
	1 death 2 lost to follow up 4 withdrew consent 4 transferred to other hospitals 3 diarrhea 1 coronary artery stenting 2 deteriorated ADL	2 deaths 4 withdrew consent 2 transferred to other hospitals 1 coronary artery stenting 1 deteriorated ADL
Total	17 (27%)	10 (17%)

2) AST-120 arm	AST-120 (n=70)	Control (n=53)
	2 lost to follow up 9 withdrew consent 3 transferred to other hospitals 1 deteriorated ADL	3 deaths 2 withdrew consent 3 transferred to other hospitals 2 coronary artery stenting 2 deteriorated ADL
Total	15 (21%)	12 (23%)

Abbreviations: ADL, activities of daily living

Supplementary Table 2. Baseline characteristics among patients who completed the study

	Magnesium oxide arm			AST-120 arm		
	Magnesium oxide n=46	Control n=50	P-value	AST-120 n=55	Control n=41	P-value
age, year	71 (11)	69 (11)	0.26	70 (11)	69 (13)	0.72
female, %	26	20	0.48	16	32	0.08
body mass index	23.8 (3.8)	24.4 (4.3)	0.45	23.8 (4.0)	24.6 (4.1)	0.34
diabetes mellitus, %	74	70	0.67	73	71	0.83
past history of CVD, %	48	48	0.99	49	46	0.79
past history of CHF, %	15	24	0.28	22	17	0.56
current smokers, %	11	12	0.86	15	7	0.27
systolic BP, mmHg	126 (17)	133 (20)	0.06	132 (19)	127 (18)	0.25
diastolic BP, mmHg	69 (14)	74 (11)	0.07	72 (13)	71 (11)	0.67
serum creatinine, mg/dL	1.61 (0.58)	1.67 (0.58)	0.64	1.72 (0.59)	1.52 (0.54)	0.08
eGFR, mL/min/1.73m^2	36 (13)	36 (13)	0.89	35 (13)	37 (12)	0.28
serum calcium, mg/dL	9.3 (0.4)	9.2 (0.4)	0.15	9.2 (0.4)	9.3 (0.4)	0.61
serum phosphate, mg/dL	3.5 (0.6)	3.4 (0.5)	0.64	3.4 (0.6)	3.4 (0.5)	0.85
serum magnesium, mg/dL	2.0 (0.2)	2.1 (0.3)	0.33	2.1 (0.2)	2.0 (0.3)	0.33
whole PTH, pg/mL	44 [33, 64]	47 [30, 67]	0.57	46 [27, 66]	43 [35, 64]	0.76
serum albumin, g/dL	3.9 (0.4)	4.0 (0.5)	0.29	3.9 (0.4)	4.1 (0.5)	0.20
LDL-cholesterol, mg/dL	106 (33)	100 (29)	0.36	102 (34)	104 (26)	0.72
CAC score	302 [64, 924]	166 [54, 606]	0.44	150 [64, 747]	203 [63, 903]	0.89

Data are based on the full-analysis set population.

Continuous variables are presented as mean (standard deviation) or median [p25, p75].

Abbreviations: CVD, cardiovascular disease; CHF, congestive heart failure; BP, blood pressure; eGFR, estimated glomerular filtration rate; PTH, parathyroid hormone; LDL, low-density lipoprotein; CAC, coronary artery calcification

Supplementary Table 3. Change in laboratory data in the AST-120 arm

parameter	allocation group	baseline	1 year	2 year	P-value
serum magnesium, mg/dL	Control	2.0 (0.3)	2.1 (0.3)	2.1 (0.3)	0.65
	AST-120	2.1 (0.2)	2.2 (0.3)	2.2 (0.4)	
serum calcium, mg/dL	Control	9.3 (0.4)	9.2 (0.4)	9.3 (0.4)	0.83
	AST-120	9.2 (0.4)	9.1 (0.4)	9.2 (0.5)	
serum phosphate, mg/dL	Control	3.4 (0.5)	3.4 (0.6)	3.5 (0.6)	0.62
	AST-120	3.4 (0.6)	3.6 (0.8)	3.6 (0.7)	
Fractional excretion of phosphate, %	Control	19.8 (10.3)	20.4 (10.1)	21.6 (10.2)	0.83
	AST-120	23.3 (12.2)	23.5 (12.5)	25.6 (13.7)	
plasma whole PTH, pg/mL	Control	43 [35, 64]	47 [35, 66]	46 [32, 72]	0.32
	AST-120	46 [27, 66]	43 [31, 98]	48 [29, 82]	
eGFR, mL/min/1.73m^2	Control	37.4 (12.3)	34.6 (12.4)	34.2 (13.1)	0.54
	AST-120	34.5 (13.0)	31.5 (15.1)	30.5 (15.1)	

Data are based on the full-analysis set population and presented as mean (standard deviation) or median [q1, q3].
Differences between allocation groups are tested using a repeated measured analysis of variance.
Abbreviations: PTH, parathyroid hormone; eGFR, estimated glomerular filtration rate

Supplementary Table 4. Change in laboratory data, medications, and blood pressure levels during the study period

Parameters	Allocation group	n	Baseline	End of the study	P-value
LDL-cholesterol, mg/dL	Control	50	100 (29)	95 (30)	0.82
	Magnesium oxide	46	106 (33)	100 (32)	
	Control	41	104 (26)	102 (35)	0.46
	AST-120	55	102 (34)	94 (28)	
HbA1c, %	Control	35	6.9 (1.2)	6.8 (1.0)	0.73
	Magnesium oxide	34	7.0 (0.9)	6.9 (1.0)	
	Control	29	6.9 (0.9)	6.9 (1.1)	0.91
	AST-120	40	7.0 (1.2)	6.8 (1.0)	
Hb, g/dL	Control	50	12.6 (1.6)	12.4 (1.9)	0.95
	Magnesium oxide	46	12.5 (1.7)	12.3 (2.0)	
	Control	41	12.7 (1.6)	12.7 (1.9)	0.27
	AST-120	55	12.5 (1.6)	12.2 (1.9)	
Statins, n (%)	Control	50	24 (48)	25 (50)	0.67
	Magnesium oxide	46	27 (59)	25 (54)	
	Control	41	24 (59)	23 (56)	0.50
	AST-120	55	27 (49)	27 (49)	
Anti-platelet agents, n (%)	Control	50	19 (38)	17 (34)	0.89
	Magnesium oxide	46	16 (35)	15 (33)	
	Control	41	15 (37)	15 (37)	0.56
	AST-120	55	20 (36)	17 (31)	

Systolic BP, mmHg	Control	50	133 (20)	132 (18)	0.19
	Magnesium oxide	46	126 (17)	132 (16)	
	Control	41	127 (18)	130 (17)	0.67
	AST-120	55	132 (19)	133 (18)	
Diastolic BP, mmHg	Control	50	74 (11)	75 (12)	0.65
	Magnesium oxide	46	69 (14)	72 (12)	
	Control	41	71 (11)	72 (13)	0.60
	AST-120	55	72 (13)	74 (11)	

Data are based on the full-analysis set population except for HbA1c in which only patients with diabetes mellitus were included.
Data are presented as mean (standard deviation) or number (percent).
Differences between allocation groups are tested using a repeated measured analysis of variance for continuous variables or chi-square test for categorical variables.
Abbreviations: LDL, low-density lipoprotein; Hb, hemoglobin; BP, blood pressure.

Supplementary Table 5. Change in CAC scores in the AST-120 arm

	Allocation group	n	CAC score		Percent change in CAC scores	P-value
			Baseline	End of the study		
Total	Control	41	203 [63, 903]	293 [93, 1033]	31.9 [8.0, 65.6]	0.57
	AST-120	55	150 [64, 747]	279 [85, 885]	23.1 [2.4, 60.1]	
Baseline eGFR ≥30 mL/min/1.73m^2	Control	28	151 [40, 788]	214 [44, 1032]	32.1 [13.1, 64.3]	0.90
	AST-120	32	119 [47, 288]	164 [60, 429]	25.9 [6.1, 77.0]	
Baseline eGFR<30 mL/min/1.73m^2	Control	13	547 [164, 903]	567 [293, 1033]	11.8 [0, 78.2]	0.62
	AST-120	23	582 [102, 1041]	622 [187, 1560]	11.0 [0, 40.0]	

Data are based on the full-analysis set population and presented as median [q1, q3].
Percent changes in CAC scores are compared between groups using the Wilcoxon rank-sum test.
Abbreviations: CAC, coronary artery calcification; eGFR, estimated glomerular filtration rate
The median CAC scores at baseline and at the end of the study are not necessarily from the same patient. Therefore, the percent change calculated from these 2 values does not correspond to the true median percent change in CAC scores in each study group.

Supplementary Table 6. Clinical events in the AST-120 arm

	AST-120 (n = 70)	Control (n = 53)
Deaths	0	3 (5.7%)
		Acute myocardial infarction (n=1) End-stage kidney disease (n=1) Hepatitis B virus cirrhosis (n=1)
Cardiovascular events	5 (7.1%)	3 (5.7%)
	Heart failure (n=1) Atrioventricular block (n=1) Infectious endocarditis (n=1) Cerebral infarction (n=1) Cerebral hemorrhage (n=1)	Heart failure (n=1) Percutaneous coronary intervention (n=2)
Initiation of RRT	6 (8.6%)	0
Adverse Events	2 (2.9%)	0
	Severe constipation (n=2)	-

Data are based on all randomized patients.
Abbreviations: RRT, renal replacement therapy