- 1.Hemodialysis,cardiovascular events (age, sex)

- 2.Coronary artery calcification (CAC) , atherosclerotic vascular disease,predict future adverse cardiovascular (dialysis Therapy)

- 3.The prevalence of CAC(CRF) ?

- 4.Electron-beam computed tomography , high speed spiral computed tomography (CT) , scoring calcified plaques in coronary arteries.

METHODS

- 1.Consecutive outpatients : glomerular filtration rate (GFR) unchanged for at least 12 months

- 2.Controls :(ie,healthy volunteers and patients with essential hypertension and normal renal function).

- 3.Exclusion criteria :symptoms of heart failure or coronary artery disease, previous history of myocardial infarction, coronary bypass surgery, angioplasty; stroke, diabetes, rapidly progressive renal disease, arrhythmia (that would exclude gating during spiral CT).

METHODS

- 1. CT : model CT Light Speed Plus multislice spiral scanner

- 2.The left main coronary artery, left anterior descending artery, circumflex artery,right coronary artery, and cardiac valves were scored.

- 3. A technician and radiologist

METHODS

- 1. calcium, phosphorus, intact parathyroid hormone (iPTH), homocysteine, and C-reactive protein (CRP) .

    serum calcium, phosphorus, and iPTH : Kidney Disease Outcomes Quality Initiativem (K/DOQI) guidelines.

- 2.GFR : clearance of creatinine.

- 3.calcium score categories :

    (1) up to 100,
    (2) 101 to 400,
    (3) 401 to 1,000,
    (4) 1,000 or greater.

RESULTS

Table 1. Clinical and Biochemical Characteristics of Patients With CRF and Controls

	Normal Value	Patients With CRF (n = 85)	Controls (n = 55)
Sex (% men)		87	79
Age (y)		52 ± 13	47 ± 11
Body mass index (kg/m^2)		27.2 ± 3.9	27.5 ± 3.4
Duration of CRF (y)		6.3 ± 5.6	—
GFR (mL/min)	90-120	33 ± 16	99 ± 10*
Urea (mg/dL)	18-53	97 ± 40	38 ± 6*
Glucose (mg/dL)	60-110	92 ± 7	94 ± 6
iPTH (pg/mL)	10-75	143 ± 121	35 ± 17*
Calcium (mg/dL)	8.9-10.3†	9.5 ± 0.5	9.5 ± 0.2
Phosphorus (mg/dL)	3.0-4.5†	4.1 ± 0.9	3.8 ± 0.8
Calcium-phosphorus product (mg^2/dL^2)		38.7 ± 7.7	37 ± 7.8
Total proteins (g/dL)	6.5-8.2	7.2 ± 0.7	7.3 ± 0.5
Albumin (g/dL)	3.6-5.2	4.0 ± 0.5	4.3 ± 0.3
Total cholesterol (mg/dL)	120-200	190 ± 43	190 ± 39
Triglycerides (mg/dL)	50-200	159 ± 88	125 ± 76
High-density lipoprotein cholesterol (mg/dL)	>35	46 ± 11	44 ± 11
Low-density lipoprotein cholesterol (mg/dL)	<180	120 ± 51	106 ± 33
CRP (mg/dL)	0.0-0.5	0.5 ± 0.7	0.3 ± 0.1
Homocysteine (μmol/L)	5-16	32.4 ± 14.6	5.7 ± 2*

NOTE. Values expressed as mean ± SD or percent. To convert GFR from mL/min to mL/s, multiply by 0.01667; urea from mg/dL to mmol/L, multiply by 0.357; glucose from mg/dL to mmol/L, multiply by 0.05551; iPTH from pg/mL to mg/mL, multiply by 1; calcium from mg/dL to mmol/L, multiply by 0.2495; phosphorus from mg/dL to mmol/L, multiply by 0.3229; total protein from g/dL to g/L, multiply by 10; cholesterol, high-density lipoprotein, and low-density lipoprotein cholesterol from mg/dL to mmol/L, multiply by 0.02586, triglycerides from mg/dL to mmol/L, multiply by 0.01129.

*$P < 0.05$ versus patients with CRF.

†See text for other normal values.

RESULTS

- **1. Causes of renal failure**
  chronic glomerulonephritis (46%),
  chronic interstitial nephritis (10%),
  postischemic renal failure,
  adult polycystic kidney disease,
  malformations of urinary apparatus (10%),
  unknown(34%).

- **2.K/DOQI guidelines,**
  8 patients :stage 2 (9.4%) (GFR, 60 to 89 mL/min);
  40 patients :stage 3 (47%) (GFR, 30 to 59 mL/min);
  24 patients: stage 4 (28.2%) (GFR, 15 to 29 mL/min;
  13 patients:stage 5(15.3%) (GFR 15 mL/min).

RESULTS

- 1. Spiral CT showed in 34 CAC / 85 patients with CRF (40%).

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- 2.Calcium scores
  <100 :12 patients,
  101 to 400 :12 patients,
  401 to 1,000 : 6 patients,
  > 1,000 : 4 patients.

RESULTS

Table 2. Clinical and Biochemical Characteristics of Patients With and Without CAC

	Patients With CAC (n = 34; 40%)	Patients Without CAC (n = 51)
Sex (% men)	91	87
Age (y)	59.2 ± 8.2	46.4 ± 12.2*
Body mass index (kg/m²)	26.8 ± 3.6	26.5 ± 4.0
Smokers (%)	22	24
Duration of CRF (y)	6.5 ± 5.2	6.0 ± 5.9
Systolic blood pressure (mm Hg)	134 ± 11	132 ± 13
Diastolic blood pressure (mm Hg)	81 ± 4	79 ± 13
GFR (mL/min)	33 ± 16	33 ± 17
iPTH (pg/mL)	122 ± 110	153 ± 128
Calcium (mg/dL)	9.3 ± 0.5	9.4 ± 0.5
Phosphorus (mg/dL)	3.9 ± 0.9	4.2 ± 0.8
Calcium-phosphorus product (mg²/dL²)	36.9 ± 8.3	39.8 ± 7.4
Total protein (g/dL)	7.2 ± 0.7	7.1 ± 0.7
Serum albumin (g/dL)	4.0 ± 0.5	4.1 ± 0.5
Total cholesterol (mg/dL)	189 ± 43	194 ± 45
Triglycerides (mg/dL)	180 ± 115	144 ± 60
High-density lipoprotein cholesterol (mg/dL)	46 ± 8	46 ± 13
Low-density lipoprotein cholesterol (mg/dL)	111 ± 39	125 ± 44
CRP (mg/dL)	0.7 ± 1.2	0.4 ± 0.2
Homocysteine (μmol/L)	36.7 ± 16	32.2 ± 18
Phosphate P binders (%)	27	27
Angiotensin-converting inhibitors/angiotensin II receptor antagonists (%)	51	50
Calcium channel blockers (%)	40	38
Statins	22	19
Vitamin D analogues	14	15

NOTE. Values are expressed as mean ± SD or percent. To convert GFR in mL/min to mL/s, multiply by 0.01667; urea in mg/dL to mmol/L, multiply by 0.357; glucose in mg/dL to mmol/L, multiply by 0.05551; iPTH in pg/mL to ng/L, multiply by 1; calcium in mg/dL to mmol/L, multiply by 0.2495; phosphorus in mg/dL to mmol/L, multiply by 0.3229; total protein in g/dL to g/L, multiply by 10; cholesterol in mg/dL to mmol/L, multiply by 0.02586; triglycerides in mg/dL to mmol/L, multiply by 0.01129.

*$P < 0.05$ versus patients with CRF.

RESULTS

- 1. > 50 y/o (85% of cases, CAC) ,> 1 coronary artery

  4-vessel : 21%;
  3-vessel : 48%;
  2-vessel : 15%;
  1-vessel disease:15%
  The left anterior descending artery (76%);

  2. the calcification process affected
  the right coronary artery (70%)
  left main coronary artery (67%)
  circumflex artery (64%).

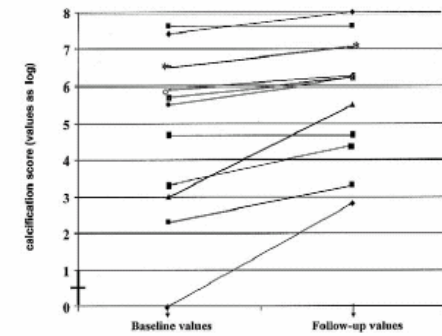- 3.Mitral valve calcification : 2 patients.

RESULTS

Fig 2. Calcification score in patients with CRF (n = 18) who underwent a repeated scan. Patients (n = 7) who remained free of calcification are not included.

- 1. Spiral CT was repeated in 18 patients (15 men,3 women; 8 patients without

  CAC, 10 patients with CAC at baseline)

  mean follow-up : 7.9 months (range, 7 to 9 months).

- 2. free of CAC: 7 patients

  ex novo appearance of CAC: 1 patient

  unchanged calcium score :2 patients

 significant increase in calcification score: 8 patients

DISCUSSION

- 1. Coronary artery disease.

  the effects of some antihypertensive drugs (ie, calcium   channel blockers versus diuretics) on plaque progression.

- 2.CAC is present in 40% of patients (13% of controls).

- 3.Calcium scores are higher than 100 in 65% of patients; 1 control subject had a calcium score higher than 100.

DISCUSSION

Table 3. Multivariable Regression With CAC as Dependent Variable

	P	Odds Ratio (95% Confidence Interval)
Age	0.000	1.137 (1.137-1.218)
Duration of CRF	0.721	1.001 (0.994-1.009)
GFR	0.698	1.010 (0.960-1.063)
iPTH	0.268	.997 (0.991-1.003)
Serum calcium	0.476	1.573 (0.451-5.471)
Serum phosphorus	0.800	.896 (0.383-2.093)
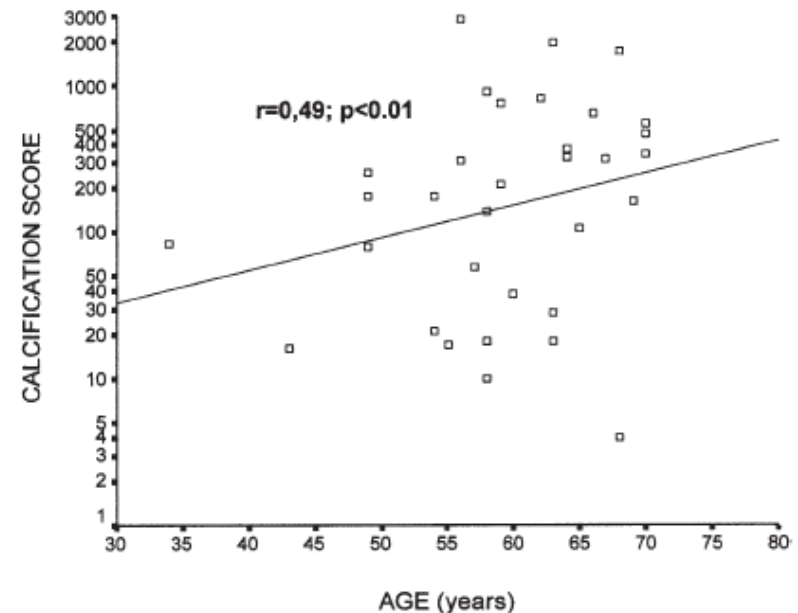
The scale on the y axis is logarithmic

Fig 1. Correlation between calcification score and age in patients with CRF with CAC (n = 34).

DISCUSSION

- 1. Amplifying effect of dialysis on calcifications ?

  *very low prevalence of cardiac valve calcification in our patient, whereas calcification of the mitral and aortic valves is present largely in patients on dialysis therapy

- 2.variables:

  greater derangement of mineral metabolism,
  greater iPTH production,
  excessive calcium load by dialysate,
  vitamin D intoxication,
  enhanced inflammation.

DISCUSSION

- 1.Chronic inflammation is : CRP and homocysteine

  CRP, homocysteine level NOT associated with calcification score.

- 2.in many patients: >1 coronary vessel , electron-beam CT , 2.2x cardiovascular

  progression is fast:14% : 26 weeks

  25% :52 weeks

  (on dialysis therapy)

- 3. In asymptomatic patients with no history of coronary artery stenosis and renal failure?

DISCUSSION

- 1. CRF -> CAC ?

- 2. Evaluate asymptomatic patients not yet on dialysis therapy ?