

"VasCalc SCORE" AND THE PROGRESSION OF VASCULAR CALCIFICATION IN HEMODIALYSIS PATIENTS

Hiroshi Tanaka, MD, PhD

Department of Internal Medicine/Nephrology
Mihara Red Cross Hospital, Mihara, Hiroshima, Japan

INTRODUCTION

•Vascular calcification (VC) is associated with higher cardiovascular morbidity and mortality in hemodialysis patients. A single X-ray film or a CT scan easily helps us to know each patient's current vascular status.

•However, we do not know how many years are required until the plain X-ray reveals vascular changes, such as new-onset or worsening calcification.

1. Vascular calcification scores using CT

- Agatston score (CACS; 0- >700s): coronary [Agatston]
- aortic calcification index: abdominal aorta [Nitta, AJN 2001]
- carotid [Nakayama M, BMC Nephrol 2011]
- carotid siphon (0-3) [Woodcock RJ, AJNR 1999]
- superficial femoral artery (0- >2200s) [Sigrist M, NDT 2006]

2. Vascular calcification scores using X-rays

- Kauppila score (0-24): abdominal aorta
- Adragao score (0-8): iliac/femoral/digital/radial arteries
- aortic arch (0-3) [Bohn E, BMC Nephrol 2013]

METHODS

•VasCalc Score is a sum of VC scores of the peripheral (proper and common palmar digital, radial, ulnar, splenic, and internal and external iliac arteries) and the central (i.e., aorta) arteries.

•The dialysis Unit has a policy to have bone X-ray films taken basically once a year in each patient. Patients on maintenance hemodialysis 3 times a week with bone films taken 4 or more times over the period of at least 4 years were eligible for the analysis. The patients were mostly on 5-hr bicarbonate-bath hemodialysis, with phosphate binders (CaCO₃, Ca acetate, sevelamer) and vitamin Ds (oral or iv, strictly keeping the serum calcium below 10.1 mg/dL)

•A set of 5 plain bone films covers the bilateral hands and fingers, the cervical and lumbar spines, the skull and the pelvis. The films were analyzed by staff physicians blinded to the previous results. On each film, the degree of VC was ranked as none, mild or severe. Summing up of the total film score yields the VasCalc Score, which is 0 (none), 0.5 (focal or patchy), 1 (diffuse but mild) and 2 (diffuse and severe both in peripheral and central) [Fig 1].

•Nutritional status was assessed by malnutrition-inflammation score (MIS), which was performed semi-annually and was averaged during the period.

RESULTS

•A total of 83 patients (68.7±11.5 years old, m±SD; M:F = 56:27), which comprised more than 90% of the patients who received hemodialysis in the Unit for 4 or more years, were included, with a follow-up period of 5.8±0.9 years.

•A baseline VasCalc Score, an average of the initial 3 years, ranged widely; 0.5 or less in 34 patients, more than 0.5 up to 1.0 in 33, more than 1.0 up to 1.5 in 8 and more than 1.5 in 8, with a median of 0.83 [Fig 2].

•During the study period, those with a lower baseline VasCalc Score (1.0 or less; n=67) had more increase in the Score (P=0.012) than those with a higher Score [Table 1].

•The increase in the Score over the period was minimal in most of the patients, with a median of 0.25; the increase by more than 0.5 was seen in only 14 (16.9%) [Fig 3].

•MIS was positively correlated with the VasCalc Score (R²=0.089, P=0.004), but not with a velocity of changes in the VasCalc Score (P=0.50) [Fig 4].

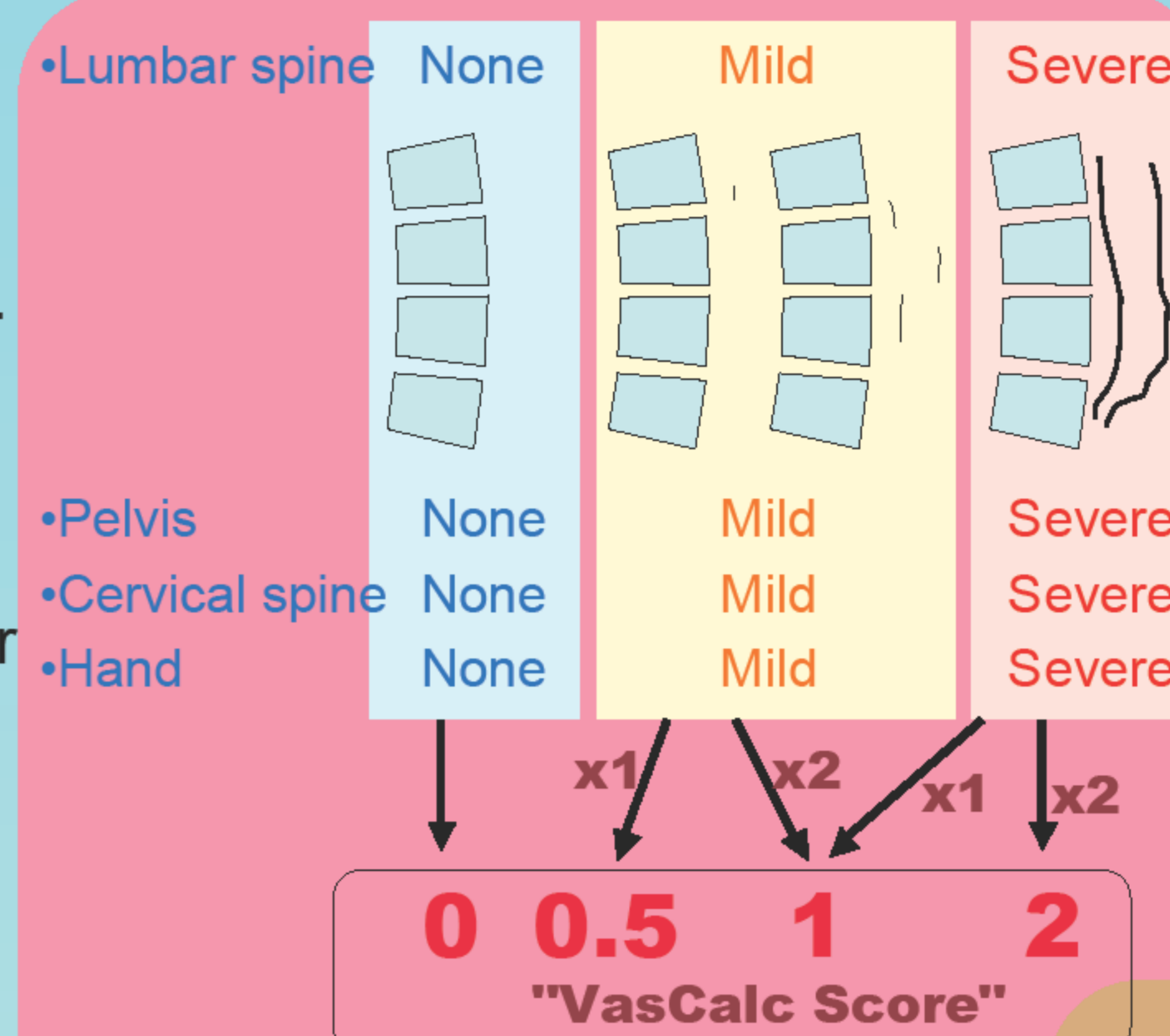


Fig 1. Scoring method

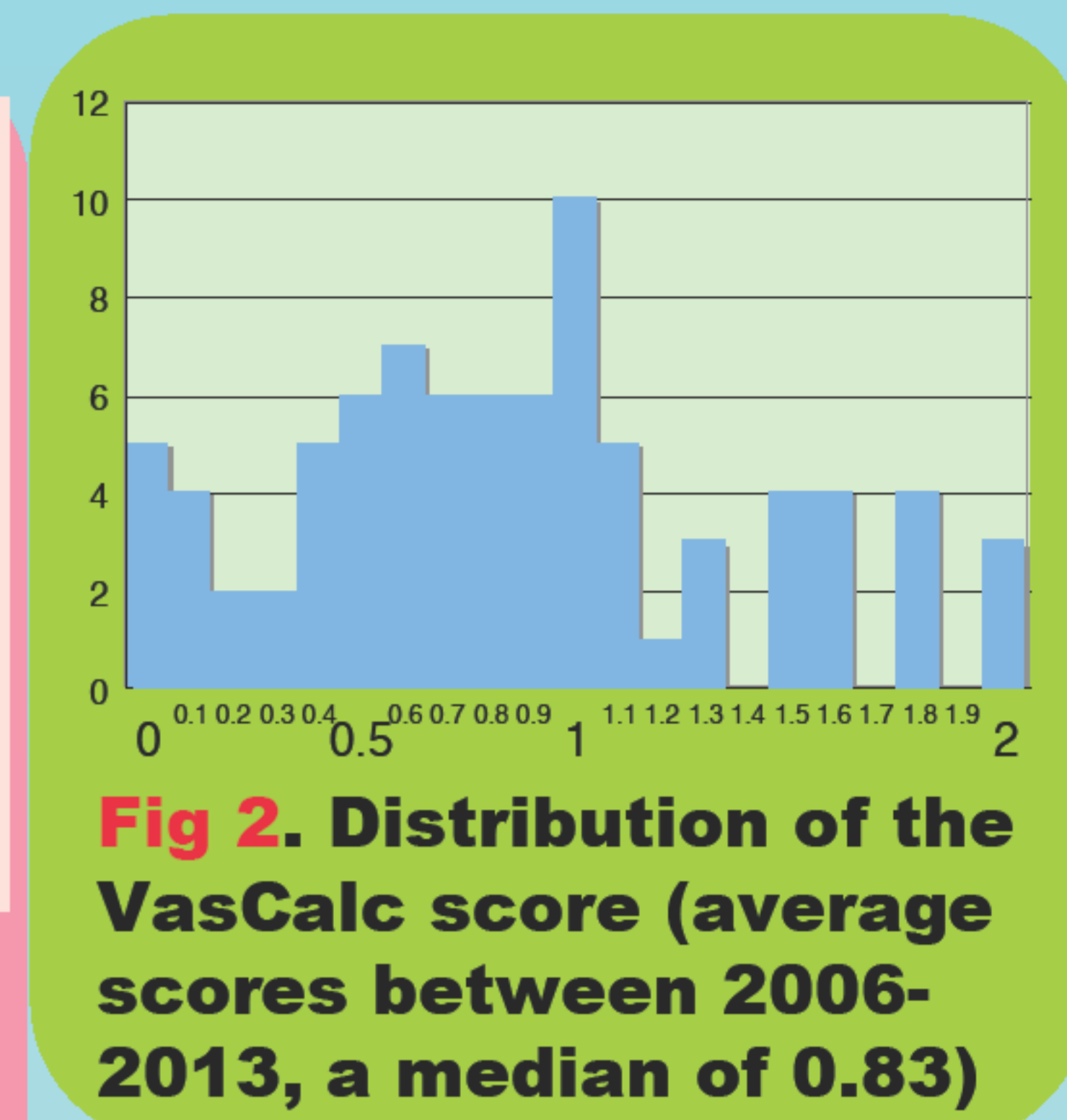


Fig 2. Distribution of the VasCalc score (average scores between 2006-2013, a median of 0.83)

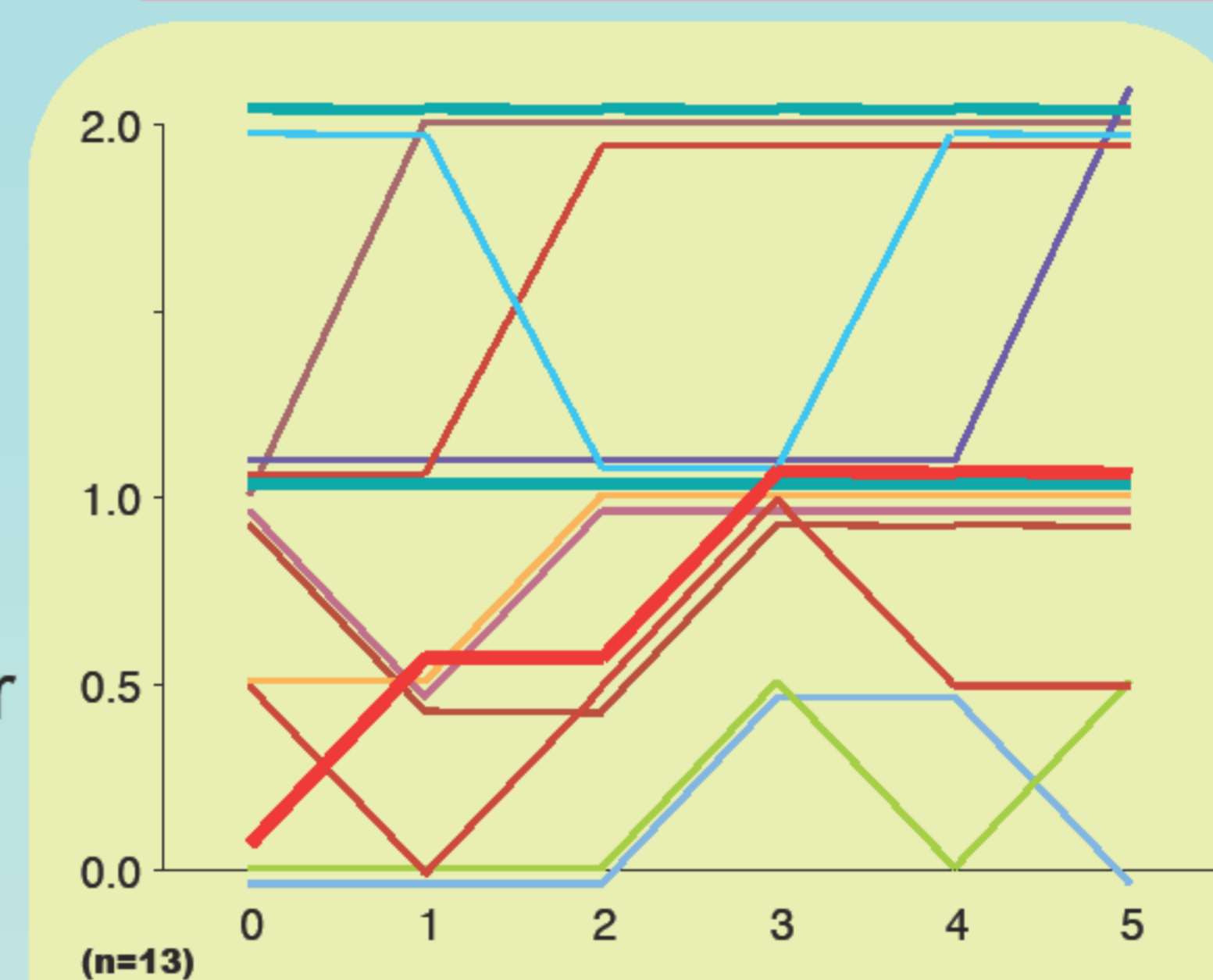


Fig 3. Reproducibility and the course over 5 years (representative 13 patients)

	baseline VasCalc score =<1.0	>1.0	P
n (M:F)	67 (48:19)	16 (8:8)	
age	65.6 ± 11.9	75.3 ± 6.2	0.008
follow period (yr)	5.8 ± 0.9	5.9 ± 0.8	0.648
increase in VasCalc	0.33 ± 0.29	0.11 ± 0.37	0.012

Table 1. Progression in VasCalc score

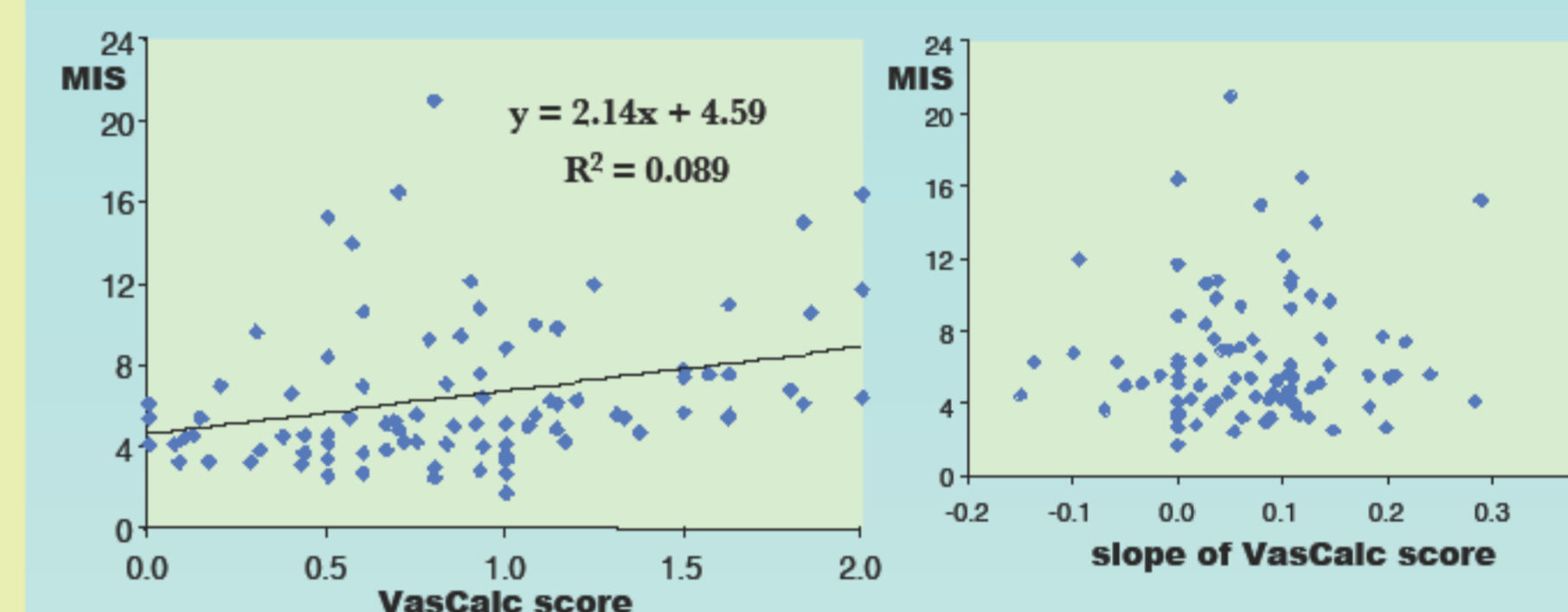


Fig 4. MIS was correlated with baseline VasCalc score (left) but not with a velocity of changes in VasCalc (right)

1. Limitation of VasCalc Score

- Only 4 grades; Less quantitative than Kauppila or Adragao scores
- Prognostic significance under investigation

2. Features of VasCalc Score

- Very simple, no need for CT; can be done in a small clinic
- Requires virtually only 3 films, once a year (cf. Cervical spine: not contributory)
- Assessing both the aorta and the peripheral arteries
- Including both intimal and medial calcifications

CONCLUSIONS

- Vascular calcification can be visualized on plain X-ray film slowly but definitely, with the change taking 4 years or more in the hemodialyzed patients.
- Malnourished patients had a higher degree of baseline vascular calcification but had the speed of worsening thereafter similar to the well-nourished patients.

References

- Górriz JL et al: Vascular calcificatin in patients with nondialysis CKD over 3 years. CJASN 2015;10:654.
- Adragao T et al: A simple vascular calcification score predicts cardiovascular risk in haemodialysis patients. NDT 2004;19:1480.
- Adragao T et al: A plain X-ray vascular calcification score is associated with arterial stiffness and mortality in dialysis patients. NDT 2009;24:997.
- Kauppila LI et al: New indices to classify location, severity and progression of calcific lesions in the abdominal aorta: A 25-year follow-up study. Atherosclerosis 1997;132:245.
- Sigrist M et al: Vascular calcificatin and cardiovascular function in chronic kidney disease. NDT 2006;21:707.
- Sigrist MK et al: Progressive vascular calcification over 2 years is associated with arterial stiffening and increased mortality in patients with stages 4 and 5 chronic kidney disease. CJASN 2007;2:1241.
- Bellasi A et al: Correlatin of simple imaging tests and coronary artery calcium measured by computed tomography in hemodialysis patients. Kidney Int 2006;70:1623.
- Agatston AS et al: Quantificatin of coronary artery calcium using ultrafast computed tomography. JACC 1990;15:827.

