

# ASSOCIATION BETWEEN ALKALINE PHOSPHATASE AND TOTAL BONE MINERAL DENSITY IN CKD STAGE 5 PATIENTS

Annelie Bergman, Abdul Rashid Qureshi, Mathias Haarhaus, Bengt Lindholm, Peter Barany, Olof Heimbürger, Peter Stenvinkel, Björn Anderstam



Divisions of Renal Medicine and Baxter Novum, CLINTEC, Karolinska Institutet, Stockholm, Sweden

## BACKGROUND & AIMS

The altered bone and mineral metabolism in patients with chronic kidney disease (CKD) directly contributes to vascular calcification (1, 2). Recent prospective studies report on an inverse relationship between bone mineral density (BMD) and vascular calcification in CKD patients (3, 4). Alkaline phosphatase (ALP) and bone specific ALP (BALP) are predictors of increased mortality in patients with CKD. BALP has shown higher sensitivity and specificity than total ALP in reflecting histological alterations in bone. However, associations between ALP, BALP and BMD in previous studies are inconsistent (1).

**The aim** of this study was to evaluate the relation of total ALP and BALP with measurements of total BMD in CKD patients during 24 months.

## PATIENTS & METHODS

This observational prospective study followed 194 patients with CKD stage 5 during their first 24 months in dialysis.

Collection of blood samples and measurements of BMD were performed close to the start of dialysis as well as at 12 and 24 months after date of enrolment, respectively. Presence of cardiovascular disease as reported by the patients' nephrologists were obtained from medical charts.

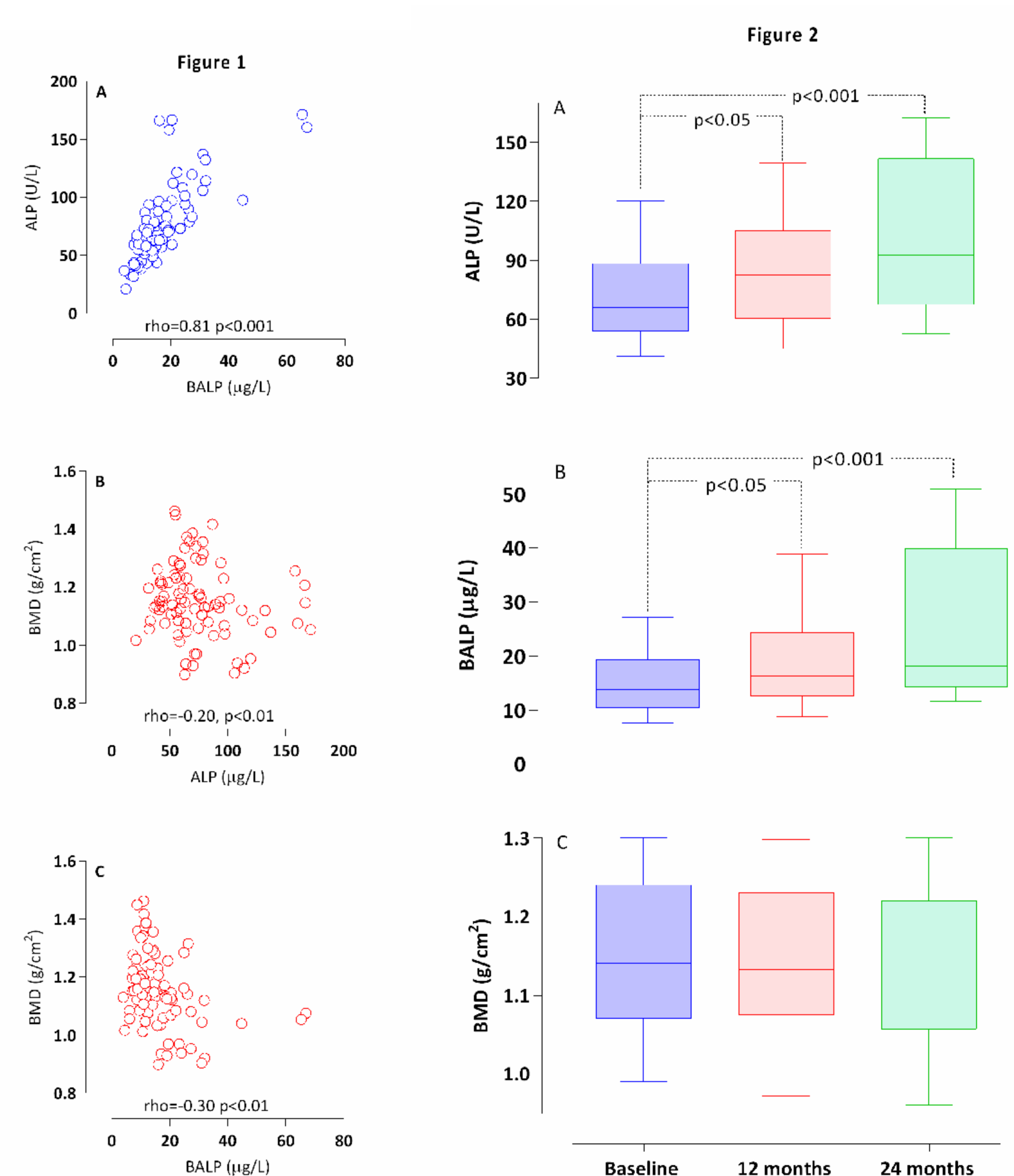
Serum concentrations of total ALP and BALP were assessed using routine technique and the Ostase® BALP ELISA-kit (Immunodiagnostic Systems Ltd, Boldon, United Kingdom), respectively. Total body BMD was measured by dual-energy X-ray absorptiometry (DXA), using the iDXA™ device (Lunar Corp., Madison, Wisc., USA).

## RESULTS

### Baseline characteristics (n=194)

Age, years	57 (34 - 68)
Male, n (%)	126 (66)
Smoking, n (%)	91 (47)
Body mass index, kg/m <sup>2</sup>	24.2 (19.8 - 30.9)
Diabetes, n (%)	61 (32)
Systolic blood pressure, mmHg	148 (180 - 120)
Diastolic blood pressure mmHg	87(71 - 102)
Presence of cardiovascular disease, n (%)	71 (37)
Hemodialysis, n (%)	71 (39)
Residual GFR, ml/min/1.73m <sup>2</sup>	6.4(4.2 - 9.0)
Albumin, g/l	34 (27 - 40)
Hemoglobin, g/l	107(90 - 123)
PTH, ng/l	240 (71 - 555)
Calcium, mmol/l	2.39 (2.02 - 2.69)
Phosphate, mmol/l	2.0 (1.4 - 2.7)
ALP, U/l	65.2 (43.2 - 120.1)
BALP, µg/l	13.5 (7.1 - 27.3)
Total BMD, g/cm <sup>2</sup>	1.14 (0.97 - 1.31)

Total ALP correlated inversely with total BMD at baseline (Fig 1B) and at 12 and 24 months after the start of dialysis. A similar correlation was found between BALP and total BMD at baseline (Fig 1C) and at 12 and 24 months. These correlations were significant even after adjusting for age and gender. During the study period, the serum concentrations of ALP and BALP increased significantly (p<0.001), whereas BMD values remained stable (Fig 2). No significant association was found between baseline values of neither ALP nor BALP and cardiovascular morbidity.



Data is expressed as number, percentages or median with 10<sup>th</sup> and 90<sup>th</sup> percentiles. Spearman's rank test was used to assess bivariate associations. A multiple linear backward regression analysis was performed to assess independent associations.

## CONCLUSIONS

These results suggest that BALP could be a more appropriate marker than ALP in the prediction of total BMD in CKD patients. Further studies to elucidate the clinical value of longitudinal assessments of ALP and BALP in CKD patients are warranted.

## References

1. Group. KDIGO CKW. Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Chapter 3. Management of Progression and Complications of CKD. *Kidney Int Suppl.* 2013;3(1):73 - 90.
2. Sardiwal S. et al. Bone alkaline phosphatase in CKD-mineral bone disorder. *Am J Kidney Dis* 2013. 62(4):810-822.
3. Toussaint ND, Lau KK, Strauss BJ, Polkinghorne KR, Kerr PG. Associations between vascular calcification, arterial stiffness and bone mineral density in chronic kidney disease. *Nephrol Dial Transplant.* 2008;23(2):586-93.
4. Matsubara K, Suliman ME, Qureshi AR, Axelsson J, Martola L, Heimbürger O, et al. Bone mineral density in end-stage renal disease patients: association with wasting, cardiovascular disease and mortality. *Blood Purif.* 2008;26(3):284-90.

June 2 2014 MP226

