Clinical effect of different albumin assays on calcium and phosphate management in chronic hemodialysis patients

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Background

- For measurement of serum albumin two different assays are generally used: bromcresol green (BCG) and bromcresol purple (BCP).
- These assays provide different results, in particular in hemodialysis (HD) patients (Ref. 1).
- When calcium levels are corrected for albumin (adjusted calcium=[total calcium]+0.0246 x (40 -[albumin])) as recommended by current guidelines, results depend on the type of albumin assay used.

Objective

To evaluate whether the type of albumin assay has clinical implications in HD patients, especially in achieving calcium and phosphate treatment targets and in prescription of phosphate binding agents.

Methods

- Cross-sectional study design
- Baseline CONTRAST (ref 2) cohort (incident and prevalent, chronic intermittent HD, stable, 3 times per week, low-flux dialyzers)
- Selection of 24 Dutch centers; patients included until 2008.
- Nine centers used BCP (n=330) and 15 centers used BCG (n=173).
- Plasma levels of calcium, phosphate and albumin, and prescription of (calcium containing and calcium-free) phosphate binding agents were compared between the patients according to the albumin assay that was used. In addition, compliance with bone mineral treatment targets was evaluated in patients with albumin measured by BCG and BCP.

Results

Table 1: Baseline characteristics

Bromcresol	green	purple	P-value
N	173	330	
Sex (% male)	66	61	0.25
Age (y)	63 ± 14.4	63 ± 14.0	0.97
Caucasian race(%)	85	87	0.47
BMI (kg/m2)	25.0 ± 3.7	24.9 ± 4.5	0.84
Diabetes Mellitus (%)	20.2	20.6	0.93
Residual diuresis (%)	56.6	48.8	0.09
Phosphate (mmol/l)	1.57 ± 0.43	1.70 ± 0.53	0.006
Calcium (mmol/l)	2.34 ± 0.17	2.32 ± 0.18	0.25
Albumin (g/l)	40.4 ± 3.09	34.5 ± 4.16	<0.001
Corrected calcium (mmol/l)	2.33 ± 0.18	2.46 ± 0.18	<0.001
PTH (ng/l)	27.9 ± 31.0	30.0 ± 35.6	0.85

Phosphate levels were higher in the BCP group (Table 1), which was not explained by patient- or treatment characteristics (by multivariable regression analysis). Nutritional (nPCR, creatinine, cholesterol and BMI) and inflammatory (hsCRP) parameters were similar in both groups.

After correction for albumin, 13.3% of the patients In the BCG group were hypercalcemic (corrected calcium ≥ 2.55 mmol/L) versus 28.8% in the BCP group (P<0.001).

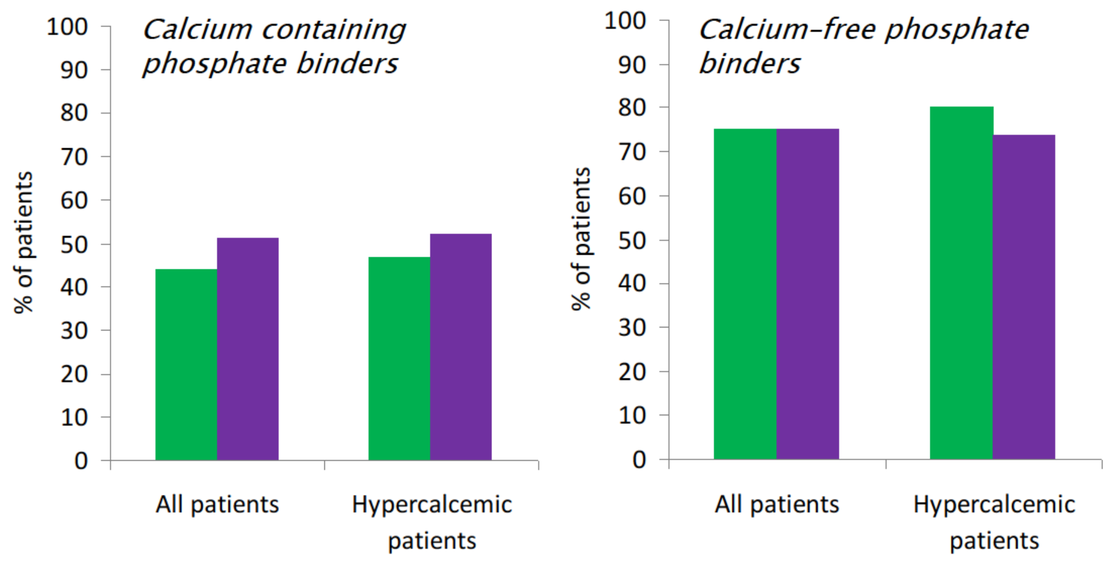

Figure 1: Prescription of phosphate binding agents in patients with hypercalcemia
Prescription of calcium-containing phosphate binders tended to be higher in the BCP group (NS). In hypercalcemic patients, use of calcium containing binders was similar to normocalcemic patients. No difference in use of calcium-free phosphate binders was found between the two groups.

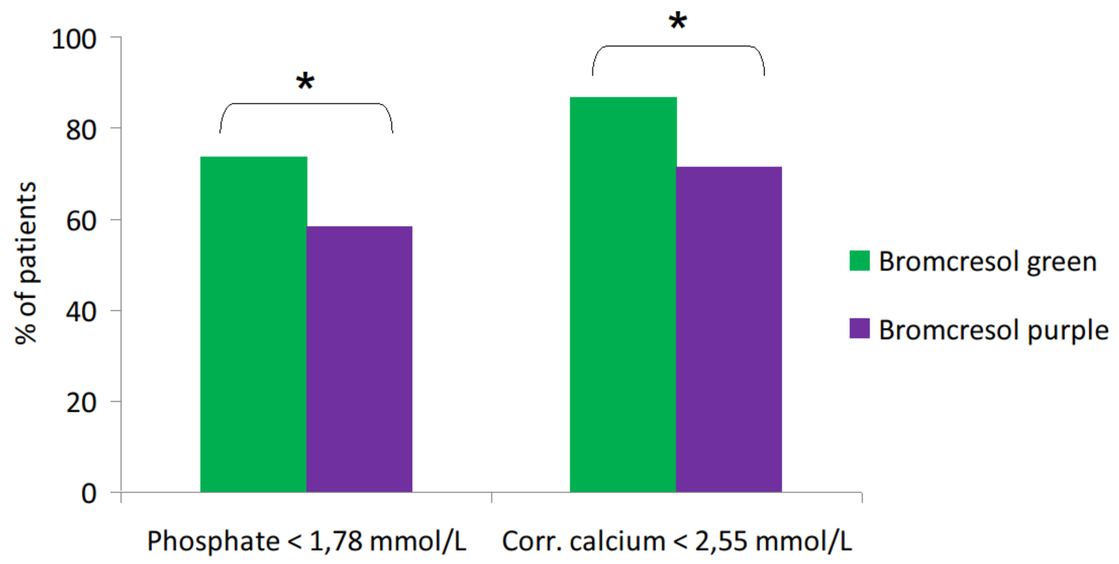

Figure 2: Compliance with bone mineral treatment markers.
In the BCP group a smaller percentage of patients achieved treatment targets for phosphate and (corrected) calcium. * P < 0.05

Conclusions

- **Calcium concentrations after correction for albumin were higher in patients treated in centres using the BCP as compared to the BCG assay, and likewise, patient in the BCP group were more likely to be hypercalcemic.**
- **Despite higher calcium levels, after correction for albumin, calcium containing binders were *not* prescribed less often in these patients, suggesting that calcium levels were not corrected for albumin by prescribing physicians.**
- **Phosphate levels were higher in the BCP group. Keeping in mind these are observational data, it may be hypothesized that the latter is explained by less restrictive dietary measures due to apparently lower serum albumin in these patients.**

References

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