

QUANTIFICATION OF CALCIUM REMOVAL DURING ONE WEEK CYCLE OF HEMODIALYSIS BY EQUIVALENT CONTINUOUS CLEARANCE

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bj ect i ves:

The calcium mass balance during hemodialysis was shown to be frequently positive (absorption of calcium from dialysis fluid) for dialysis fluids with calcium of 1.25 mmol/L or more (Gotch, 2008).

We present a quantitative assessment of calcium kinetics and mass balance during the weekly cycle of three hemodialysis sessions and propose to apply equivalent continuous clearance to quantify the removal of calcium by hemodialysis.

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Eighteen patients on HD were examined during three consecutive HD sessions of one week dialysis treatment cycle (with the interdialytic breaks of 2-2-3 days) and before the fourth session. Total calcium concentration was measured by a colorimetric method in serum before, at 1, 2 and 3 h, at the end and 45 min after each session, and every 0.5 h in the outlet dialysate. The measured concentration of calcium in inlet dialysis fluid was 1.34 ± 0.10 mmol/L. The removed mass was calculated from the measurements in inlet and outlet dialysis fluid and dialysis fluid flow rate. The average values of calcium concentration were calculated from the weakly profiles of calcium in serum. Dialysis equivalent continuous clearance, ECC, was calculated as the removed mass per dialysis cycle time (one week) per the time average solute concentration in serum.

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The time average concentration of calcium in plasma was 8.90 ± 0.53 mg/dL (mean \pm SD). Calcium concentration in serum increased during dialysis sessions from 8.7 ± 0.7 to 9.4 ± 0.6 mg/dL ($p < 0.0001$), and later on slightly decreased to 9.1 ± 0.6 mg/dL ($p < 0.003$) at 45 min after the end of dialysis. The removed calcium mass was on average 156 ± 486 mg, with 670 ± 291 mg removed from patients on negative (removal) dialysis mass balance, and -113 ± 315 mg from five patients with calcium absorption from dialysis fluid; in two patients the mass balance was close to zero. The dialysis equivalent continuous clearance for calcium was 0.16 ± 0.55 mL/min (0.53 ± 26 mL/min in 10 patients with positive ECC, -0.49 ± 35 mL/min in 5 patients with negative ECC, and close to zero in 2 patients), compared to the healthy kidney clearance of 1.5 mL/min.

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We conclude that in hemodialysis patients on low calcium dialysis fluid of 1.25 mmol/L calcium is removed by dialysis on average 10 times slower than by the normal kidneys, and some patients are on positive dialytic calcium mass balance due to absorption of calcium from dialysis fluid. The dialysis treatment stimulates physiological processes that increase calcium concentration in plasma during dialysis in spite of a moderate calcium removal.

ef erences:

Gotch F: Calcium and phosphorus kinetics in hemodialysis therapy. Contrib Nephrol. 2008;161:210-4.

