Is the Type of Hemodialysis Important to Control Serum Phosphate?

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A high serum phosphate (P) level is an independent determinant of morbidity and mortality in hemodialysis (HD) patients, with values of ≤ 4.5 mg/dl to be considered as the ideal target [1, 2]. To date, however, the therapeutic interventions have generally failed with about 50% of patients showing predialytic p values >5.5 mg/dl [2, 3].

Prevention of hyperphosphatemia is based on restriction of dietary P intake and reduction of intestinal absorption of P; however, both the therapeutic approaches are weakened by major drawbacks. Indeed, lowering of protein intake <1.0 g/kg b.w./day to reduce dietary P is not safe since this is the minimum level to avoid malnutrition in HD patients; HD, in fact, induces protein catabolism by means of loss of amino acids and albumin, and by inflammatory stimuli as well. On the other hand, use of P binders to decrease absorption may be associated with detrimental effects dependent on excessive load of aluminum or calcium; a more valid alternative is likely represented by the new generation of calcium and aluminum-free agents but compliance to prescription is often hardly achieved for these drugs.

On the basis of these observations, the role of dialytic removal in the achievement of adequate P levels becomes relevant. Standard 4-hour HD allows to remove about 800 mg/session, that is, 2,500 mg in 1 week. This amount is almost half of the quantity of P derived from a normal protein intake. Therefore, standard intermittent HD is

not efficacious if not associated with dietary restriction and P binders.

In this issue of *Blood Purification*, Bolasco et al. compared P kinetics in standard HD and on-line hemodiafiltration with endogenous reinfusion (HFR) by using a new method to measure P levels into the dialysate. This issue is of interest because sensitivity of the common automatic analyzers is inadequate to precisely quantify the low P concentrations into the dialysate. Nevertheless, from the clinical point of view, the most important finding of the study is that the dialytic P removal by HFR was comparable to that obtained by standard HD, and that both types of dialysis allowed to maintain the plasma P levels below the recommended target in most patients [4]. However, HFR also decreases inflammatory stimuli because of purity of reinfusion solution, adsorption of inflammatory cytokines by resin and optimal balance of bicarbonate [5]. This point is critical; in fact in uremic patients, inflammation and metabolic acidosis worsens nutritional status. Taken together, these findings suggest that HFR may be an option more suitable than standard HD to ameliorate P balance in the subset of patients with impaired nutritional status or signs of systemic inflammation. Long-term controlled studies on this issue are still required to verify this hypothesis.

Of note, standard hemodiafiltration techniques (HDF), where ultrafiltrate is not reinfused, significantly increase P removal, of about 40% versus HD, because of

the greater convective removal of P [6, 7]. HDF has been found effective in significantly improving P levels also in the medium term [7]. It is important to note, however, that HFR, as compared with HDF, induces a minor loss of amino acids into dialysate, leading to higher levels of amino acids in plasma [8]. This finding suggests a minor risk of malnutrition for HFR with respect to HDF that, again, must be confirmed in studies with adequate follow-up.

Finally, as evidenced in chronic studies [9, 10], P removal can also be improved by prolonging duration or

frequency of dialytic sessions; in fact the consequent increase of weekly dialytic dose drastically improves control of P levels with patients that are allowed to discontinue P binders and ingest a more liberal diet.

In conclusion, the type of dialytic treatment plays a major role in the control of phosphatemia in uremic patients. HFR is a suitable option to control serum P, especially in patients at risk of malnutrition and/or inflammation. However, at variance with standard HDF and prolonged or more frequent HD sessions, controlled studies are required to confirm these effects in the long term.

References

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