

Efficacy of Combined CHAp and Lanthanum Carbonate in Therapy for Hyperphosphatemia

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Abstract : Lanthanum carbonate exhibits a considerable ability to bind phosphate and the substitution of Ca²⁺ ions by divalent or trivalent lanthanide metal ions attracted attention during the past few years. Although Lanthanum carbonate has not been approved by the FDA for treatment of hyperphosphatemia, we prospectively evaluated the efficacy of the combination of Calcium hydroxyapatite and Lanthanum carbonate for the treatment of hyperphosphatemia on mice. Calcium hydroxyapatite commonly referred as CHAp is a bioceramic material and is one of the most important implantable materials due to its biocompatibility and osteoconductivity. We prepared calcium hydroxyapatite and lanthanum carbonate. CHAp was prepared by co-precipitation method using Ca(OH)₂, H₃PO₄, NH₄OH with calcination at 1200°C. Lanthanum carbonate was prepared by chemical method using NaHCO₃ and LaCl₃ at low pH environment, pH below 4.0. The confirmation of both substances structures was made using XRD characterization, FTIR spectra and SEM /EDX analysis. The study group included 20 subjects-mice divided into four groups according to the administered substance: lanthanum carbonate (group A), lanthanum carbonate + CHAp (group B), CHAp (group C) and salt water (group D). The results indicate a phosphate decrease when subjects (mice) were treated with CHAp and lanthanum carbonate (0.5 % CMC), in a single dose of 1500 mg/kg. Serum phosphate concentration decreased [from 4.5 ± 0.8 mg/dL to 4.05 ± 0.2 mg/dL, P < 0.01] in group A and to 3.6 ± 0.2 mg/dL only after the 24 hours of combination therapy. The combination of CHAp and lanthanum carbonate is a suitable regimen for hyperphosphatemia treatment subjects because it avoids both the hypercalcemia of CaCO₃ and the adverse effects of CHAp. The ability of CHAp to decrease the serum phosphate concentration is 1/3 that of lanthanum carbonate.

Keywords : calcium hydroxyapatite, hyperphosphatemia, lanthanum carbonate, phosphate, structures

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