CKD-MBD, DIAGNOSIS AND MANAGEMENT DILEMMA

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Chronic Kidney Disease-Mineral and Bone Disorder (CKD-MBD) is a systemic syndrome encompassing biochemical, skeletal, and extra-skeletal abnormalities that develop progressively with declining renal function. The disorder originates from impaired phosphate excretion and reduced renal 1-alpha hydroxylase activity, leading to hyperphosphatemia, hypocalcemia, and deficient calcitriol synthesis. These disturbances drive secondary hyperparathyroidism, characterized by elevated parathyroid hormone (PTH) levels that attempt to normalize mineral balance but ultimately contribute to high-turnover bone disease (osteitis fibrosa cystica). Concomitantly, adynamic bone disease and osteomalacia may occur, particularly with over-suppression of PTH. Beyond skeletal complications—including fractures, bone pain, and deformities—CKD-MBD promotes vascular and valvular calcification through osteogenic transformation of vascular smooth muscle cells, significantly increasing cardiovascular morbidity and mortality. Diagnosis relies on serial monitoring of serum calcium, phosphate, PTH, and 25-hydroxyvitamin D, along with imaging for calcification and bone biopsy as the gold standard for turnover assessment. Management integrates dietary phosphate restriction, phosphate binders (non-calcium-based preferred), active vitamin D analogs, and calcimimetics such as cinacalcet. Emerging therapies targeting fibroblast growth factor 23 (FGF-23) and klotho pathways offer future potential. Optimal control of CKD-MBD requires a balanced, individualized approach to mitigate both bone fragility and cardiovascular risk, improving long-term outcomes in patients with advanced chronic kidney disease.

Keywords : Chronic Kidney Disease, Mineral and Bone Disorder , Secondary hyperparathyroidism, Vascular calcification, Phosphate metabolism

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