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Extended Abstract

Influence of aligner appliance and pendulum orthodontic on bone metabolism during the process of molar distalization

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Abstract

In patients on hemodialysis (HD), the various chemical elements in the dialysate may influence survival rates. In particular, calcium modifies mineral and bone metabolism and the vascular calcification rate. We studied the influence of the dialysate calcium concentration and the treatments prescribed for mineral bone disease (MBD) on survival. With the rising number of anterior cruciate ligament (ACL) reconstructions, revision ACL reconstructions are becoming increasingly common. A revision procedure may be performed to improved knee function, correct instability, and facilitate a return to normal activities. When performing a revision reconstruction, the surgeon decides between a single-stage or a two-stage revision. Two-stage revisions are rarely performed, but are particularly useful when addressing substantial tunnel-widening, active infection, and concomitant knee pathology (e.g., malalignment, other ligamentous injuries, meniscal or chondral lesions). Among these potential scenarios requiring a two-stage revision, tunnel-widening is the most common cause; the first stage involves graft removal, tunnel curettage, and bone grafting, followed by revision ACL reconstruction in the second stage. The purpose of this article is to review the preoperative planning, surgical considerations, rehabilitation, and outcomes of two-stage revision ACL reconstructions and summarize the recent literature outlining treatment results.

Methods: All patients in REIN having initiated HD from 2010 to 2013 were classified according to their exposure to the different dialysate calcium concentrations in their dialysis unit. Data on the individual patients' treatments for MBD were extracted from the French national health database. Cox proportional hazard models were used to estimate mortality hazard ratios (HR) associated with time-dependent exposure to dialysate calcium concentrations and MBD therapies, adjusted for comorbidities, laboratory and technical data. Osteoporosis characterized by low bone mineral density (BMD) as assessed by dual-energy X-ray absorptiometry (DXA) is common among end-stage renal disease (ESRD) patients and associates with high fracture incidence and high all-cause mortality. This is because chronic kidney disease-mineral bone disorders (CKD-MBDs) promote not only bone disease (osteoporosis and renal dystrophy) but also vascular calcification and cardiovascular disease. The disturbed bone metabolism in ESRD leads to 'loss of cortical bone' with increased cortical porosity and thinning of cortical bone rather than to loss of trabecular bone. Low BMD, especially at cortical-rich bone sites, is closely linked to CKD-MBD, vascular calcification and poor cardiovascular outcomes. These effects appear to be largely mediated by shared mechanistic pathways via the 'bone-vascular axis' through which impaired bone status associates with changes in the vascular wall. Thus, bone is more than just the scaffolding that holds the body together and protects organs from external forces but is-in addition to its physical supportive function-also an active endocrine organ that interacts with the vasculature by paracrine and endocrine factors through pathways including Wnt signalling, osteoprotegerin (OPG)/receptor activator of nuclear factor-κB (RANK)/RANK ligand system and the Galectin-3/receptor of advanced glycation end products axis. The insight that osteogenesis and vascular calcification share many similarities-and the knowledge that vascular calcification is a cell-mediated active rather than a passive mineralization process-

suggest that low BMD and vascular calcification ('vascular ossification') to a large extent represent two sides of the same coin. Here, we briefly review changes of BMD in ESRD as observed using different DXA methods (central and whole-body DXA) at different bone sites for BMD measurements, and summarize recent knowledge regarding the relationships between 'low BMD' and 'fracture incidence, vascular calcification and increased mortality' in ESRD patients, as well as potential 'molecular mechanisms' underlying these associations.

Results: Dialysate calcium concentration of 1.5 mmol/L was used by 81% of the dialysis centers in 2010 and in 83% in 2014. Most centers were using several formulas in up to 78% for 3 formulas in 2010 to 86% in 2014. In full adjusted Cox survival analyses, the percentage of calcium >1.5 mmol/L and <1.5 mmol/l by center and the number of formula used per center were not associated with survival. Depending on the daily dose used, the MBD therapies were associated with survival improvement for calcium, native vitamin D, active vitamin D, sevelamer, lanthanum and cinacalcet in the second and third tertiles of dose.

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