

Bone mineral disorders in pediatric and adolescent renal transplant recipients

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Abstract: Incomplete resolution of abnormalities of mineral metabolism associated with CRF results in the relatively high prevalence of ROD in pediatric kidney recipients. This non-randomized, cross-sectional, and analytic-descriptive study on bone density, vitamin D, and mineral metabolism was performed in 57 children and adolescents who had received a total of 60 renal allografts in Shiraz, Iran. The height and weight of the patients were measured; their serum calcium (Ca), phosphorus (P), Alk-P, PTH, 25(OH)-vitamin D₃, BUN, creatinine, and electrolyte levels were analyzed, and a complete blood count was performed. In addition, standard radiologic bone assessments, which included conventional left hand-wrist radiography and bone mineral densitometry by the DXA technique, were carried out. Special pediatric software was used for age-related interpretation of the Z-scores of BMD. SPSS[®] software (version 15) was used for statistical analyses. We studied 57 patients (27 males [47.4%]) with a mean age of 18.7 ± 4.25 (9–27) yr and a mean age at transplantation of 13.1 ± 3.46 (4.5–20) yr. They had a post-transplantation follow-up of 67.1 ± 33.8 (6–132) months, and all had well-functioning allografts at enrollment. The mean height age of the patients was 11.9 ± 1.8 (6–15.5), and the mean bone age was 15.6 ± 3.3 (7–19) yr, which corresponded to mean height-age and bone-age retardations of 5.7 ± 2.3 (0.5–10.5) and 1.22 ± 1.47 (0–7) yr, respectively. Hyperphosphatemia and hypercalcemia were each found in nine patients (15.8%), hypophosphatemia in five (8.8%), and hypocalcemia in none of the patients. Seven out of 57 patients (12.3%) had a (Ca×P) product of more than $55 \text{ mg}^2/\text{dL}^2$. Hyperparathyroidism was found in 27 (47.3%) and vitamin D₃ deficiency in four (7%) of the cases. The serum level of Alk-P was higher than the age-related normal range in 20 patients (35%). Left hand-wrist radiography showed no radiologic sign of ROD in any patient. The mean BMD Z-score was -1.77 ± 1.13 (–4.2–1.1) for the lumbar spine and -1.64 ± 0.89 (–3.9 to 1.9) for the femoral neck. “Stepwise backward regression” revealed a significant inverse correlation between the serum level of PTH and the GFR of the transplanted kidney; this correlation was independent from the influence of other variables such as Ca, P, and Alk-P ($p = 0.011$, $\beta = -1.556$). Bone age and height age both showed significant correlations with age at transplantation and serum levels of P ($p < 0.001$), but only bone age had a meaningful correlation with Alk-P ($p = 0.036$). The BMD Z-scores showed statistically meaningful correlations with the serum level of Alk-P, which were independent from the influence of other variables such as Ca, P, and PTH ($p \leq 0.002$). Our study revealed a relatively high prevalence of bone mineral disorder in pediatric kidney recipients, which suggests the need for a routine program for periodic screening of these patients to facilitate early diagnosis of either persistent or evolving manifestations of disturbed mineral metabolism, especially ROD.

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