Age-Dependent Phosphate Homeostasis Is Regulated by a Circulating Factor

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\textbf{Abstract}

To evaluate the age-dependent phosphate homeostasis, we studied the serum inorganic phosphate (Pi) concentration in 78 recipients, aged 5–25 years, a year after renal transplantation (RT). The significant age-dependent decline of the serum Pi concentration was observed in recipients (p < 0.0001) as well as in normal children. Our study revealed that a circulating factor may play a central role in the age-dependent change of phosphate regulation in human.

\textbf{Introduction}

During development the serum inorganic phosphate (Pi) concentration is maintained at a higher level than during adult life to meet the needs of the growing organisms. This is seen because tubular Pi reabsorption in the kidney decreases with aging [1]. Although the age-dependence was also observed at the level of NPT2 (the type II sodium-phosphate cotransporter) protein expression [2], its molecular mechanism remains to be clarified. With the aim of evaluating the age-dependent phosphate homeostasis, we studied the recipients’ serum Pi concentration a year after renal transplantation (RT).

\textbf{Patients and Methods}

78 patients, aged 5–25 years, who received living-related RT were enrolled in this study and their serum Pi concentrations were examined a year after RT. They had not been administered vitamin D and phosphate-binding antacids and their graft function at a year after RT was stable. Total ischemia time, warm ischemia time, the frequency of acute rejection, the dosage of steroids and nephrotoxicity by ciclosporin or tacrolims were not different in any age group. All of the donors were either the recipients’ father or mother who were in their twenties to their forties, and their serum Pi level before RT were within normal range (0.81–1.45 mmol/l).

\textbf{Results}

As figure 1 shows, based on Kruskal-Wallis test we observed that the serum Pi concentration at a year after RT decline significantly in correlation with their age (p < 0.0001).
Fig. 1. Relationship between serum phosphate level and recipients’ age. Mean ± SE serum phosphate level in recipients at a year after RT decline age-dependently in Kruskal-Wallis test (p < 0.0001).

Discussion

The age-dependent decline of recipients’ serum Pi concentration in this study is similar to that of normal children. That is, when adult kidney is transplanted to children, age-dependent phosphate balance is maintained.

A previous study showed that the phosphate regulation in the newborn and infant period is related to change in expression of NPT2 accompanied with nephrogenesis [2]. Moreover, it has been suggested that an age-dependent decline in the PHEX (phosphate-regulating gene with homologies to endopeptidases on the X chromosome) gene may underlie a similar decrease in NPT2 mRNA and protein expression [3]. These studies indicate that the expression of NPT2 through a circulating factor, which might be regulated by PHEX gene, could be associated with age-dependent change of tubular Pi reabsorption in mammalian animals [4]. Our study reveals that it’s not the aging of kidney but a circulating factor that may play a central role in the age-dependent change of phosphate regulation in human.

References