Osteodystrophy in Children with Urolithiasis Caused by Primary Hyperparathyroidism

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Abstract

Carried out the retrospective analysis 52 children, ill nefrolitiasis of etiology hyperparathyroidism. By purpose showed up to study degree demineralization bony cloth as to forms primary hyperparathyroidism at children. The studies of the activity of alkalized phosphatase and choostometrii will lend possibility to appreciate degree demineralization bony cloth and accordingly differation PGPT as to forms and the weights of disease. Hyperparathyroidism contributes development demineralization the bony cloth of various intensity which is connected by physical charge on bonus cloth. Indicators characterizing bony changes in stone disease of etiology hyperparathyroidism were more at children in miscellaneous form PGPT and accordingly high indicators are noted at children with the disorder of the function of buds and had direct relationship with quantity and size of formed stone and osteoporosis of bones.

Keywords: Urolithiasis, Primary Hyperparathyroidism, Kidneys, Alkaline Phosphatase, Pediatric Urology.

Introduction

In children suffering from urolithiasis, enamel destruction and tooth loss, pain and curvature of limbs and joints are noted. Attempts to reveal the cause of these phenomena by studying the mineral composition of blood and urine do not give positive results.1–5 In recent years, the hyperparathyroid nature of these changes has been more often mentioned, especially when combined with bone demineralization and the formation of kidney stones.6,7 Excessive production of parathyroid hormone enhances the activity of osteoclasts and osteoclastic resorption of bone tissue, which is accompanied by the mobilization of minerals from the bone tissue (calcium and inorganic phosphorus) and their excessive excretion by the kidneys.3 Purpose of the study Assessment of the degree of bone tissue demineralization depending on the form of primary hyperparathyroidism (PH) and urolithiasis.

Materials and Methods

The study involved 2100 children aged 1 to 15 years, patients with urolithiasis, of which PGPT was diagnosed in 52 (2.5%) children. There were 29 (55.7%) patients with renal form (PF) PHPT, and 23 (44.2%) patients with mixed form (kidney and bone damage) (SF). PGPT was diagnosed on the basis of studying the content of total calcium and inorganic phosphorus in the blood and in daily urine, ionized calcium in the blood, stress tests with calcium and sodium chloride, the content of parathyroid hormone (PTH), calcitonin (CT), vitamin D and cyclic 3,5-adenosine monophosphate (cAMP) in serum. To detect damage to bone tissue, we studied the activity of alkaline phosphatase (ALP) and X-ray densitometry of the bones of the hand and ultrasound osteometry of tubular bones.8,9 To clarify the severity of canine formation and assess the functional state of the kidneys, ultrasound, radiological (survey, excretory or infusion urography), radioisotope (radioisotope renography, renal scanning, dynamic nephroscintigraphy) studies were used.10–13 The ALP activity was determined by the photocolorimetric method using reagents from Lachema. Ultrasound examination of the bone tissue was investigated with the device "Echoostometer EOM - 02 Ts", in four bones - tibial, radial, clavicle and lower jaw.14,15
Results and Discussion

Clinical symptoms characteristic of bone changes were: pain in the limbs in 30 (57.65%) children, change in gait - in 19 (36.5%) children, deformity and curvature of the bones of the skull, spine and limbs - in 21 (40.3%) of a child, fractures of tubular bones were observed in 7 (13.4%) children. In 50 (96.1%) children, the disease was complicated by pyelonephritis, in 24 (46.1%) children, gross renal dysfunction was noted. Patients with HGPT significantly lagged behind in physical development.

The alkaline phosphatase activity in patients with urolithiasis without PGPT (comparison group) did not significantly differ from that of healthy children [Table 1].

The alkaline phosphatase activity in 46 (88.4%) children with PGPT was higher than that in the control group. With PPHPT, the ALP activity significantly increased (1.23 ± 0.06 µmol/liter) compared with children in the control group (p < 0.05), which is a characteristic sign of evaluating the process of bone tissue demineralization. A significantly high level of alkaline phosphatase and a low level of echoosteometry were observed in children with a mixed form of PHPT, especially in children with impaired renal function (p < 0.001).

With SF PHPT, the ALP activity was 2.8 times higher, p < 0.001. If renal failure was associated, then the indicator increased significantly and was equal to 6.38 ± 0.22 µmol/liter, which is 7.8 times higher than the indicator of children in the control group (p < 0.001).

To identify the degree of impairment of the mineral saturation of bone tissue during PGPT in children with urolithiasis, an ultrasound examination of bones was performed [Table 2]. The difference in echoosteometry indices in children with ICD without PHPT with healthy children was significant only in the tibia, in the rest of the bones there was a tendency to decrease.

In children with the renal form of PGPT, the echo osteometry indices in all bones were significantly lower (p < 0.05). Bone tissue in the mixed form of PHPT was distinguished by a significantly low (1.8 times) conductivity of ultrasound signals compared with children, the renal form of PHPT. Echoosteometry indices in children with renal form of PHPT complicated by renal failure were 1.41 times lower (P < 0.05), in children with a mixed form - 2.1 times lower (P < 0.001).

Analysis of the research results showed that the activity of alkaline phosphatase and echoosteometry in children with PHPT significantly differs from the indicators of children in the control group (p < 0.05), which is a characteristic sign of evaluating the process of bone tissue demineralization. A significantly high level of alkaline phosphatase and a low level of echoosteometry was observed in children with a mixed form of PHPT, especially in children with impaired renal function (p < 0.001).

Conclusion

Thus, the study of the activity of alkaline phosphatase and echo-osteometry of bones makes it possible to assess the severity of osteodystrophy and, accordingly, to differentiate PHPT by forms (renal and mixed) and severity of the disease. High indices of alkaline phosphatase and low indices of echoosteometry were observed in children with impaired renal function and had a direct relationship with the number and size of formed calculi and bone osteoporosis.

References

Table 1: Alkaline phosphatase activity in children with ice (μmol / liter)

<table>
<thead>
<tr>
<th>Study groups children</th>
<th>n</th>
<th>Alkaline phosphatase activity (μmol / liter)</th>
<th>P</th>
</tr>
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<tbody>
<tr>
<td>Healthy children</td>
<td>20</td>
<td>0.82 ± 0.04</td>
<td>p&gt;0,05</td>
</tr>
<tr>
<td>Children with urolithiasis without PGPT (control)</td>
<td>20</td>
<td>0.91 ± 0.06</td>
<td>p&gt;0.05; p1&lt;0.05</td>
</tr>
<tr>
<td>Children with the renal form of PGPT.</td>
<td>16</td>
<td>1.23 ± 0.06</td>
<td>p&lt;0.01; p1&lt;0.01</td>
</tr>
<tr>
<td>Mixed form of PGPT</td>
<td>12</td>
<td>2.3 ± 0.1</td>
<td>p&lt;0.01; p1&lt;0.01</td>
</tr>
<tr>
<td>Renal form of PGPT complicated by renal failure.</td>
<td>13</td>
<td>1.87 ± 0.08</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Mixed form of PGPT complicated by renal failure.</td>
<td>11</td>
<td>6.38 ± 0.22</td>
<td>p&lt;0.001</td>
</tr>
</tbody>
</table>

R - Compared with the indicators of healthy children.
P1 - Compared with the indicators of children with urolithiasis (control).

Table 2: Echoosteometry indices in the examined children

<table>
<thead>
<tr>
<th>Study groups of children</th>
<th>n</th>
<th>Echoosteometry (meter / seconds) / seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Tibia</td>
</tr>
<tr>
<td>1 Healthy children</td>
<td>20</td>
<td>3898±43</td>
</tr>
<tr>
<td>2 Children with urolithiasis disease without HGPT (control)</td>
<td>20</td>
<td>p 3609±37</td>
</tr>
<tr>
<td>3 Renal form PGPT</td>
<td>16</td>
<td>p &lt; 0.05</td>
</tr>
<tr>
<td>4 Mixed form PGPT</td>
<td>12</td>
<td>p 2208±41</td>
</tr>
<tr>
<td>5 Renal form PGPT complicated by renal failure</td>
<td>13</td>
<td>p &lt; 0.05</td>
</tr>
<tr>
<td>6 Mixed PHPT complicated by renal failure</td>
<td>11</td>
<td>p &lt; 0.001</td>
</tr>
</tbody>
</table>

R - Compared with the indicators of healthy children.
P1 - Compared with the indicators of children with urolithiasis (control).


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