Congenital Hypothyroidism and Nephrocalcinosis

Congenital hypothyroidism affects renal growth, which improves on intake of thyroxine supplements(1). Apart from growth, thyroid hormone also has other effects on the kidney. We present here an interesting case of severe congenital hypothyroidism with nephrocalcinosis.

An 8-year-old girl presented with history of delayed milestones, severe malnutrition, decubitus ulcers over buttocks and elbows, and severe constipation. She was a product of non-consanguineous marriage with no significant perinatal history. On examination, she had coarse facial features, bilateral convergent squint, thickened dry skin, delayed dentition and non pitting pedal edema. She had severe growth failure (weight 9.3 kg (-4.4 SDS); height 75 cm (-8.77 SDS); upper segment: lower segment ratio 1.2:1. The child's developmental age was about 6 months.

Investigations revealed microcytic hypochromic anemia (Hb 7.8gm/dL), with sodium 135 mEq/L, potassium 3.4 meq/L, magnesium 1.6 mg/dL, calcium 8.3 mg/dL, phosphates 2.92 mg/dL, and uric acid 4.4 mg/dL. The estimated GFR by Schwartz formula was 46.4 mL/min/1.73m² (creatinine 0.89 mg/dL). Free triiodothyronine was 1.3 pg/mL with free thyroxine 0.10 µgm/dL and thyroid stimulating hormone (TSH) 150 µIU /mL. Venous blood gas showed pH 7.39, bicarbonate 22 mEq/L and base excess 1.4 mEq/L. Radiographs of limbs, pelvis, and skull showed thickened dense calvaria, retarded bone ossification, presence of wormian bones, and presence of epiphyseal dysgenesis in long bones. Radiography showed bone age <1 year and dense calcifications in the renal areas of pelvic film. Ultrasonography of abdomen revealed right kidney 5.2×3.4 cm in size; left kidney 5.0×2.8 cm with bilateral dense medullary nephrocalcinosis. The 24-hours urinary calcium excretion was 5 mg/kg (spot calcium/creatinine ratio 0.6 mg/mg), indicating hypercalciuria. A diagnosis of congenital hypothyroidism with bilateral nephro-calcinosis was made.

The association of congenital hypothyroidism with nephrocalcinosis has been reported previously(2,3). Newman(4) in 1973 reviewed the entity and found that 23 cases were reported in world literature. The mechanism of nephrocalcinosis postulated was that intact mitochondria can accumulate calcium against concentration gradient as an active process using oxidative phosphorylation in proximal or distal renal tubular cells. This mechanism is altered in hypothyroidism, leading to high intracytoplasmic calcium concentrations predisposing to nephrocalcinosis. Studies have shown that supplementation of thyroxine increases serum calcium and 1,25-dihydroxyvitmin D levels. Serum parathormone levels have also been reported to be elevated in adult hypothyroid patients on treatment with thyroxine. This further predisposes to nephrolithiasis.

Thus, apart from impaired renal growth, children with congenital hypothyroidism are also predisposed to nephrolithiasis. Care should be taken to avoid large supplements of calcium or vitamin D during initial treatment of hypothyroidism with thyroxine, as this may exacerbate hypercalciuria and cause nephrocalcinosis.

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