

Hypothyroidism mimicking chronic renal failure in reflux nephropathy

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Abstract

An adolescent with a history of pyelonephritis and renal scarring had antireflux surgery at the age of 2.5 years. His serum creatinine was high at the age of 14 years (133 $\mu\text{mol/l}$; glomerular filtration rate (GFR) 56 $\text{ml/min} \times 1.73 \text{ m}^2$), and reflux nephropathy with chronic renal failure was diagnosed. Because of a fall in height velocity, endocrinological investigations were performed six months later which showed hypothyroidism caused by autoimmune thyroiditis. Substitution with thyroxine was started; renal function improved to normal six months later (GFR 108 $\text{ml/min} \times 1.73 \text{ m}^2$). Metabolic changes of hypothyroidism led to a reduction of GFR in this patient and mimicked chronic renal failure.

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In the early 1950s, the influence of hypothyroidism on renal plasma flow and glomerular filtration rate (GFR) was described,¹ but clinically significant rises in serum creatinine are rare, and hypothyroidism as a cause of raised serum creatinine is not mentioned in textbooks of paediatric nephrology.² We report an adolescent with reflux nephropathy who developed reduced renal function following hypothyroidism caused by autoimmune thyroiditis. Therapy with thyroxine led to a normalisation of GFR after six months.

Case report

The boy was born at 34 weeks of gestation and was treated for respiratory distress. At 11 months he suffered from pyelonephritis. Bilateral vesicoureteric reflux was found by voiding cystourethrography, and scarring in the right

kidney by ultrasound. Reflux persisted on the right side; antireflux surgery was therefore performed at the age of 2.5 years. Renal function was normal at the age of 6 years (GFR 85 $\text{ml/min} \times 1.73 \text{ m}^2$ according the formula of Schwartz). At the age of 14 years, he suffered from mycoplasma pneumonia and was treated with erythromycin. Laboratory investigations showed a serum creatinine of 133 $\mu\text{mol/l}$.

He was admitted for further evaluation. Table 1 presents auxological and laboratory data. GFR was reduced to 56 $\text{ml/min} \times 1.73 \text{ m}^2$ (endogenous creatinine clearance). Urinalysis showed no proteinuria or haematuria. Clinical examination was normal and pubertal stage was 2–3 according to Tanner. Ultrasound showed small kidneys (right kidney 50 ml, left kidney 40 ml) with increased echogenicity and additional renal scarring of the right kidney. Voiding cystourethrography excluded persisting reflux, and DMSA scan confirmed scarring of the right kidney. Therefore, we confirmed the diagnosis of reflux nephropathy with chronic renal failure according to recently accepted criteria.³

Six months later endogenous creatinine clearance had decreased further. Because of a decrease in height velocity, we performed endocrinological investigations which showed raised thyroid stimulating hormone (TSH) and decreased free thyroxine (fT4). Microsomal thyroid antibodies were raised. We diagnosed severe hypothyroidism caused by autoimmune thyroiditis and started treatment with thyroxine (2–3 $\mu\text{g/kg}$ body weight/day). His height and height velocity increased over subsequent months while serum creatinine and GFR normalised (table 1).

Discussion

Renal tubular abnormalities of sodium and water excretion are reported in patients with hypothyroidism. Metabolic changes lead to a decrease in renal plasma flow, glomerular filtration rate, and free water clearance comparable to changes seen in patients with chronic renal failure caused by glomerulonephritis.⁴ The association of hypothyroidism and increased serum creatinine concentrations has been described previously in children.^{5–7}

Our patient had primary renal disease which, at first presentation, was considered to have caused his increase in serum creatinine. At this time, he had no clinical signs of hypothyroidism except height velocity had decreased. Therefore, diagnosis was delayed until thyroid hormones were measured.⁸ Treatment with thyroxine normalised renal function. However, because of reflux nephropathy, he is still at risk

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Table 1 Auxological and laboratory data in a patient with reflux nephropathy and hypothyroidism

Auxological data				
Age (y)	14.0	14.5	15.0	16.0
Height (cm)	143.3	144.2	150.0	158.5
Height velocity (cm/y)		1.8	11.6	8.5
Weight (kg)	46.0	50.2	42.8	51.0
Blood pressure (mm Hg)	82/59	92/62	103/58	113/48
Laboratory findings				
Serum sodium (mmol/l)	139	140	140	143
Serum creatinine ($\mu\text{mol/l}$)	133	168	62	80
Endogenous creatinine clearance ($\text{ml/min} \times 1.73 \text{ m}^2$)	56	42	108	97
Thyroid stimulating hormone* (mU/l)		>300	0.4	0.4
Free thyroxine* (pmol/l)		4	22	17
Microsomal thyroid antibodies* (U/l)		0.79		

Substitution with thyroxine was started at the age of 14.5 years.

*Reference values: thyroid stimulating hormone 0.5–4.0 mU/l; free thyroxine 10–28 pmol/l; microsomal thyroid antibodies <0.1 U/l.

for hypertension and deterioration of renal function in later life.

A study in a larger population of hypothyroid patients showed a small increase of serum creatinine in this group.⁹ Serum creatinine was slightly raised in more than half of 22 hypothyroid patients reported in another study and there was a rapid improvement of GFR to normal values after treatment with thyroxine.¹⁰ In a retrospective study in children with prolonged acquired hypothyroidism, four of five patients had moderate increased serum creatinine concentrations at the time of diagnosis.¹¹ Therefore, increased creatinine concentrations may be common in severe hypothyroidism, but it is rare that this is of clinical relevance as in our patient.

Some case reports also described acute renal failure associated with rhabdomyolysis in patients with hypothyroid myopathy or membranous glomerulonephritis with nephrotic syndrome in autoimmune thyroiditis.^{12 13} Our patient had no signs of myalgia or muscular weakness and showed myoglobinuria or proteinuria which excluded these diagnoses.

In conclusion, we report an adolescent with a history of pyelonephritis and renal scarring and an elevation of serum creatinine at the age of 14 years, which led to the diagnosis of chronic renal failure caused by reflux nephropathy. However, six months later hypothyroidism was diagnosed and renal function improved to normal after therapy with thyroxine. Therefore, hypothyroidism mimicked chronic renal failure in this patient. We recom-

mend considering measurement of thyroid stimulating hormone and thyroid hormones in all patients with raised serum creatinine to exclude disturbances of thyroid function.

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