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.

(Arch Dis Child 2000;83:251-252)

Keywords: hypothyroidism; renal insufficiency; reflux nephropathy

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Accepted 3 April 2000

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.

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

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.

We appreciate the support of Dr E-M Eden, who is responsible for primary care of the patient.

- 1 Yount E, Little JM. Renal clearance in patients with myxedema. *J Clin Endocrinol* 1955;15:343-6.
- 2 Schäfer F, Mehls O. Endocrine, metabolic and growth disorders. In: Holliday MA, Barratt TM, Avner ED, eds. *Pediatric nephrology*, 3rd edition. Baltimore: Williams & Wilkins, 1993:1241-86.
- 3 Dillon MJ, Goonasekera CDA. Reflux nephropathy. *J Am Soc Nephrol* 1998;9:2377-83.
- 4 Allon M, Harrow A, Pasque CB, Rodriguez M. Renal sodium and water handling in hypothyroid patients: the role of renal insufficiency. *J Am Soc Nephrol* 1990;1:205-10.
- 5 Steiger MJ, Watson AR, Morgan AG. Hypothyroidism and renal impairment. *J R Soc Med* 1991;84:688-9.
- 6 McLaughlin KJ, Mactier RA. Renal impairment in hypothyroidism. *Nephrol Dial Transplant* 1994;9:1521-2.
- 7 Hall C, Batch J, Jones C. Increased serum creatinine associated with severe primary hypothyroidism. *J Paediatr Child Health* 1996;32:73-4.
- 8 Lafranchi S. Diagnosis and treatment of hypothyroidism in children. *Compr Ther* 1987;13:20-30.
- 9 Verhelst J, Berwaerts J, Marescau B, Abs R, Neels H, Mahler C, De Deyn PP. Serum creatine, creatinine, and other guanidino compounds in patients with thyroid dysfunction. *Metabolism* 1997;46:1063-7.
- 10 Montenegro J, González O, Saracho R, Aguirre R, González O, Martínez I. Changes in renal function in primary hypothyroidism. *Am J Kidney Dis* 1996;27:195-8.
- 11 Al-Fifi S, Girardin C, Sharma A, Rodd C. Moderate renal failure in association with prolonged acquired hypothyroidism in children. *Acta Paediatr* 1999;88:715-17.
- 12 Gepner P, Botto H, Piette AM, Gravelleau Ph, Chapman A. Myopathie hypothyroïdienne: à propos d'un cas avec élévation majeure de la créatine phosphokinase, myoglobulinémie et insuffisance rénale transitoire. *Rev Med Interne* 1990;11:165-7.
- 13 Jordan SC, Buckingham B, Sakai R, Olson D. Studies of immune-complex glomerulonephritis mediated by human thyroglobulin. *N Engl J Med* 1981;304:1212-15.