

Renal and hepatic impairment in hypothyroidism

Cecília Martins, Eduarda Marques, Graça Ferreira, Rosa Arménia Campos, António Vilarinho, Jorge Sales Marques

Paediatrics Department, Vila Nova de Gaia Hospital. Gaia, Portugal.

Received for publication: 07/12/2010

Accepted in revised form: 07/11/2011

ABSTRACT

Hypothyroidism is defined as low serum thyroid hormones, and it is established that thyroxine plays a role in renal and hepatic function. Despite this established relationship, there are few cases reporting this association.

We present the case of a fourteen-year-old girl who complained of depression, weight gain and hirsutism. She was obese, apathetic and had poverty of movements. She had anaemia, deteriorated renal function and elevated hepatic enzymes. Free T₃ was <0.19 pg/mL and TSH 276 UI/mL. Antithyroglobulin and antimicrosome antibodies were positive, and the thyroid ultrasonography revealed thyroiditis. She started thyroxine and after two months her thyroid, renal and hepatic functions were normal.

Despite being barely mentioned in the literature, the systemic involvement in hypothyroidism is frequent in clinical practice, and evaluating renal and hepatic function in children with hypothyroidism is therefore recommended.

Key-Words:

Hepatic dysfunction; hypothyroidism; renal impairment.

INTRODUCTION

Hypothyroidism is defined as low serum thyroid hormones. Many are the systemic manifestations occurring in this situation, and, in practice, thyroid tests are often ordered when overt hypothyroidism

is unlikely to be found, such as in cases of congestive heart failure, pericarditis, fatigue, depression, psychosis, ataxia, obesity and in girls with irregular menses^{1,2}. It is established that thyroxine plays a role in renal and hepatic function³⁻⁶. In the kidney, the hormone influences glomerular filtration rate as well as tubular function^{3,6}. In the liver, it is responsible for normal hepatic function, including lipoprotein metabolism^{4,5}. Despite the relation between thyroid hormones and the kidney and liver function, there are few cases reporting renal and hepatic impairment associated with hypothyroidism^{7,8}.

CASE REPORT

We report a case of a fourteen-year-old girl who was referred to a psychiatrist, complaining of depression. She also complained of weight gain, cold intolerance and amenorrhoea, the original reasons she was referred to a paediatrician.

Personal history revealed menarche at the age of 12, poor scholastic performance and poor socio-familial environment. She had had hirsutism for about a year and a half with no other relevant personal antecedents. Family history revealed sarcoidosis in her mother and diabetes mellitus type 2 in her grandmothers.

On physical examination she was apathetic, had slow speech and poverty of movements. She had normal blood pressure, cardiac frequency and temperature. Height was in the 50th percentile and weight

above 95th percentile. Her body mass index (BMI) was 28.74. Her skin was pale, had hirsutism and was in Tanner's V state. Thyroid was not palpable, and there were no other particularities in physical examination.

The blood cell count revealed normochromic and normocytic anaemia (Hg 9.8 g/dL, MCV 94.8 fl, MCHC 33.7 g/dL), with normal platelets and white blood cells. The sedimentation rate was high: 26 mm/h. Creatinine was 1.72 mg/dL and urea 32 mg/dL. Schwartz formula showed a creatinine clearance of 53 mL/min/1.73 m². Urine analysis did not reveal abnormalities. There was no hydroelectrolytic disorder. Hepatic enzymes were abnormal: ALT 131 U/L, AST 118 U/L, LDH 724 U/L and CK 742 U/L. Total cholesterol was 380 mg/dL and triglycerides 440 mg/dL. Free T₃ was 0.19 pg/mL, free T₄ 0.42 ng/dL and TSH 276 UI/mL. A hormonal study (FSH, LH, Estradiol, Prolactin, ACTH, PTH, Cortisol, DHEPA and testosterone) was normal. Antithyroglobulin and antimicrosome antibodies were positive. ANA were positive with a speckled pattern. The anti-SCL 70, anti-DNA, anti-Sm, anti-RNP, anti-SS A and SS antibodies and ANCA were negative. Serum complement, immunoglobulins and rheumatoid factor were normal. Thyroid ultrasonography revealed images compatible with thyroiditis; echocardiogram showed a medium volume effusion and abdominal ultrasonography was normal. She was started on thyroxine 0.15 mg/day, and a month later renal function and hepatic enzymes were normal. After two months of therapy, thyroid function was normal too. No alterations in renal and thyroid function and hepatic enzymes were found during follow-up.

■ DISCUSSION

The description of systemic involvement in children with hypothyroidism is rare. Textbooks of paediatric endocrinology and nephrology rarely reveal an association of hypothyroidism with metabolic and renal dysfunction.

Primary hypothyroidism is associated with a consistent elevation in serum creatinine levels⁸. The

greater the impairment in thyroid function, the more common the occurrence of renal dysfunction^{9,10}. This has been reported in the paediatric population¹¹⁻¹⁴. Description of hepatic impairment in these children is rarer⁷.

The exact mechanism by which renal function is affected in hypothyroidism is not completely understood. There are some theories explaining this relation. The hypodynamic state in children with hypothyroidism may lead to renal hypoperfusion and so diminished glomerular filtration³. Other possibility is that the rise in myoglobin, frequently seen in myopathy states such as hypothyroidism, may lead to myoglobinuria which in turn can have a toxic effect on the kidney¹⁵. Nevertheless, a multifactorial explanation is still the most likely. It is known that low thyroxine is responsible for lipid profile abnormalities that will consequently elevate hepatic enzymes^{4,5}.

The 14-year-old girl reported had hypothyroidism and renal insufficiency with hypercreatinemia and decreased creatinine clearance. She also presented elevated hepatic enzyme levels along with total cholesterol and triglyceride levels. Although her complaints could be wholly explained by the hypothyroid state, she had a systemic involvement with numerous serum abnormalities that would not have been brought to light if she had not undergone a wide-ranging analysis.

All symptoms and serum changes cleared completely with thyroid replacement therapy, consistent with previously published studies^{6,9,16}.

It is possible that the systemic involvement in hypothyroidism is not well reported because renal and hepatic functions are not routinely monitored in children with thyroid disease.

Thus, the authors propose evaluating renal function and hepatic enzymes along with lipid profile in patients with hypothyroidism.

Conflict of interest statement. None declared.

References

1. Kaplowitz PB. Subclinical hypothyroidism in children: normal variation or sign of a failing thyroid gland? *Int J Pediatr Endocrinol* 2010;2010:281453
2. Kostoglou-Athanassiou I, Ntalles K. Hypothyroidism – new aspects of an old disease. *Hippokratia* 2010;14:82-7
3. Katz AI, Emmanouel DS, Lindheimer MD. Thyroid hormone and the kidney. *Nephron* 1975;15:223-49
4. Malik R, Hodgson H. The relationship between the thyroid gland and the liver. *QJM* 2002;95:559-69
5. Brenta G, Berg G, Arias P, *et al*. Lipoprotein alterations, hepatic lipase activity and insulin sensitivity in subclinical hypothyroidism: response to L-T₄ treatment. *Thyroid* 2007;17:453-60
6. Lo JC, Chertow GM, Go AS, Hsu CY. Increased prevalence of subclinical and clinical hypothyroidism in persons with chronic kidney disease. *Kidney Int* 2005;67:1047-52
7. Shaikh MG, McLachlan K, Stirling H. Renal and hepatic dysfunction in hypothyroid children. *Acta Ped* 2007;96:605-6
8. Del-Río Camacho G, Tapia Ceballos L, Picazo Angelín B, Ruiz Moreno JA, Hortas Nieto ML, Romero González J. Renal failure and acquired hypothyroidism. *Pediatr Nephrol* 2003;18:290-2
9. Nakahama H, Sakagushi K, Horita Y, *et al*. Treatment of severe hypothyroidism reduced serum creatinine levels in two chronic renal failure patients. *Nephron* 2001;88:264-7
10. Chonchol M, Lippi G, Salvagno G, Zoppini G, Muggeo M, Targher G. Prevalence of Subclinical Hypothyroidism in Patients with Chronic Kidney Disease. *Clin J Am Soc Nephrol* 2008;3:1296-300
11. Al-Fifi S, Girardin C, Sharma A, Rodd C. Moderate renal failure in association with prolonged acquired hypothyroidism in children. *Acta Paediatr* 1999;88:715-7
12. Hall C, Batch J, Jones C. Increased serum creatinine associated with severe primary hypothyroidism. *J Paediatr Child Health* 1996;32:73-4
13. Kreisman SH, Hennessey JV. Consistent reversible elevations of serum creatinine levels in severe hypothyroidism. *Arch Inter Med* 1999;159:79-82
14. Asami T, Uchiyama M. Elevated serum creatinine levels in infants with congenital hypothyroidism: reflection of decreased renal function? *Acta Paediatr* 2000;89:1431-4
15. Lafayette RA, Costa ME, King AJ. Increased serum creatinine in the absence of renal failure in profound hypothyroidism. *Am J Med* 1994;96:298-9
16. Montasser DI, Hassani M, Zajjari Y, *et al*. Clinical case of acute renal failure revealing an autoimmune hypothyroidism. *Nephrol Ther* 2010;6:128-31

Correspondence to:

Dr Cecília Martins
 Av. República, 2194, 2^o frente
 4430 Gaia, Portugal
 E-mail: ceciliamartins@net.sapo.pt