

# THYROID-RELATED BONE LESIONS : clinical illustration

S. Tribolet (1), R. Nicolescu (2)

University Department of Pediatrics, CHR LA CITADELLE, University of Liège.

<sup>1</sup> Pediatric resident, University of Liège

<sup>2</sup> Pediatrician endocrinologist, Pediatrics unit, CHR Citadelle, 4000 Liège

## INTRODUCTION :

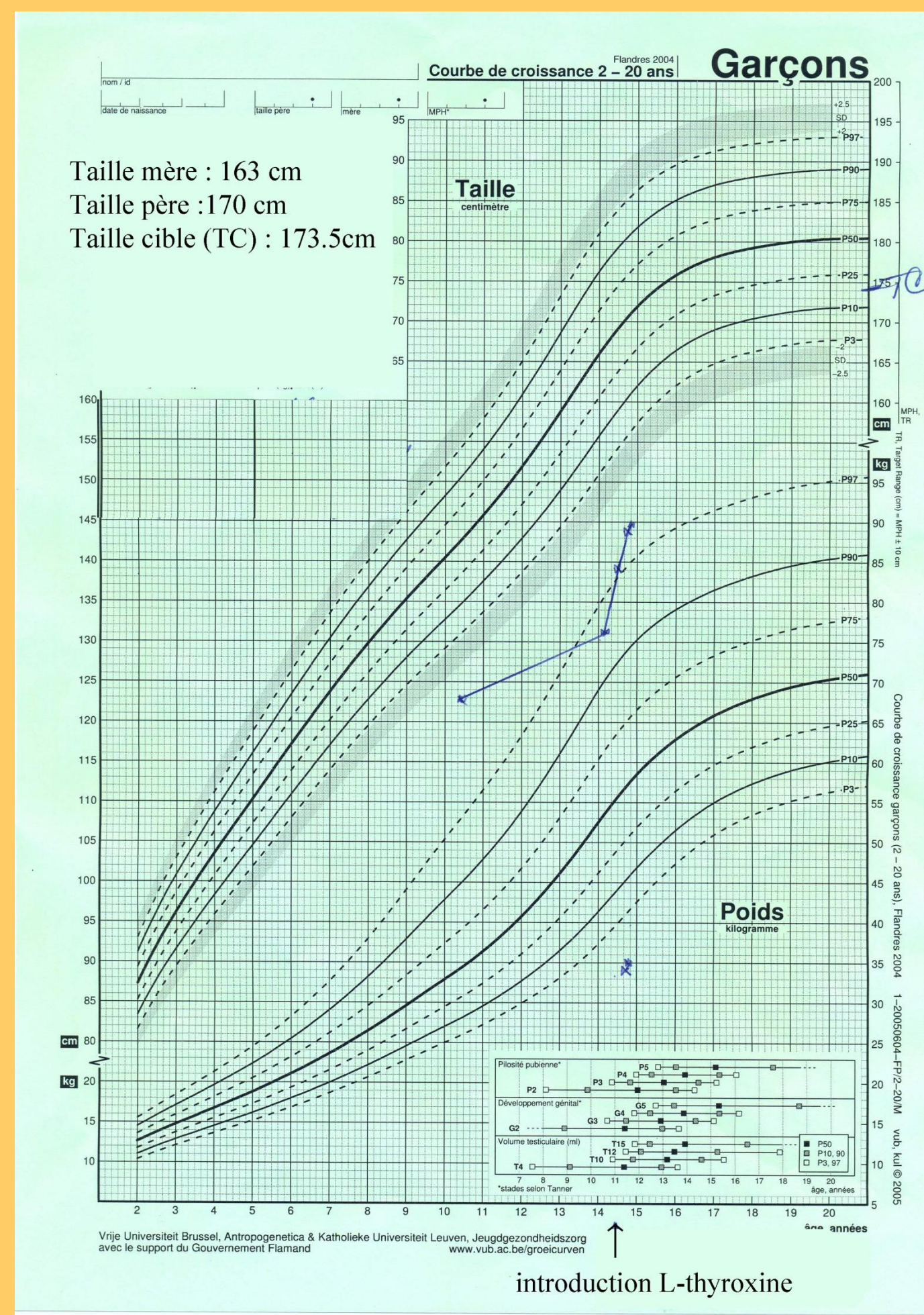
Primary hypothyroidism is a common endocrine disease. Although the diagnosis is often simple, some clinical presentations are rarer. The association of short stature, epiphysis bone lesions and severe retarded bone age in children should lead to the diagnosis of severe, long-standing acquired hypothyroidism.

## CLINICAL CASE :

- A 14-year-old boy presents bilateral hip pain that have been evolving for 3 days (already intermittent for 2 years)
- Pain increase with mobilization and weight bearing.
- No fever and no history of trauma.

### - Radiology :

condensation and fragmentation of the epiphyseal nuclei bilaterally with irregular aspect of cotyles?  
→ diagnosis of severe and bilateral Legg-Calve-Perthes disease (infirmated afterward)



### - Clinical examination :

- internal and external rotation of hips provoked pain
- no neurological deficiency.
- very short proportionate stature (133cm)
- abnormal phenotypic features of the patient : relatively macrocephaly and macroorchidism

### - Additional tests :

- Biology :
  - no inflammatory syndrome;
  - low level of T3 and T4 hormones;
  - very high TSH level in serum (312mUI/l);
  - no antibodies against thyroid;
  - gonadotrophin, cortisol normals ;
  - growth hormones (IGF-1 and IGF-BP3) a little bit reduced;

- US : atrophic thyroid

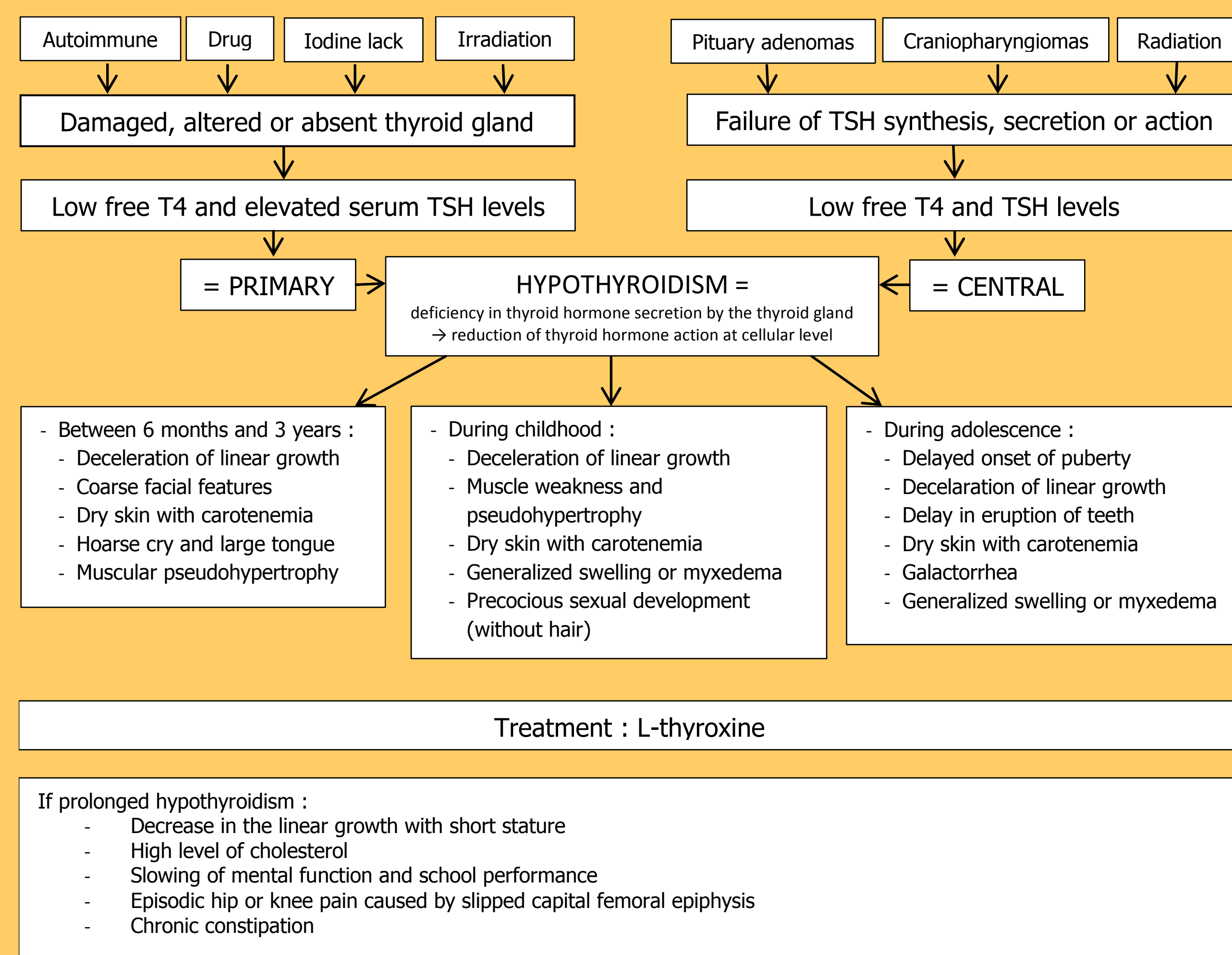
- Bone maturation : 6 years (Graulich and Pyle atlas)

- Treatment : L-thyroxine with progressive dosis

- Evolution : favorable with linear growth acceleration

→ diagnosis of **severe acquired hypothyroidism**

## HYPOTHYROIDISM :



### Bone-related lesions :

- retarded growth and bone maturation with delayed ossification
- reduced postnatal growth and bone mineralization
- delayed closure of the cranial sutures in early life
- greater thickness in cortical bone with ↑ risk of fractures
- disturbances of endochondral ossification

## THYROID AND BONE:

### Actions of T3 :

- During bone formation : - stimulation of osteoblast proliferation, differentiation and apoptosis
  - ↑ the expression of osteocalcin, type 1 collagen, alkaline phosphatase, IGF1,...
- During bone resorption : - ↑ expression of IL6 and PGE2 (differentiating factors of osteoclast lineage)
  - synergistic action with PTH and vitamin D
  - activation of RANK, a key step in osteoclastogenesis

→ **anabolism during development and catabolism after bone maturation**

### Actions of TSH :

- negative regulator of bone turnover
- enhanced bone remodeling and osteoporosis

### -Mains effects of thyroid disorders on bone :

	Hypothyroidism	Hyperthyroidism
<b>On bone remodeling cycle</b>		
Deiodinases 2 activity	Maximum	Minimum
Osteoblastic and osteoclastic activity	↓	↑
Duration of bone remodeling cycle	Prolonged (mainly resorption phase)	Reduced (mainly formation phase)
<b>On young skeleton</b>		
Growth velocity	↓	↑
Bone mineralization	↓	↑
Intramembranous ossification/bone age	↓	↑
Final stature	↓ and disproportionate	↓ and proportionate

## CONCLUSION :

Relationships between endocrine-associated biochemical abnormalities and altered growth plate structure and function are known. Hypothyroidism in children results in short stature and delayed bone maturation with a fragmentation of the femoral heads, misdiagnosed as Legg-Calve-Perthes disease, as in this clinical case. Recuperation of the expected weight and of the bone mineralization depends on the duration and severity of the lack of hormones.