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.
- 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 norms;
    - Growth hormones (IGF-1 and IGF-BP3) a little bit reduced;
- Diagnosis of severe acquired hypothyroidism
- Radiology:
  - Condensation and fragmentation of the epiphysal nuclei bilateraly with irregular aspect of coxyles?
  - Diagnosis of severe and bilateral Legg-Calvé-Perthes disease (informed afterward)
- US: atrophic thyroid
- Bone maturation: 6 years (Graulich and Pyle atlas)
- Treatment: l-thyroxine with progressive doses
- Evolution: favorable with linear growth acceleration

HYPOTHYROIDISM:

- Low free T4 and elevated serum TSH levels
- Hypothyroidism is a decrease of thyroid hormone action at cellular level
- THYROID dysfunction may be prolonged in children

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 1 risk of fractures
- Disturbances of endochondral ossification
- Painful hip or leg pain caused by slipped capital femoral epiphysis
- Osteoporosis
- Decreased bone density

THYROID AND BONE:

Actions of T3:
- During bone formation: - Stimulation of osteoblast proliferation, differentiation and apoptosis
- Expression of osteocalcin, type 1 collagen, alkaline phosphatase, IGF1, ...
- During bone resorption: - Synergistic action with PTH and vitamin D
- Activation of RANK, a key step in osteodestogonosis
- 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:

<table>
<thead>
<tr>
<th>Hypothyroidism</th>
<th>Hyperthyroidism</th>
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<tbody>
<tr>
<td>On bone remodeling cycle</td>
<td>Maximum</td>
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<tr>
<td>Osteoblastic and osteoclastic activity</td>
<td>↓</td>
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<tr>
<td>Duration of bone remodeling cycle</td>
<td>Prolonged (mainly resorption phase)</td>
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<td>On young skeleton</td>
<td>Growth velocity</td>
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<tr>
<td>Bone mineralization</td>
<td>↓</td>
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<tr>
<td>Intramembranous ossification/bone age</td>
<td>↓</td>
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<tr>
<td>Final stature</td>
<td>↓ and disproportionate</td>
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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-Calvé-Perthes disease, as in this clinical case.
Recovery of the expected weight and of the bone mineralization depends on the duration and severity of the lack of hormones.