Pituitary Diseases and Bone

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KEYWORDS

• Pituitary diseases • Osteoporosis • Bone mineral density • Fractures
• Growth hormone • Prolactin • Cortisol • Sex steroids

KEY POINTS

- Fragility fractures are frequent complications of pituitary diseases.
- Deficiency and excess of growth hormone may be cause of skeletal fragility.
- Overtreatment of central hypoadrenalism and hypothyroidism may contribute to an increased fracture risk in patients with hypopituitarism.
- In pituitary diseases, the occurrence of vertebral fractures is not strictly dependent on bone mineral density.

INTRODUCTION

The skeleton is an extremely dynamic tissue with a continuous remodeling process guided by bone-forming osteoblasts and bone-resorbing osteoclasts.[1] The traditional paradigm is that pituitary-derived hormones exert their biological effects on bone by peripheral mediators produced by target glands under their stimulation. However, pituitary hormones have been also shown to bypass peripheral endocrine organs, possibly exerting remarkable direct effects on the skeleton (**Fig. 1**).[2–10]

SKELETAL FRAGILITY IN PITUITARY DISEASES: CLINICAL AND THERAPEUTIC ASPECTS

Prolactin-Secreting Adenomas

Patients with prolactinomas have high bone turnover (**Box 1**), with uncoupling between bone resorption and bone formation markers in some experiences.[11] This uncoupled bone turnover may explain the bone loss, with osteopenia and osteoporosis occurring predominantly at the lumbar spine[12] in association with hypogonadism, duration of disease, serum values of prolactin (PRL), and bone turnover markers.[13,14] Patients with prolactinomas may develop vertebral and nonvertebral fractures.[15–17] A high prevalence of morphometric vertebral fractures[18] (**Box 2**) was

The authors have nothing to disclose.
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Endocrinol Metab Clin N Am 44 (2015) 171–180
http://dx.doi.org/10.1016/j.ecl.2014.10.014 **endo.theclinics.com**
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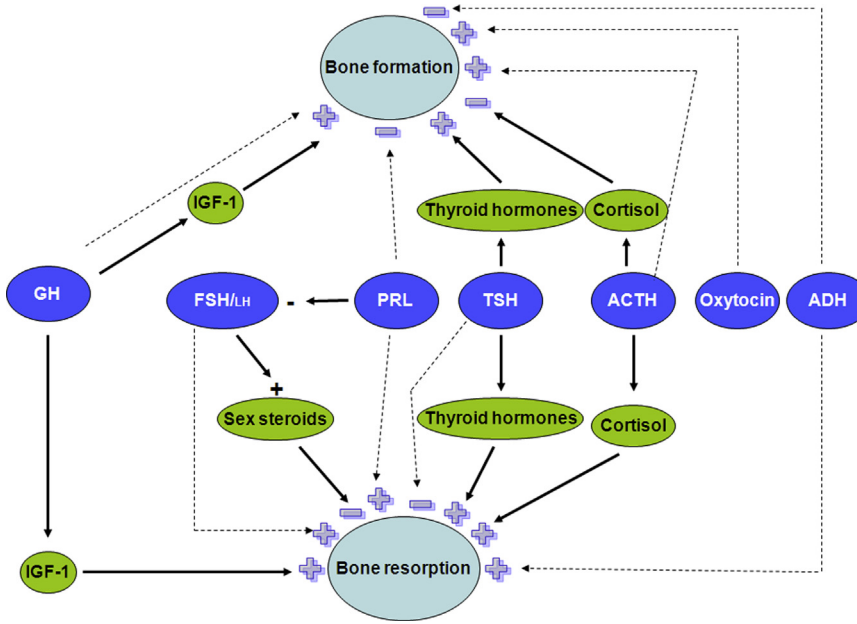

Fig. 1. Direct and indirect effects of pituitary hormones on bone remodeling. ACTH, corticotropin; +, positive effect; −, negative effect; ADH, antidiuretic hormone/vasopressin; dashed line, suggested effect; FSH, follicle-stimulating hormone; GH, growth hormone; IGF-1, insulin-like growth factor 1; LH, luteinizing hormone; PRL, prolactin; solid line, well-demonstrated effect; TSH, thyrotropin.

Box 1
Bone turnover in pituitary diseases

Suppression of bone turnover
- Growth hormone deficiency
- Cushing disease
- Overtreatment of central hypoadrenalism

Increase of bone turnover
- Acromegaly
- Hypogonadism
- Prolactinomas
- Overtreatment of central hypothyroidism

Box 2
Morphometric classification of radiologic vertebral fractures

Vertebral fractures are identified by marking the vertebral body with 6 points to describe the vertebral shape and heights. According to the quantitative morphometric approach, vertebral fractures are defined as mild, moderate, and severe, based on a height ratio decrease of 20% to 25%, 25% to 40%, and more than 40%, respectively.