



# POSNA

## The Core Curriculum

### Thyroid disorders

#### Objectives

1. Discuss the effect of thyroid hormone on normal growth
2. Describe the clinical features of hypothyroidism in children
3. Describe radiographic findings associated with hypothyroidism
4. Describe the effect of calcitonin on bone and kidney
5. Discuss the orthopaedic condition most associated with hypothyroidism in children

#### Discussion

Thyroid function plays a critical role in the normal growth and development of children. Cretinism, an unambiguously unflattering term, is used to describe the effects of hypothyroidism in the newborn. Affected infants demonstrate short stature, mental retardation, developmental delay, coarse hair, constipation, and a protruding tongue. In the older child, the major features are related to growth delay and lethargy. Sluggish reflexes are an important physical sign of hypothyroidism. Radiographically, delayed bone age is an important factor in diagnosis; sometimes the epiphysis can be fragmented and appear similar to osteonecrosis. Hypothyroid children were found to have elevated serum calcium and 1,25 dihydroxyvitamin D, and lowered calcitonin. These findings reverted to normal after treatment, but if treatment for hypothyroidism in children is delayed, the growth retardation may be permanent. A rat study demonstrated that the effect of thyroid hormone on growth plates was independent of that of growth hormone. Calcitonin acts to decrease bone resorption, increase calcium and phosphorus excretion, and stimulate formation of 24,25 dihydroxyvitamin D, the inactive metabolite. Calcitonin secretion by the parafollicular cells of the thyroid is normally stimulated by hypercalcemia. Children with hyperthyroidism have been noted to have accelerated growth and maturation

Slipped capital epiphysis is associated with endocrinopathies, including hypothyroidism, but is particularly associated with the time that treatment is instituted for hypothyroidism. Slipped capital femoral epiphysis accompanying hypothyroidism has regularly been bilateral and bilateral fixation has been advocated on a routine basis in this situation. A case has been made for routine thyroid screening in children with slipped capital femoral epiphysis, this would seem particularly appropriate when the affected child is of short stature.

## References

1. Bijlsma JW, Duursma SA, Roelofs JM, der Kinderen PJ. Thyroid function and bone turnover. *Acta Endocrinologica* 1983;104(1):42-9.
2. Kruse K, Suss A, Busse M, Schneider P. Monomeric serum calcitonin and bone turnover during anticonvulsant treatment and in congenital hypothyroidism. *Journal of Pediatrics* 1987;111(1):57-63.
3. Lewinson D, Harel Z, Shenzer P, Silbermann M, Hochberg Z. Effect of thyroid hormone and growth hormone on recovery from hypothyroidism of epiphyseal growth plate cartilage and its adjacent bone. *Endocrinology* 1989;124(2):937-45.
4. Mosekilde L, Melsen F. Morphometric and dynamic studies of bone changes in hypothyroidism. *Acta Pathologica et Microbiologica Scandinavica - Section A, Pathology* 1978;86(1):56-62.
5. Rivkees SA, Bode HH, Crawford JD. Long-term growth in juvenile acquired hypothyroidism: the failure to achieve normal adult stature. *New England Journal of Medicine* 1988;318(10):599-602.
6. Schlesinger S, MacGillivray MH, Munschauer RW. Acceleration of growth and bone maturation in childhood thyrotoxicosis. *Journal of Pediatrics* 1973;83(2):233-6.
7. Verrotti A, Greco R, Altobelli E, Morgese G, Chiarelli F. Bone metabolism in children with congenital hypothyroidism--a longitudinal study. *Journal of Pediatric Endocrinology & Metabolism* 1998;11(6):699-705.
8. Weber G, Mora S, Bellini A, Bosco M, Prinster C, Siragusa V, et al. Bone mineral metabolism and thyroid replacement therapy in congenital hypothyroid infants and young children. *Journal of Endocrinological Investigation* 1995;18(4):277-82.
9. Wells D, King JD, Roe TF, Kaufman FR. Review of slipped capital femoral epiphysis associated with endocrine disease. *Journal of Pediatric Orthopedics* 1993;13(5):610-4.
10. Zaleske DJ. Metabolic and endocrine abnormalities. In: Morrissy RT, Weinstein SL, editors. *Pediatric Orthopaedics*. Philadelphia: Lippincott-Raven; 1996. p. 137-201.
11. Zubrow AB, Lane JM, Parks JS. Slipped capital femoral epiphysis occurring during treatment for hypothyroidism. *Journal of Bone & Joint Surgery - American Volume* 1978;60(2):256-8.
12. Gamble JG. *The musculoskeletal system. Physiological basis*. New York: Raven Press; 1988.