

# Osteomalacia

## Ostoemalacia

### Definition of Disease

Osteomalacia/ Rickets is a metabolic bone disease characterized by inadequate bone mineralization. The remodeling cycle proceeds normally through osteoid formation, but mineral calcification fails to occur. Rickets is the term used to describe the condition prior to the closing of the physis. Osteomalacia is used after physis closure.

### Pathophysiology

Crystallization of minerals in osteoid requires adequate concentrations of ionized calcium and phosphate. Vitamin D influences these levels after its dihydroxylation into calcitriol (hepatic position 25 and renal position 1). When concentrations are too low crystallization does not proceed normally. Vitamin D disrupts mineralization because it normally regulates and enhances the absorption of calcium in the intestine. A lack of vitamin D causes plasma calcium concentrations to fall. Low plasma calcium levels stimulate parathyroid hormone (PTH). PTH raises calcium concentration but also increases renal clearance of phosphate. When phosphate decreases below a critical level, mineralization cannot proceed normally.

### Genetics

Hereditary forms of osteomalacia include:

- Hypophosphatemic vitamin D resistant rickets, an X-linked, autosomal dominant disorder,
- Hypophosphatemic rickets with hypercalciuria autosomal recessive
- Vitamin D dependant rickets caused by a mutation in the renal tubular 25-hydroxyvitamin D hydrolase

Hereditary forms of vitamin D deficiency and resistance, identified in childhood, are associated with osteomalacia in adults, but these disorders are rare.

### Epidemiology

Osteomalacia is rare in the United States and Western Europe. There is a growing prevalence of vitamin D deficiency in many countries, which when severe and prolonged results in hypocalcemia, secondary hyperparathyroidism, secondary hypophosphatemia, and osteomalacia. Populations at risk include:

- The homebound elderly who have little sun exposure and insufficient dietary calcium and vitamin D
- Patients with malabsorption related to gastrointestinal bypass surgery, crohns, or celiac disease
- Vegetarian diets without vitamin D supplementation
- Women who wear traditional veils or dresses that prevent sun exposure
- Patient on long term anticonvulsant therapy i.e. phenytoin and phenobarbital
- Rifampin and glucocorticoids
- Tumor induced osteomalacia i.e. paraneoplastic syndrome of renal phosphate wasting by tumor secretion of phosphatonin

### Disease described

The principle abnormality associated with Osteomalacia/ Rickets is a defect in the mineralization of the osteoid matrix. It can be definitively diagnosed by bone biopsy. The clinical syndrome associated with osteomalacia consists of pain, myopathy, and fracture.

### Sign and Symptoms

- Pain, sometimes severe, in bones, particularly in the pelvis, lower back and legs. Tenderness may sometimes be felt in the shins and in other bones.
- The patient usually walks with feet rather widely separated and may appear to waddle. Deformities of the pelvis and long bones may be obvious.
- Tetany is manifested by involuntary twitching of the muscles of the face or by carpedal spasm.

- Spontaneous fractures may be a feature. Before the deformities are clinically detectable, diagnosis may be made by X-ray examination, which will show rarefaction or decalcification of bones all over the body.

## Diagnosis

- Blood and urine tests. In cases of osteomalacia caused by vitamin D deficiency or by phosphorus loss, abnormal levels of vitamin D and the minerals calcium and phosphorus are often detected.
- X-ray. Slight cracks in bones that are visible on X-rays, referred to as Looser transformation zones, are a characteristic feature of osteomalacia.
- Bone biopsy. High specificity in detecting osteomalacia, it's not often needed to make the diagnosis.
- ALP and PTH may be done to rule out renal disorders causing the problem.

## Treatment

Osteomalacia is managed by treating the underlying cause. If vitamin-D deficiency is diagnosed, repletion can be accomplished with:

- Oral vitamin D, 1000 IU per day.
- Neutral phosphate salts, 500 mg four times daily.
- Long-term anticonvulsant therapy may be supplemented with 400 to 800 IU of vitamin D daily.
- Hepatobiliary disease or chronic renal failure is managed with supplemental 25(OH)D ( calcifediol) and 1,25(OH)2D ( calcitriol) (Lexicomp, 2014).

## Links

<http://www.mayoclinic.org/diseases-conditions/osteomalacia/basics/definition/con-20029393>

<http://my.clevelandclinic.org/orthopaedics-rheumatology/diseases-conditions/hic-osteomalacia.aspx>

## Related current articles

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1819593/>

<http://onlinelibrary.wiley.com/store/10.1111/j.1753-4887.2008.00100.x/asset/j.1753-4887.2008.00100.x.pdf?v=1&t=hta9wzlo&s=bd3005296b46d52d150162df20d17a80f485c5da>

## References

Donghi, V., Di Frenna, M., Di Lascio, A., Chiumello, G., & Weber, G. (2012). Vitamin D dependent rickets, diagnostic and therapeutic difficulties: Two case reports. *Journal of Pediatric Endocrinology and Metabolism*, 24, 801-805. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/22145480>

Hereditary hypophosphatemic rickets and tumor-induced osteomalacia. (2014). Retrieved 3/25/2014, from <http://www.uptodate.com/contents/hereditary-hypophosphatemic-rickets-and-tumor-induced-osteomalacia>

Lexicomp (2014). *Osteomalacia and rickets (2.0.1)* [Mobile application software]

McCance, K., & Heuther, S. (2014). *Pathophysiology: The biological basis for disease in adults and children (7th ed.)*. St. Louis, MO.: Elsevier/Mosby.