# Rickets

**Rickets** is one of the most common acquired diseases of the musculoskeletal system affecting children.

## Etiopathogenesis and pathological anatomy

The disease corresponds to osteomalacia in adulthood[1].

### Calcipenic rickets

The cause of this type of rickets is a lack of Ca nebo vitamin D, which can be caused by vitamin resorption disorders in the intestine, their insufficient intake, or lower exposure to sunlight. The result is insufficient mineralization of the osteoid. Furthermore, the bony beams are lined with strips of unossified matrix, the bone is expanded in the landscape of growth cartilage is soft and can bend. This results in characteristic changes of the growing skeleton[1].

### Phosphopenic rickets

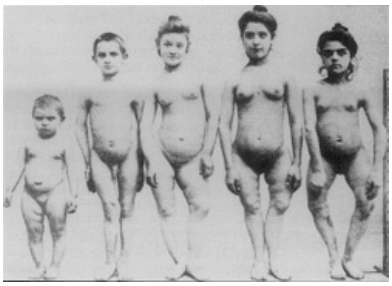
The cause of phosphopenic rickets is a lack of phosphates, which is caused by their increased losses in the kidneys[1].

### Vitamin D-resistant rickets

We classify this type among **hereditary** (*autosomal recessive*) diseases that are caused by disorders of phosphate and calcium metabolism[1]. Among the causes are insufficient *1-hydroxylation* of calcidiol in the kidneys or a malfunction of receptors for calcitriol. In addition to bone deformity, the manifestations include hypoplasia of the teeth.

## Clinical picture

The child is often apathetic, sleepy, pale, irritable, and has an enlarged belly[1]. Insufficient mineralization of the skeleton leads to a decrease in the resistance of bones to loads[2].


Siblings with rickets

### Typical deformities of the growing skeleton

#### Kraniotabes rachitica

n this deformity, the fontanels close late. The calf in the header is soft. Sometimes there is deformation due to the pressure of the growing brain into the form of caput quadratum, which is manifested by the prominence of the bumps of the frontal and parietal bones [2][1].

#### Rickets rosary

Deformity manifested by a symmetrical spherical expansion of the transition between the bony and cartilaginous part of the ribs[2].

#### Harrison's furrow

Another name *for lacing groove* is a circular groove deforming the distal part of the chest[2].

#### Sitzbuckel

These are vertebral deformities in which there is insufficient mineralization of the vertebral bodies. In severe cases, it causes gibbus[2].

#### Crura vara rachitic

The manifestation is typical varus deformities of the lower legs[2].

#### Pelvic deformities

The pelvis is flattened, shaped like a three-cornered hat[2].

#### Fractures

Fractures of long bones often occur[2].

## Laboratory finding

1. Alkaline phosphatase (ALP) is **increased** (result of bone remodeling)[2].

2. Calcium (Ca) in the serum is **slightly reduced**,or **normal**[2].

3. Serum phosphate (P) level is **reduced**[2].

## X-ray image

On the X-ray image, we can find cup-shaped metaphyses, enlarged epiphyseal cartilages or angular bone deformities [1]. The X-ray picture is typical. We differentiate **4 x-ray stages:**

#### 1st stage (acute)

The epiphysis and the contour of the metaphysis is irregular. If the epiphysis already contains an ossifying core, then it is indistinct and irregular[2].

#### 2nd stage

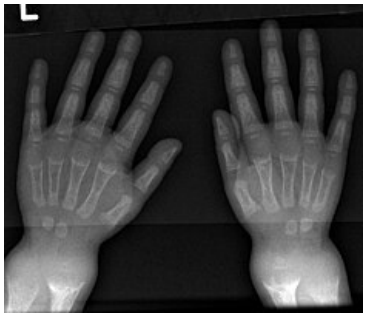
The pineal gland is irregular. The metaphysis is wider than normal as a result of being "pushed" to the sides by the load, it also takes on a cup-like shape. There is a loss of thickening of the periosteum, and the curvature of the bones affected by the compact appears. Condensation of corticalis occurs in the concavity of curvature[2].

#### 3rd stage

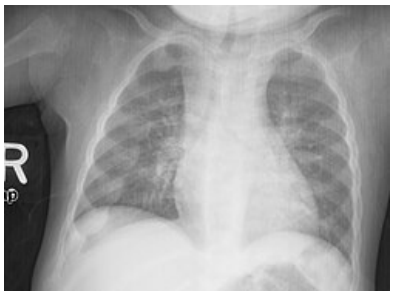
***There is a thickening of the shadow of the metaphysis and the characteristic Looser's zones*** appear , which are lines of condensation that run transversely through the end of the metaphyses. Furthermore, we can observe the difference in the width of the metaphysis and epiphysis[2].

#### 4th stage

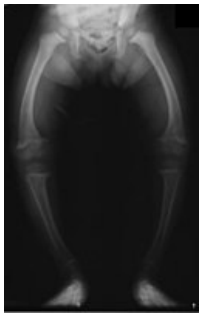
In the last stage, reparation and gradual restoration of the normal bone structure occurs, as well as its calcification[2].



Typical x-ray image of florid rickets - *rachitic cups* = cup-like enlargement at the distal ends of the ulna and radius



Rachitic rosary on x-ray (widened ends of the ribs)



X-ray image of DK rickets

## Treatment

**High doses of vitamin D** are administered , and sufficient sunlight is recommended for the growing child (**heliotherapy**). In the Czech Republic, vitamin D is administered from the 2nd week throughout the first year and in the winter months of the second year of life (prophylaxis is mandatory in our country). Early therapy leads to spontaneous correction of mild deformities.

Severe deformities that do not respond to treatment are corrected in the case of long bones **by osteoclasts** or **osteotomies**, in the case of the chest and spine by exercises, a corset or a plaster cast[2].

## Differential diagnosis

Differential diagnosis is usually unproblematic. In the beginning, the disease is similar to congenital syphilis, avitaminosis C (scurvy) and renal osteomalacia[2].

# Links

## Related Articles

- Vitamin D

## External links

- Rachitis (česká wikipedie)
- Rickets (anglická wikipedie)

# Resources

## References


1. DUNGL, P., et al. *Ortopedie.* 1. edition. Praha : Grada Publishing, 2005. ISBN 80-247-0550-8.
2. SOSNA, A. – VAVŘÍK, P. – KRBEC, M., et al. *Základy ortopedie.* 1. edition. Praha : Triton, 2001. ISBN 80-7254-202-8.


## References


- SOSNA, A. – VAVŘÍK, P. – KRBEC, M., et al. *Základy ortopedie.* 1. edition. Praha : Triton, 2001. ISBN 80-7254-202-8.
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