

Mechanical characteristics of bones

The mechanical characteristics of bones represent the mechanical properties of bone tissue, which depend primarily on the intercellular mass of this Connective Tissue, on the loading of the given bone, age, architecture, chemical composition, etc.

Bone strength

The bone is very strong, this feature is achieved with minimal material consumption. Bone strength decreases by 10-20% in old age. Bone can best withstand static loads acting in the direction of its **longitudinal axis**. For example the humerus can withstand a load of about 600 kg, the femur 760 kg, but the tibia the most, namely 1350 kg. In tension, bone shows even greater strength than in compression. In **the transverse direction** the strength of the bone is about half, e.g. for the humerus it is around 300kg. The bone least resists stress in **twisting** (torsion), e.g. the limit value for the humerus is 10 kg, for the clavicle 8 kg, the smallest for the fibula – 6 kg. This low strength is probably due to the absence of collagen fibres between the individual lamellae there is a highly mineralized cement substance with osteocytes. The strength of bone in a living organism is less, because the bone is also loaded by the action of muscles.

Bone architectonics

Bone architectonics is determined by the arrangement of spongiosa (bone beams) in epiphysis of long bones. The beams create trajectories corresponding to the pressure load of the bone. With other, longer-term pressure loads, the beams are rebuilt. **By not loading the bone, bone beams** are rebuilt and weakened. This leads to a loss of **strength** and flexibility and the result can even be a fracture of the bone itself. This phenomenon is especially common in old people. In the cavities between the beams there are other structures – fat tissue, bone marrow, blood vessels, nerves and intercellular fluid. These structures are involved in shock absorption and the beams are loaded only afterwards, thus forming **the hydraulic system of the bone**.



Internal structure of bone

Osteoporosis

 For more information see *Osteoporosis*.

A syndrome characterized by pathological loss of **the inorganic** and **organic** part of the bone with changes in **the microstructure** and function of the bone. Negative factors of pathogenesis are the decrease or disappearance of the production of female sex hormones, a diet with a low supply of calcium and fiber and an excess of proteins, sugars and fats and a lack of anti-gravity body load. The diagnosis is most often established by X-ray osteodensitometry, quantitative computed tomography (QCT) and ultrasound densitometry, which, in addition to density and structure, informs about the elasticity of the tissue by measuring the speed of propagation of sound waves. 90% of femoral neck fractures are osteoporotic in origin, and about 50% of women over the age of 75 will suffer a vertebral compression fracture.



Places of the most frequent occurrence of osteoporosis

Links

Related Articles

- Bone

References

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Comparison of spongiosis of healthy bone and osteoporotic bone

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