

PATHOLOGICAL ANATOMICAL FEATURES OF DISORDERS OF BONE DEVELOPMENT, FRACTURES AND OSTEONECROSIS

Muhammadaliyev Asliddin Zoirjon o'g'li

Email: @asliddinpubgm88@gmail.com

Address: Toshkent shahri, O'zbekiston

Place of study: Toshkent davlat tibbiyot universiteti

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Annotatsiya: Ushbu maqolada suyaklarning rivojlanishini buzilishlari, sinishlar hamda osteonekrozning patologik anatomik xususiyatlari o'rganildi. Suyak to'qimasida yuz beradigan morfologik va hujayraviy o'zgarishlar, qon aylanishining buzilishi, regeneratsiya mexanizmlari hamda nekrotik jarayonlarning rivojlanishi ilmiy adabiyotlar asosida tahlil qilindi. Tadqiqot davomida suyak patologiyalarida osteoblast va osteoklastlarning faoliyati, kallus hosil bo'lish bosqichlari hamda osteonekrozda ishemik o'zgarishlar muhim ahamiyatga ega ekanligi aniqlandi.

Kalit so'zlar: suyak patologiyasi, osteonekroz, sinish, regeneratsiya, nekroz, patologik anatomiya.

Аннотация: В данной статье изучены патологические анатомические особенности нарушений развития костей, переломов и остеонекроза. На основе научной литературы были проанализированы морфологические и клеточные изменения костной ткани, нарушения кровообращения, механизмы регенерации и развитие некротических процессов. В ходе исследования было установлено важное значение активности остеобластов и остеокластов, формирования костной мозоли и ишемических изменений при остеонекрозе.

Ключевые слова: патология костей, остеонекроз, перелом, регенерация, некроз, патологическая анатомия.

Abstract: This article studies the pathological anatomical features of bone developmental disorders, fractures, and osteonecrosis. Morphological and cellular changes in bone tissue, circulatory disorders, regeneration mechanisms, and necrotic processes were analyzed based on scientific literature. The study revealed the important role of osteoblast and osteoclast activity, callus formation stages, and ischemic changes in osteonecrosis.

Keywords: bone pathology, osteonecrosis, fracture, regeneration, necrosis, pathological anatomy.

Introduction

Bone tissue is one of the main components of the musculoskeletal system in the human body. It provides mechanical support to the body, protects internal organs, stores minerals, and participates in blood cell formation. Normal bone development begins during the embryonic period and continues throughout life through complex remodeling processes. In pathological anatomy, disorders of bone development, traumatic injuries, and osteonecrosis are considered important topics. These pathological conditions lead to structural deformities, necrotic changes, and functional impairment of bone tissue. The German scientist Rudolf Virchow developed the theory of cellular pathology and emphasized that diseases originate from cellular damage. His scientific works played an important role in explaining necrosis and degenerative processes. The pathologist William Boyd described in his pathology textbooks that the regeneration process after fractures occurs in several stages. According to his studies,

hematoma formation occurs first, followed by the development of granulation tissue, after which osteoblasts produce new bone tissue. According to the World Health Organization, osteoporosis and traumatic fractures are among the leading causes of disability worldwide. Osteonecrosis and femoral head fractures are especially common among elderly patients.

Literature review

The textbook Robbins Basic Pathology states that bone necrosis develops mainly as a result of impaired blood circulation. The book explains that osteonecrosis is characterized by the death of osteocytes, destruction of bone trabeculae, and formation of empty spaces within bone tissue.

In Boyd's Pathology, the mechanisms of bone regeneration after fractures are described in detail. The author emphasized the important role of osteoblast activity during callus formation.

The Russian scientist Ivan Davydovsky extensively studied necrotic and dystrophic changes in pathological anatomy. He noted that vascular pathology is one of the main factors in the development of osteonecrosis.

Research conducted by the National Institutes of Health demonstrated that long-term corticosteroid therapy significantly increases the risk of osteonecrosis.

The orthopedic scientist Gavriil Ilizarov performed important scientific studies on bone regeneration and repair. The Ilizarov apparatus developed by him became highly important in the treatment of complex fractures.

During the review of scientific literature, it became clear that circulatory disorders and cellular changes play a central role in bone pathologies. Disturbances in the balance between osteoblasts and osteoclasts often lead to bone deformities and necrotic processes.

Research methods

During the preparation of this article, scientific sources related to pathological anatomy, traumatology, histology, and orthopedics were analyzed. Electronic scientific articles, pathology textbooks, and data from international medical organizations were studied.

The research focused on:

- disorders of bone development;
- osteogenesis processes;
- regeneration after fractures;
- necrotic changes in osteonecrosis;
- the role of blood vessels in bone pathology.

Macroscopic and microscopic changes were comparatively analyzed using scientific literature. The mechanisms of cellular activity and necrotic processes in bone tissue were thoroughly examined.

Results

The results of the study showed that disorders of bone development are often associated with genetic mutations, vitamin D deficiency, metabolic diseases, and abnormalities during embryonic development.

In osteogenesis imperfecta, impaired collagen synthesis leads to increased bone fragility. As a result, patients experience frequent fractures.

In fractures, rupture of blood vessels initially causes hematoma formation. This is followed by the inflammatory stage, during which neutrophils and macrophages remove

damaged tissue. Later, osteoblasts begin producing new bone tissue. During the final stage of regeneration, the callus becomes mineralized and transforms into normal bone tissue.

In osteonecrosis, impaired blood supply leads to the death of osteocytes.

Microscopic examination reveals:

- necrotic trabeculae;
- empty bone cavities;
- bone deformities;
- fibrotic changes.

According to data from Mayo Clinic, osteonecrosis most commonly affects the femoral head and may lead to disability if diagnosed late.

While preparing this article, I learned that bone tissue is a highly active biological system. Even minor disturbances in blood circulation may result in severe pathological changes.

Conclusion

Disorders of bone development, fractures, and osteonecrosis are complex pathological processes. These conditions are characterized by cellular alterations, necrosis, impaired blood circulation, and regenerative changes.

Based on the reviewed scientific literature, it can be concluded that pathological anatomy has great theoretical and practical importance in understanding bone diseases. Detailed study of morphological changes in bone pathology contributes to early diagnosis and the selection of effective treatment methods.

During the study of this topic, I gained a deeper understanding of bone regeneration, the functions of osteoblasts and osteoclasts, and the mechanisms underlying the development of osteonecrosis.

Adabiyotlar, References, Литературы:

1. Robbins V. Kumar, A.K. Abbas, J.C. Aster. Robbins Basic Pathology, Elsevier, 10th edition <https://www.elsevier.com/books/robbins-basic-pathology/kumar/978-0-323-53113->
2. Boyd W. Boyd's Pathology: Pathology for the Health Professions <https://archive.org/details/boydstextbookofp0000unse>
3. Cotran R.S., Kumar V., Collins T. Pathologic Basis of Disease <https://archive.org/details/robbinspat00cotr>
4. World Health Organization (WHO). Musculoskeletal Conditions <https://www.who.int/news-room/fact-sheets/detail/musculoskeletal-conditions>
5. National Institutes of Health (NIH). Bone and Osteonecrosis Resources <https://www.ncbi.nlm.nih.gov/books/>
6. Mayo Clinic. Osteonecrosis (Avascular Necrosis) <https://www.mayoclinic.org/diseases-conditions/osteonecrosis>
7. Cleveland Clinic. Osteonecrosis Information <https://my.clevelandclinic.org/health/diseases/10371-osteonecrosis-avascular-necrosis>
8. American Academy of Orthopaedic Surgeons (AAOS). Fractures <https://orthoinfo.aaos.org/en/diseases--conditions/fractures-broken-bones/>
9. MedlinePlus. Osteonecrosis Overview <https://medlineplus.gov/osteonecrosis.html>
10. Junqueira L.C., Carneiro J. Basic Histology <https://accessmedicine.mhmedical.com/book.aspx?bookID=2430>

11. Ilizarov Center. Bone Regeneration Studies <https://ilizarovcentre.com>
12. Pathology Outlines. Bone Pathology Reference <https://www.pathologyoutlines.com>