

Wrist Bones Distal from the end Fractures Immunopathogenesis, Osteoreparation Process

TESHAEV AZAMAT AZAMOVICH¹

Abstract: *Today, the treatment of distal ulnar fractures is one of the most urgent problems in the field of traumatology. According to the data of a number of scientists around the world, distal ulnar fractures have become more common among working-age people in recent years, and a steady increase in the number of fractures of the distal ulnar joint has been observed. Recently, modern scientists have emphasized that a sedentary lifestyle leads to the development of this injury, and the authors noted that this condition was especially widespread in all developed countries of the world at the end of the 20th century..*

Keywords: Distal ulnar fractures, Osteoreparation, Immunopathogenesis, Osteosynthesis, Interleukin-1 β (IL-1 β), Vascular endothelial growth factor (VEGF-A), Bone regeneration.

¹ BUKHARA STATE MEDICAL INSTITUTE

Introduction

Today, the treatment of distal ulnar fractures is one of the most urgent problems in the field of traumatology. According to the data of a number of scientists around the world, distal ulnar fractures have become more common among working-age people in recent years, and a steady increase in the number of fractures of the distal ulnar joint has been observed. Recently, modern scientists have emphasized that a sedentary lifestyle leads to the development of this injury, and the authors noted that this condition was especially

widespread in all developed countries of the world at the end of the 20th century.

Other authors indicate in their data that the steady increase in the incidence of this injury is due, among other reasons, to the rapid development of production and industry, and as a result, the increase in the number of people engaged in narrow professional activities over the years, the deterioration of the ecological situation in the place of residence, and other less important factors. They emphasize that fractures of the tibial plateau account for 39% to 60% of all injuries of the musculoskeletal system. Scientific research analyses of surgical treatment and complications of distal ulnar fractures have shown that the initial instability of bone fixation is associated with an error in the selection of the appropriate fixation device [2.4.6.8].

To date, a large number of recommendations have been collected in the world on the methods of treatment of fractures of the distal end of the forearm, but there is no single opinion on the choice of therapeutic tactics and surgical methods. In solving these problems, the indicators of primary and delayed osteosynthesis of fractures have not been identified. Solving these important issues will improve the quality of specialized care for patients and improve the results of functional treatment of fractures of the distal end of the forearm.

In recent years, the problem of bone tissue regeneration has become relevant for medical principles and clinical practice. This is due to the constant increase in injuries due to the introduction of traumatizing factors - extreme sports in tourism and sports, an increase in the number of road accidents and occupational injuries. The problem of regeneration is especially important for bone tissue affected by various pathological processes. The theoretical aspects of bone tissue regeneration have been studied for many years, but a special impetus for its development was the discovery by the Russian scientist G.A. Ilizarov of the role of the stimulating effect in restoring tensile strength.

Bone is one of the few tissues in the body that heals without scarring. After a bone fracture, complex processes such as endochondral and intramembranous ossification develop to restore the skeleton. Bone healing begins with an inflammatory process, and in the initial stage, various inflammatory cells enter the damaged area, cleanse the wound and stimulate the healing process. However, we know that there is not enough information about the inflammatory process during bone repair, especially the effect after various surgical procedures in distal forearm fractures has not been fully studied.

The close interaction between the immune system and bone fracture healing has been recognized in the emerging field of osteoimmunology research. In particular, the early phase of healing, the inflammatory phase, appears to be a promising target for immunomodulatory approaches to accelerate bone healing. The inflammatory response is an important driver or initiator of the healing process after fracture. However, a strong or prolonged inflammatory response (due to the absence or attenuation of the anti-inflammatory phase) negatively affects the healing process [1.3.5.7].

Researchers have concluded that, despite the constant improvement of bone osteosynthesis methods, their attitude towards them should be limited, as we know from several publications that this situation is especially related to the degree of development of the local inflammatory process in the fracture area. When bone is injured, an inflammatory response occurs: immune cells are recruited to the site of injury; numerous factors, inflammatory factors, etc. are released. This intense inflammatory process is necessary to ensure normal fracture healing through blood vessel angiogenesis, repair of damaged tissues, and ultimately remodeling. IL-1 is a prototypical anti-inflammatory cytokine that regulates a wide range of cellular and tissue functions. IL-1, IL-1 α and IL-1 β , have similar biological activities but are involved in different functional states of the body. Bone is highly sensitive to IL-1, which regulates both bone formation and bone resorption. IL-1, also known as osteoclast activating factor (OCF), is involved in various stages of

osteoclast development in vitro. IL-1 is a key factor in osteoclast differentiation and formation, and its mechanism is related to the RANKL/RANK signaling pathway. IL-1 α can enhance osteoclast differentiation by stimulating the secretion of prostaglandin E2 (PGE2). Short-term secretion of IL-1 β is essential for successful regeneration, but persistent local release of IL-1 β may be associated with severe bone loss. It has been shown that IL-1 β , a precursor of osteoclasts, is significantly increased in peripheral blood monocytes of patients with idiopathic osteoporosis compared with healthy controls.

IL-1 β enhances bone resorption by promoting osteoclast adhesion to the surface of calcified bone trabeculae. In addition, IL-1 β expression induces the migration of peripheral blood mononuclear cells across the vascular endothelium, their recruitment, and differentiation into osteoclasts. During bone injury, large amounts of IL-1 β are released and bind to IL-1R1 receptors. The overall effect of IL-1 β is reported in the literature to be its effect on bone repair after fracture. The most studied function of IL-1 β is the activation of osteoclasts for bone metabolism. However, there is little information on the effects of IL-1 β on human osteoblasts and mesenchymal stem cell migration, which are important for bone repair.

The success or failure of bone regeneration is largely dependent on the location of vascularization; in particular, the turning point is the ability of blood vessels to inject blood into the scaffolds that are formed to deliver sufficient nutrients, growth factors, minerals, and oxygen to the tissue for repair. Bone vasculature plays a crucial role in bone formation, remodeling, and homeostasis. The growth of new blood vessels is important in both primary bone development and adult fracture repair. Both bone repair and remodeling involve complex interactions between angiogenic and osteogenic pathways. Insufficient or inappropriate blood vessel formation in bone is associated with decreased bone formation. This evidence can be explained by angiogenesis events during the healing process after bone fractures. Vascular endothelial growth factor-A (VEGF-A), a member of the VEGF family, plays a key role in angiogenesis. VEGF-A can induce endothelial cell migration and proliferation and indirectly stimulate osteogenesis and angiogenesis, regulating the secretion of osteogenic growth factors through paracrine signaling.

Among the many growth factors released in response to bone fracture, β FGF is another factor that stimulates the growth of blood vessels for bone regeneration and acts synergistically with vascular endothelial growth factor (β FGF) or platelet-derived growth factor (TGF), which are important angiogenic factors for wound healing. In rodent studies, scientists have found that the level of basic fibroblast growth factor (β FGF) in the articular cartilage is significantly increased compared with control animals. In mice, overexpression of β FGF during the early phase of fracture healing was associated with increased osteoblast maturation and vascular invasion. The literature has shown that surgical treatment failures are directly related to the increased use of internal and external fixators and structural changes in bone tissue. To predict the results of surgical treatment, it is possible to use multifactorial statistical methods that allow taking into account qualitative indicators (according to the types of surgical intervention) and quantitative indicators such as the number of cells in blood tests, immunological indicators.

The analysis of various types of surgical treatment of bone and soft tissues, taking into account hemoimmunogram parameters, allows testing the hypothesis of preventing the prediction of adverse outcomes preoperatively when determining the treatment plan and its determination upon hospitalization. There are several methods of surgical treatment of the distal end of the forearm bones (superficial osteosynthesis, osteosynthesis through the bone, osteosynthesis using percutaneous screws), and of course, there are many complications after them. The compression-distraction method of osteosynthesis in particular is considered a highly effective treatment method for fresh (no more than three days after injury) fractures of the distal end of the forearm bones.

Determining the quality and speed of fracture healing is important in practical work in traumatology and

orthopedic departments. One of the necessary conditions for overcoming the above problems is the conduct of studies that are rich in information and do not cause difficulties in execution.

Conventional x-ray radiological methods, which are widely used for diagnostic purposes, create a radiation load and record cases of bone loss. Another method of evaluating the process of osteogenesis is the morphological examination method, which is somewhat traumatic for the patient. It is known from the literature that computed magnetic resonance imaging cannot give accurate results due to the presence of shadows of metal constructions in patients after osteosynthesis.

To our knowledge, X-ray signs of the reparative process are not always a reliable guide for early diagnosis and prognosis of this process. Immunograms allow us to predict the negative course of the reparative process and change the treatment tactics, as well as to use additional surgical and immunological methods of influencing the reparative process [7.8].

At the same time, despite the fact that a number of laboratory methods have been proposed to assess the state of bone tissue regeneration, they have not yet been systematized, and the essence of immunological tests developed in the 80s-90s of the last century requires clarification due to the development of modern immunodiagnostic technologies and new methods of wound treatment. In addition, at the present stage there is no algorithm for predicting osteogenesis complications and protocols for managing patients during bone tissue regeneration. The data from the studied literature show that the analysis of clinical and laboratory predictors of osteogenesis disorders, combined with the use of other methods in the formation of patient management protocols, allows us to predict the nature of regeneration in the aggregate. In order to create an immunopathogenetic prediction system of regeneration in fractures of the distal end of the wrist bones, it is desirable not only to conduct laboratory work, but also to correctly evaluate the results obtained for use in choosing the treatment tactics of the patient.

The process of fracture healing itself is a complex and tightly controlled process consisting of sequential and partially overlapping stages aimed at restoring the integrity of the bone's form and function. Various cell types (immune cells, stem cells, and mesenchymal cells) and their signaling molecules (cytokines, growth factors, and chemokines) successfully participate in the regenerative process.

Several growth factors involved in the healing process—fibroblast growth factor (FGF), vascular endothelial growth factor A (VEGF A), and the inflammatory cytokine interleukin 1 β (IL-1 β)—are currently being investigated to develop new therapeutic approaches to improve bone healing. After a bone fracture, complex processes such as skeletal regeneration, endochondral and intramembranous ossification develop. Unlike growth, bone formation involves inflammation. In the early stages of the healing process, various inflammatory cells enter the fracture area, clean the wound from dead tissue and stimulate the healing process.

There is little information on the inflammatory process during bone healing, and in this study, we investigated the effects of the inflammatory cytokine, interleukin 1 β (IL-1 β), on osteoblast and stem cell differentiation, as well as intramembranous and endochondral ossification, as IL-1 β affects skeletal homeostasis and is activated in response to fracture [6.7.8].

Conclusion. Vascular endothelial growth factor (VEGF-A) is of particular interest because of its ability to promote neovascularization. In some experiments conducted at the University of Ireland, exogenous VEGF-A enhanced blood vessel formation, ossification, and new bone formation in mouse femoral fractures, and also promoted bone fusion of segmental defects in the forearm in rabbits. Most importantly, scientific research is ongoing to improve diagnostic methods and surgical treatment, including: studying bone healing; determining the nature of immunity: the state of bone mineral density; developing new approaches to surgical procedures for limb fractures, effective methods of rehabilitation in patients after

surgical treatment and improving their quality of life..

LITERATURE USED:

1. Тешаев А.А., Асилова С.У., Хакимов Ш.К. Вопросы диагностики и тактики лечения переломов дистального конца костей предплечья // Тиббиётда янги кун - Бухара, Узбекистан. 2019. - 4 (28). 384-391 б.(14.00.22,)
2. Teshaeв Azamat, Asilova Saodat, Akhmedov Shamshod. Hardware-Surgical Treatment For Fractures Of The Distal End Of The Forearm Bones // European Journal of Molecular & Clinical Medicine - London, United Kingdom., 2020 - Vol 07, Issue 03. pp 3906-3913(14.00.22)
3. Teshaeв Azamat Azamovich., Hamdamov Bakhtiyor Zarifovich. Dynamics of cytokine(IL-1 β , VEGFA and FGF) levels in patients with fractures of the distal end of the forearm bones depending on the type of surgery // American Journal of Medicine and Medical Sciences 2022, 12(11): (14.00.22 , 14.00.36)
4. Тешаев Азамат Аъзамович, Хамдамов Бахтиёр Зарипович. Роль иммунологических факторов роста при лечении переломов дистального конца костей предплечья // Биология ва тиббиёт муаммолари. – Самарқанд, 2022. .№6 (140)197-203 б. (14.00.22 , 14.00.36)
5. Тешаев Азамат Аъзамович. Значение факторов роста в комплексном хирургическом лечении переломов дистального конца костей предплечья // Тиббиётда янги кун - Бухара, Узбекистан. 2022. 11(49) - 533-538 б. (14.00.22 , 14.00.36)
6. Тешаев Азамат Аъзамович, Хамдамов Бахтиёр Зарипович. Билак суяклари дистал учидан синишларида турли даво усулларида кейинги иммунологик кўрсаткичларнинг қийсий тахлили // вестник ТМА. 2022. №8. 185-189 б. (14.00.22 , 14.00.36)
7. Тешаев Азамат Аъзамович, Хамдамов Бахтиёр Зарипович Сравнительный анализ иммунологических показателей после различных методов лечения при переломах дистального конца костей предплечья// Journal of Medicine and Inovations. 2022. 4 (8)422-432 б. (14.00.22 , 14.00.36)
8. Teshaeв Azamat, Asilova Saodat, Hakimov Sherali. Apparatus and Surgical Treatment for fractures of the distal end of the forearm bones // Middle European Scientific Bulletin - Praha , Czech Republic., 2022 June. - vol 25. pp 178-190.(14.00.22).