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імені О. О. Богомольця

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РЕДАКЦІЙНА РАДА

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КАФЕДРА ГІСТОЛОГІЇ ТА ЕМБРІОЛОГІЇ

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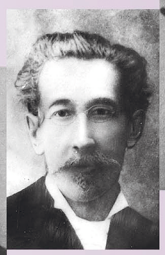
ПРОФ. ТЕРЕМЕЖКО П.І.
1868-1891



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1992-2022

Матеріали конференції під редакцією професора О.М.Грабового

the fourth and eighth weeks as a result of adaptation and compensatory mechanisms, along with decreased elasticity of the vascular wall. After 12 weeks of the experiment, signs of hypertrophy in the structural elements of the arteriolar wall appear. However, further exposure to toxic agents leads to depletion of the vascular component and loss of the adaptive potential of the resistive segment of the haemomicrocirculatory system, and, as a result, impaired blood supply to the intestinal wall.

Conclusions: The results of the experimental study indicate pronounced morphometric changes in the vascular wall structure of the ileal arterioles against the backdrop of prolonged combined administration of monosodium glutamate, sodium nitrite, and Ponceau 4R. The data obtained indicate a phased dynamic of changes: an initial increase in arteriolar wall thickness, followed by fluctuations in the indicator, accompanied by both a decrease in control values and a subsequent increase after the 12th week of the experiment. In the final stages of the study, a progressive decrease in vascular wall thickness was observed, which is likely associated with the development of chronic damage and destructive changes in the vascular component of the submucosa, resulting in impaired microcirculation in the ileal wall of the rats.

Key words: ileum, haemomicrocirculatory bed, arterioles, submucosa, morphometric study, food additives, rats.

MECHANISMS OF FRACTURE HEALING

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Relevance: In cases of heterogeneous conditions, a number of overlapping interrelationships arise, which are discussed in the context of pathological processes – for example, types of bone necrosis and fracture healing, bone grafts and bone fragments detached at the moment of trauma, or surgical joint replacement.

The aim of this study: To explore the processes involved in fracture healing.

Materials and Methods: Theoretical: review and analysis of scientific and methodological literature; Practical: original research.

Results: Fractures occur due to mechanical forces applied to the bone. It is well known, for example, that a simple spiral fracture of the tibial diaphysis in two-thirds of cases is caused by accidents during skiing or falls at home or on the street. In contrast, transverse fractures, which also occur in skiers, are more often associated with motorcycle accidents or football injuries in young individuals.

Some terms used to describe fractures are quite straightforward, though others require special attention. A simple closed fracture occurs without damage to the skin over the fractured bone. When the skin and soft tissues are injured and the fracture site is exposed to the external environment, it is considered an open fracture. This distinction is essential in orthopedic treatment, as open fractures are more susceptible to infection, and the risk of infection increases with the severity of soft tissue damage. A comminuted fracture refers to one in which the bone is broken into several smaller fragments.

Factors influencing treatment, prognosis, and anatomical outcome of fracture healing include the nature of the injury, presence of fragmentation, soft tissue damage, and displacement of the bone ends. Complications in healing may include delayed union or nonunion, which can be diagnosed by the absence of radiographic healing at 4 and 8 months, respectively.

Tissue changes during fracture occur in a sequence: initially, vascular integrity is disrupted, and bone fragments separate, with blood accumulating between the bone ends. Damage may be limited to the periosteum or extend to the surrounding soft tissues, which may also rupture. A perifibrinous exudate forms as part of the acute inflammatory response to tissue damage. Fibrous, adipose, and hematopoietic tissues die due to direct trauma and reduced blood supply. Separated bone parts undergo necrosis, with the extent of cell death at the fracture site and along the bone shaft varying, though classical empty osteocyte lacunae are typically seen no earlier than 7 days post-injury. Acute

inflammation at the fracture site lasts 24–48 hours, accompanied by exudation and the migration of polymorphonuclear leukocytes, followed by macrophages. The process then enters the healing phase, with granulation tissue formation, proliferation of capillaries, and migration of fibroblasts. The rate of fibrous tissue development between bone ends depends on local conditions; ideally, fibrous union occurs in about two weeks. During healing, osteoclasts remove fragments of dead bone. Transformation of granulation tissue into coarse fibrous tissue marks the formation of callus. Misinterpretation of different types of callus may occur: external callus refers to ossified fibrous tissue outside the bone, while internal callus lies between the bone ends. “Primary callus” refers to newly formed woven bone initially bridging the fracture. This coarse bone is later resorbed and replaced with lamellar bone, forming “secondary callus,” which establishes solid union. Further remodeling depends on factors such as mechanical load and return of functional activity. Small cartilage islands may appear in the callus due to instability or local avascularity. A small amount of cartilage-like tissue is often observed within the healing callus.

Healing generally follows the natural path of bone union seen in closed treatments – with or without traction or splinting using plaster casts. The goal of external fixation is to maintain length, alignment, and controlled stability. Some micromotion may stimulate callus formation, but excessive movement impairs healing.

The reparative process is modified with rigid fixation and immobilization. Revascularization occurs, including osteon formation and deposition of woven bone in small gaps between bone ends. The presence of implants introduces certain challenges, one of which is altered biomechanics. Forces that normally stimulate healing are bypassed by the implant, leading to local bone atrophy and potential refracture. Intramedullary fixation is less rigid and typically does not inhibit external callus formation, proceeding similarly to natural healing. However, it has drawbacks, such as increased infection risk due to surgical exposure and potential disruption of bone marrow blood supply. A gap of more than 0.5 cm may extend healing time to 12–18 months, and gaps over 1 cm even longer. In slowly healing fractures, fusiform accumulations of fibrous tissue appear along the fracture line within 4–6 months. The center of this tissue contains amorphous fibrin-like material, sometimes with mucinous substance – an early stage of pseudoarthrosis. Between 6 months and 2 years, the fracture ends may become covered with cartilage. Between 2 and 5 years, a mature pseudo-joint forms, involving compact and cancellous bone with a cartilaginous surface and a cavity filled with viscous fluid.

Conclusions: Healing rate and process also depend on bone type, patient age, fracture complexity, and degree of bone fragment separation. The size of the gap, blood supply, and any infection are important. Interposition of soft tissues, muscle, and large dead bone fragments can hinder healing.

It is important to understand the effect of internal fixation on callus formation. Many techniques aim to hold bone ends together, resembling external fixation and resulting in external callus formation.

Keywords: Fracture healing, bone regeneration, callus formation, osteonecrosis, bone remodeling, soft tissue damage, bone fixation, pseudoarthrosis, osteoclast activity, vascular disruption, granulation tissue, orthopedic trauma, primary callus, secondary callus, intramedullary fixation.

REACTION OF HAND MUSCLES IN MEDIAN NERVE INJURY

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Introduction: median nerve injury can be caused by a wide range of factors, including acute trauma, chronic microtrauma, and compression. The site of injury can vary from the brachial plexus to the hand. In clinical practice, chronic compression of the median nerve in the carpal tunnel is most common. The prevalence of carpal tunnel