# MICROCIRCULATORY AND METABOLIC CHANGES IN SOFT TISSUES IN THE DYNAMICS OF THE WOUND PROCESS DURING BLAST INJURY IN AN EXPERIMENT

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**Abstract**. *The purpose of the study was to evaluate microcirculatory and metabolic changes in damaged skeletal muscles in rats during experimental blast injury with acute blood loss. Using an experimental model of blast injury to the soft tissues of the pelvic limb in rats, microcirculation and metabolic activity in the muscles of the blast wound area were assessed using laser Doppler flowmetry and laser fluorescence diagnostics using the LAKK-M device.*

**Keywords:** *mine blast wound, blast injury, metabolism, microcirculation, regeneration, laser Doppler flowmetry.*

## INTRODUCTION

In recent decades, modern medicine has faced the problem of treating blast injuries, which is associated with the emergence of local armed conflicts and numerous terrorist attacks. After the end of active hostilities, a large number of uncleared territories remain, and therefore, in different countries, civilians suffer from explosion damage [1, 2]. An explosive device or mine causes injury characterized by severe damage to soft tissue (blast wounds) and bones (fractures) as a result of the combined action of factors such as the blast wave, high temperature and elements of the explosive device.

## MATERIALS AND METHODS

Despite the availability of modern treatment methods, the outcomes of blast trauma can be death, disability, and a decrease in the quality of life of victims. In this regard, the search for the mechanisms underlying tissue damage and the subsequent development of pathological disorders during blast injury is relevant. The emergence of new methods for diagnosing tissue damage makes it possible to differentiate at a high level the changes occurring in the damaged segments. Considering the importance of the microcirculatory link in the formation of the metabolic activity of tissues and ensuring their regenerative activity, the study of various parameters of tissue blood flow will make it possible to study the depth and direction of damage, which can be used both for the development of new treatment methods and for assessing the effectiveness of existing ones .

The purpose of the study is to evaluate the dynamics of the wound process, microcirculatory and metabolic changes in the skeletal muscles of the pelvic limb of experimental animals with blast injury with acute blood loss.

## RESULTS AND DISCUSSION

Before installing an explosive charge in the soft tissues of the pelvic limb, a linear incision 0.8–1.0 cm long was made on the lateral surface of the animal's thigh parallel to the length of the femur. Using a blunt method, using a clamp, a channel 2.0–2.5 cm long was formed, into which an explosive charge was placed so that its part from the fuse site protruded 2 cm above the surface of the skin. The detonation of the animal was carried out in a special container in compliance with safety requirements. As an explosive charge, we used a pyrotechnic product for household use - ordinary firecrackers made in production conditions (hazard class II), which consisted of a cardboard shell container (length 4.8–5.0 cm, radius 0.8 cm, thickness - shell thickness 1.2 mm), filled with pyrotechnic mixture.

After blood collection, the tail stump wound was cauterized with hydrogen peroxide and bandaged; an aseptic gauze bandage was applied to the thigh wound, simulating an individual dressing package. The animal's bcc was determined at the rate of 7% of its weight [4]. 3 hours after the injury, under anesthesia with a mixture of zoletil and xylazine at a dose of 3 mg/kg of each drug, primary surgical treatment of the wound was performed and an aseptic bandage was applied. Gentamicin was injected intramuscularly into a healthy pelvic limb at a rate of 3 mg/kg of animal weight.

Subsequently, for 7 days, the wound was dressed daily using antiseptics (0.02% chlorhexidine solution) and dressings with water-soluble ointments (levomekol, ointment for external use), intramuscular injection of gentamicin in that same dose (3 mg/kg daily) [2]. 7, 14 and 28 days after the blast injury of soft tissues with acute blood loss, the general condition of the animals was assessed, the timing of wound healing was determined, the dynamics of blood parameters, the state of microcirculation and metabolism in the soft tissues of the injury area were analyzed. Blood parameters were determined using a hematological analyzer Abacus Junior 30 (Diatron, Hungary), the number of erythrocytes, leukocytes and platelets, hemoglobin concentration and hematocrit were measured. Microcirculation and metabolism of the soft tissues of the damaged area were studied by laser Doppler flowmetry (LDF) using a laser blood flow analyzer "LAKK-M" (LLC NPP "Lazma") with special software for automatic analysis of indicators. Immediately before the study, the rats were anesthetized and 10 mg/kg of animal weight of zoletil and xylazine were injected intramuscularly. The animals were fixed, and a flap of skin was removed from the thigh area down to the muscle layer, 5–8 mm from the edge of the wound.

During the entire observation period (28 days), there was no death of animals. In the first 3–5 days after the injury, the rats are sedentary, lethargic, lie in the corner of the cage most of the time, and consume little water and food. Subsequently, starting from the 7th day, the condition of the animals gradually improved, they became mobile, actively moved around the cage, drank water and consumed food in the required amount.

After causing an explosive injury, the resulting lacerated flap wound of the soft tissues of the thigh had a defect in the skin, subcutaneous fat, fascia and muscles in the center, was moderately contaminated with products of incomplete combustion of the explosive charge and cement-silicate mixture, pieces charge shell (cardboard), scraps of damaged fabrics and wool.

**CONCLUSION**

The problem of early local treatment of soft tissue injuries due to blast injury remains relevant. Our experimental study showed that the wound process during blast injury of soft tissues is characterized by long wound healing times, multidirectional disturbances of microcirculation and metabolism in the tissues of the paravulnar area. This is due to the pronounced destruction of skeletal muscles and a protracted phase of inflammation with the subsequent formation of defective muscle-connective tissue regenerate, in which scar tissue predominates.

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