

## Новий ефективний підхід до лікування ангулярного перелому нижньої щелепи на тлі остеопорозу

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## New Effective Approach to Treatment of Mandibular Angular Fracture on Background of Osteoporosis

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Current surgical treatment methods of mandibular fractures are mainly designed and used to treat the fractures, occurring in a bone without the osteoporosis signs. However, mandibular fractures caused by impaired repair and low calcium levels are quite common and require the use of modern drugs to increase the density and normalize the structure of bone tissue. Placental cryopreservation enables to obtain not only nonspecific biostimulating effect, but also a specific immune-endocrine one of drugs on the patient's body.

The experiments were performed in 245 adult male Wistar rats of 180–200g, which were divided into 4 groups: group 1 (control) – rats with a simulated angular fracture of the mandible on the osteoporosis background (FM + OP); group 2 – rats with simulated pathology implanted with cryopreserved human placental tissue (FM + OP + CP); group 3 – rats with simulated pathology, which were injected with the calcium citrate in addition to the implantation of cryopreserved human placental tissue (FM + OP + CP + Ca); group 4 – pseudooperated rats. The research was performed on days 7, 14, 21, 30 and 45 after implantation of cryopreserved placental fragments.

After the combined use of cryopreserved placental tissue and calcium citrate the signs of fragments consolidation were radiologically determined on the 14<sup>th</sup> day, on the 21<sup>st</sup> day there was compaction of the distal part of fragments; on the 30<sup>th</sup> day the fracture line was not observed, and on the 45<sup>th</sup> day there was a complete consolidation of fragments and formation of callus. Histological examination of bone fragments revealed significant decrease in the volume of necrotic areas on the background of increasing fields of newly formed bone tissue on the 7<sup>th</sup> day. There was a compact fusion of the newly formed bone tissue fields on the 21<sup>st</sup> day and up to the 30<sup>th</sup> day.

The combined use of cryopreserved placental tissue and calcium citrate furthers the beginning normalization of biochemical parameters on the 7<sup>th</sup> day of the experiment; on the 21<sup>st</sup> day there was determined the maximum anti-inflammatory process (level of TNF- $\alpha$  in the blood serum was lower by 44.5% compared with the untreated group;  $p < 0.05$ ), there were normalized antioxidant (carbonyl groups of proteins, nitrites and nitrates decreased by 49.9 and 31.0%;  $p < 0.05$ ), antitoxic (content of average weight molecules was lower by 27.6%;  $p < 0.05$ ) and proangiogenic (VEGF was higher by 28.2%;  $p < 0.05$ ) ones. The highest activity of osteogenesis and collagen biosynthesis was noted (the content of peptide-bound oxyproline and TGF- $\beta$ 1 increased by 35.2 and 36.2%, respectively;  $p < 0.05$ ).

Therefore, the use of cryopreserved placental tissue and calcium citrate can significantly complement current modern approaches to the treatment of mandibular angular fracture on the background of osteoporosis.

## Ремоделювання серцевого м'язу після застосування терапевтичної гіпотермії і алогених мезенхімальних стромальних клітин на моделі інфаркту міокарда

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## Cardiac Muscle Remodeling After Therapeutic Hypothermia and Allogeneic Mesenchymal Stromal Cells in Myocardial Infarction Model

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High morbidity and mortality resulted from a number of heart diseases, including myocardial infarction (MI), stimulate the search for new approaches to treatment. This area prospect is the combination of therapeutic hypothermia (TH), which has a neuro- and cardioprotective effect with MSC transplantation, as a factor in stimulation of regeneration and neoangiogenesis in the myocardium ischemic areas.

The purpose of the work was to analyze the ultrasound parameters of heart to determine the effect of combination of TH and introduction of allogeneic MSCs on the remodeling of the rat heart with MI.

The experiment was performed in 75 white male rats. MI were modeled by ligation of the left coronary artery. The animals with MI were divided into 4 groups of 15 in each: 1 – control (MI), 2 – MI and induction of hypothermia, 3 – MI and single intravenous administration of a suspension of allogeneic cryopreserved MSCs at a dose of  $3 \times 10^5$  cells per 100g of animal weight, 4 – MI and combination of hypothermia with the introduction of MSCs. The intact rats were the normal group. The heart was sonographically examined with an ultrasound sonometer Sonomed 500 (SPECTROMED, Russia) within the B- and M-modes using a linear sensor 7.5L38 with a frequency of 7.5 MHz for 7 and 30 days.

In the control group, echocardiography after coronary artery ligation at day 7 showed development of left ventricular (LV) dilation and decreased LV myocardial contractile function. The changes in architecture of heart corresponded to its remodeling by the model of eccentric hypertrophy with the signs of systolic dysfunction of the LV. A significant reduction in stroke volume and cardiac output corresponded to a decrease in the ejection fraction (46.04%), which was by 35% below the norm. On the 30<sup>th</sup> day, namely at the stage of scarring, there was the LV dilation progression, myocardial contractility reduction and deviation from the norm of hemodynamic characteristics.

The combined use of therapeutic hypothermia and the introduction of allogeneic MSCs contributed to the most pronounced, in comparison with the other experimental groups, restraint of the development of LV dysfunction and restoration of the final systolic and diastolic volume, resulted in the increase of ejection fraction (58.78%). In group 4, the relative thickness of LV wall and the mass of LV were not significantly different from the norm, and cardiac remodeling was performed according to normal geometry.

