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

O.O. Likhitskyi

1 Institute for Problems of Cryobiology and Cryomedicine of the National Academy of Sciences of Ukraine, Kharkiv, Ukraine
2 National Pirogov Memorial Medical University, Vinnytsya, Ukraine

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 180–200 g, 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 anaddition 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 14th day, on the 21st day there was compaction of the distal part of fragments; on the 30th day the fracture line was not observed, and on the 45th 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 7th day. There was a compact fusion of the newly formed bone tissue fields on the 21st day and up to the 30th day.

The combined use of cryopreserved placental tissue and calcium citrate furthers the beginning normalization of biochemical parameters on the 7th day of the experiment; on the 21st day there was determined the maximum anti-inflammatory process (level of TNF-α 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 protein 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-β1 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.