

## THE USE OF 3D MODELING IN THE SURGICAL TREATMENT OF FACTURES OF THE MANDIBLE.

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**Abstract.** The development of technologies for the control of bone tissue regeneration and the replenishment of bone defects is one of the urgent tasks of maxillofacial surgery. The attention of researchers to this problem is due to the wide spread of inflammatory and oncological diseases of the bones, the high incidence of postoperative complications. To restore the lost bone tissue that is well used. The attention of researchers to this problem is due to the wide spread of inflammatory and oncological diseases of the bones, high postoperative complications of biomaterials and synthetic analogs. A wide selection of modern materials for bone grafting, many of them have a number of significant disadvantages.

One of the promising areas of cellular technologies in the field of bone tissue regeneration is the development and use of tissue-engineered constructs based on porous materials, which are a matrix for cell delivery, or a construct for its active colonization with recipient cells. The use of composite bone grafting materials should be reasoned depending on the nature, type and location of the injury.

For the surgical treatment of patients with mandibular fractures, individual ZB models were used to visualize and plan the surgical stage of treatment. Three-dimensional anatomical models based on computed tomography data accurately reproduce the structural features of the bones of the maxillofacial skeleton of the patient and the existing pathology in this area, etc. 3D models are used for accurate preoperative modeling by pathologists.

**Key words:** three-dimensional modeling, osteografts, bone defect, reparative regeneration, osteoblasts, osteocytes, 3D models.

### **Relevance.**

Restoration of defects in the bone tissue of the lower jaw is one of the most pressing problems of modern dentistry and orthopedics. The reasons for bone loss are varied: tooth extraction, inflammation, trauma, tumors, osteoporosis.

In some cases, in dental practice, the process of orthopedic rehabilitation is associated with the need to heal bone defects in the lower jaw. In this regard, the search for the optimal material for plastic replacement of defects in the lower jaw is relevant [3,4]. It is quite obvious that the use of composite bone grafting materials should be clearly argued depending on the nature, type and location of the injury. In this regard, the currently accumulated rather extensive material needs further experimental and clinical confirmation of the effectiveness of the structures and the development of clear indications for their use.

One of the requirements for plastic material in orthopedic and any other pathology is tissue specificity, absence of toxicity, high regenerative potential and the formation of organ-specific tissue in the transplantation area [1,5].

### **Purpose of the study.**

Improving the functional and aesthetic results of our operations, microsurgical reconstruction of the lower jaw through the use of the latest techniques of 3D modeling and 3D printing.

### **Materials and research methods.**

The most common type of injury to the maxillofacial area is fractures of the mandible. Among all injuries to the bones of the face, they are the most common and range from 25% to 87% [1, 7, 8]. The intensity of our labor, the development of various vehicles, the deterioration of the psycho-emotional state of the inhabitants of our country, all this in recent years has led to a significant increase injury. The proposed majority of methods for treating mandibular fractures and their results do not completely satisfy practical surgeons. This is due to the fact that the number of complications such as delayed consolidation, traumatic osteomyelitis, abnormal fusion of fragments, formation of false joints, remains high and ranges from 19 to 40% [1, 5].

One of the important reasons for the emergence of complications in the treatment of fractures of the lower jaw is poor fixation of bone fragments, leading to displacement of fragments and preventing the anatomical and functional restoration of the damaged bone. Nowadays, many surgical methods of osteosynthesis have been developed, based on the use of numerous designs of external and internal fixation [4,6,7]. However, an individual approach to the choice of fixation operations, visualization in diagnostics and planning of treatment stages remains one of the important problems. Certain prospects for the individualization of the treatment of fractures of the mandible are opened by modern computer technologies [8,9].

In the program of complex treatment of patients with mandibular fractures, individual 3D models were used to visualize and plan the surgical stage of treatment. Three-dimensional anatomical models based on computed tomography data accurately reproduce the structural features of the patient's facial skeleton and the existing pathology in this area, or other 3D models are used for accurate preoperative modeling.

- In maxillofacial surgery and neurosurgery, doctors give the titanium bonding plates the required geometry, relying on a three-dimensional model of the patient's damaged bone site.

- Determine the area of minimal operative access and build an intraoperative algorithm of actions before the start of the operation.
- Fixing an individual implant in the operative field is practiced on a 3D model.
- Models clearly retain structure and geometry.
- Completely replicate the existing bone defect or accurately replicate the normal anatomy.
- Allow not only to visualize the area of operative interest, but also give the doctor a tangible, material idea of the bone fragment and pathology.

Suitable for practicing well-accessible operative access, methods and stages of surgical intervention; visual examination of a specific defect. These models help the surgeon to describe the objective and course of the operation to the patient.

First, anatomically, functionally accurate 3D models of bone areas are used in preparation for operations:

- osteosynthesis
- bone grafting
- reconstructive maxillofacial surgery with graft transplantation.

## **Conclusion.**

After using a composite bone material to replace an artificially created defect in the bone tissue of the lower jaw, there is a rapid regeneration of bone tissue based on the chemical composition and natural (bovine) type I collagen; all processes were verified by three-dimensional modeling and 3D printing. Collagen coating facilitating the capture of bone material, reducing the overall operation time and healing time. The bone material showed good indicators of the attachment of osteoblasts to the surface of the bone trabeculae, by activating them, which accelerates the formation of the structural components of the lamellar bone. Acceleration of increased osteoblast activity is determined by increased secretion of carbohydrate, protein and mineral components of the bone, vascular growth factors initiating the mechanism of revascularization [4] Improvement of the functional and aesthetic results of our

operations, microsurgical reconstruction of the mandible through the use of the latest techniques of three-dimensional modeling and 3D printing.

These three-dimensional models were then printed on a plastic 3D printer at a 1: 1 scale using (fused deposition modeling) FDM technology and used during the operation to simulate the defect. Also, the advantages of the technique are the ability to simultaneously perform the reconstructive and resection stages and reduce the operation time.

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