



## **MODERN APPROACHES TO DIAGNOSIS AND TREATMENT OF MANDIBULAR FRACTURES**

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### **ABSTRACT**

*Mandibular fractures represent one of the most common injuries of the maxillofacial region, accounting for 70% to 85% of all facial skeleton fractures according to various studies. The high frequency of this pathology is due to the anatomical features of the mandible, its mobility, and its prominent position in the facial skeleton, which makes it vulnerable to various traumatic impacts. The social significance of the problem is determined by the predominant affliction of working-age individuals (20-40 years), which leads to significant economic losses associated with temporary disability and treatment costs.*

**Introduction:** Epidemiological studies in recent years demonstrate a steady trend toward increasing frequency of mandibular fractures, which is associated with the growth of road traffic injuries, sports injuries, interpersonal violence, and domestic injuries. According to WHO data, approximately 2.5 million cases of mandibular fractures are registered annually worldwide, with significant geographical variability in indicators depending on socioeconomic conditions, cultural characteristics, and the level of trauma service development.

Analysis of current literature indicates significant progress in understanding pathophysiological mechanisms, improving diagnostic algorithms, and developing new methods for treating mandibular fractures. The transformation of approaches to managing this category of patients is associated with the introduction of high-tech imaging methods (multispiral computed tomography, cone-beam computed tomography), the development of the concept of functionally stable osteosynthesis, the development of biocompatible implantation systems, the application of additive technologies, and a personalized approach to treatment planning.

Despite the successes achieved, questions regarding the optimal diagnostic algorithm, the choice of treatment method depending on the nature and location of the fracture, prevention of complications, and functional rehabilitation of patients remain the subject of scientific discussions. The frequency of complications in mandibular fractures, according to various authors, ranges from 9% to 36%, which indicates the need for further improvement of diagnostic and therapeutic approaches.

The purpose of this study is to systematize and analyze modern approaches to the diagnosis and treatment of mandibular fractures based on the integration of the latest scientific



data and clinical experience. The implementation of this goal involves solving the following tasks: assessing the informativeness of various diagnostic methods; comparative analysis of the effectiveness of conservative and surgical treatment methods; determining optimal approaches to managing patients with fractures of various locations; studying risk factors and methods for preventing complications; developing personalized protocols for managing patients, taking into account individual anatomical and physiological characteristics, the nature of the injury, and concomitant pathology.

The scientific novelty of the research lies in the comprehensive interdisciplinary approach to the problem, integration of data from fundamental and clinical studies, as well as the application of evidence-based medicine principles for forming optimal diagnostic and treatment algorithms. The practical significance is determined by the possibility of using the obtained results to improve the quality of medical care for patients with mandibular fractures, reduce the frequency of complications, and improve functional and aesthetic treatment outcomes.

Despite significant progress in surgical treatment methods for mandibular fractures, including the development of the concept of functionally stable osteosynthesis, the introduction of biocompatible implantation systems, and the use of computer modeling, the problem of complete functional rehabilitation and restoration of quality of life for this category of patients remains insufficiently resolved. According to multicenter studies, 30-45% of patients after mandibular fractures develop persistent functional disorders, including limited range of motion, pain syndrome, dysfunction of the temporomandibular joint and masticatory muscles, which significantly reduces quality of life and social adaptation.

The problem of functional rehabilitation becomes particularly relevant in multiple and combined fractures, fractures of the condylar process, and high risk of developing post-traumatic dysfunction of the temporomandibular joint. These clinical situations are characterized by the most pronounced functional disorders and require a comprehensive interdisciplinary approach to rehabilitation. Recent studies demonstrate that up to 68% of patients with condylar process fractures experience significant limitations in chewing, speech, and mouth opening even a year after injury, which emphasizes the need to optimize rehabilitation programs.

The concept of Health-Related Quality of Life (HRQOL) is becoming an increasingly significant criterion for evaluating the effectiveness of treatment and rehabilitation measures for mandibular fractures. A comprehensive understanding of the impact of trauma and its consequences on the physical, psychological, and social functioning of the patient allows for developing personalized rehabilitation programs aimed at restoring all aspects of quality of life. Modern research confirms that the quality of life of patients after mandibular fractures depends not only on the anatomical restoration of bone integrity but also on complete functional rehabilitation, psychological adaptation, and social reintegration.

Functional rehabilitation of patients after mandibular fractures is a complex process that includes various therapeutic approaches: physiotherapy, mechanotherapy, myogymnastics, manual techniques, hardware methods, and psychological correction. In recent years, there has been significant progress in the development of functional rehabilitation methods associated



with the introduction of computerized biofeedback systems, robotic complexes, virtual reality, and telemedicine technologies. However, the absence of standardized rehabilitation protocols based on evidence-based medicine principles limits the widespread implementation of these innovative approaches in clinical practice.

An important aspect of the problem is the insufficient integration of rehabilitation measures into the general treatment system for patients with mandibular fractures. Often, functional rehabilitation begins with a delay, is conducted fragmentarily, or is terminated prematurely, which significantly reduces its effectiveness. Research shows that early initiation of rehabilitation measures, their continuity, and sufficient duration are key factors for successful functional recovery and improving the quality of life of patients.

Special attention in modern literature is paid to studying predictors of impaired functional recovery and decreased quality of life after mandibular fractures. These include the location and nature of the fracture, treatment method, patient age, presence of concomitant pathology, initial condition of the dentition, timeliness and adequacy of treatment, patient compliance, and socioeconomic factors. Identification of these predictors allows for stratifying patients by risk groups and individualizing rehabilitation programs.

An interdisciplinary approach to the functional rehabilitation of patients with mandibular fractures, including collaboration between maxillofacial surgeons, prosthodontists, physiotherapists, rehabilitation specialists, psychologists, and social adaptation specialists, allows for achieving the most complete restoration of functions and improving the quality of life of patients. Integration of various competencies and coordination of specialists' efforts provides comprehensive coverage of the patient's problems and consistent solution of rehabilitation tasks.

The purpose of this study is to systematize and analyze modern approaches to the functional rehabilitation of patients after mandibular fractures and assess their impact on quality of life. To achieve this goal, it is necessary to solve the following tasks: determine the main functional disorders in various types of mandibular fractures; analyze the effectiveness of various methods of functional rehabilitation; evaluate the dynamics of quality of life indicators during rehabilitation; identify predictors of unfavorable functional outcomes; develop personalized rehabilitation programs taking into account individual characteristics of patients and the nature of trauma.

The scientific novelty of the research lies in the comprehensive approach to the problem of functional rehabilitation, integration of data from biomechanics, neurophysiology, and psychology, as well as the application of modern methods for assessing quality of life to determine the effectiveness of rehabilitation measures. The practical significance is determined by the possibility of using the obtained results to optimize rehabilitation programs, increase the effectiveness of functional recovery, and improve the quality of life of patients after mandibular fractures.

**Conclusions:** Modern diagnosis of mandibular fractures should be based on a multimodal approach, including clinical examination, radiological diagnostic methods with priority for computed tomography, which provides accurate visualization of the fracture line, degree of fragment displacement, and associated injuries. Cone-beam computed tomography has



advantages in the form of lower radiation exposure and high detailing of bone structures, making it the method of choice for uncomplicated fractures. The choice of treatment method for mandibular fractures should be made differentially, taking into account the location and nature of the fracture, the degree of fragment displacement, the presence of teeth in the fracture line, the general condition of the patient, and concomitant pathology. For uncomplicated fractures without displacement or with minimal displacement of fragments, conservative treatment with modern splinting systems and functional therapy remains effective. Surgical treatment of mandibular fractures using titanium mini-plates and screws provides the most stable fixation of fragments, early functional loading, and reduction in rehabilitation time. Analysis of long-term results demonstrates the advantages of open reduction and internal fixation over traditional conservative treatment in terms of accuracy of fragment alignment, frequency of complications, and functional outcomes.

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