

New methods of rehabilitation after a jaw fracture

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Abstract: The article presents basic rehabilitation techniques physiotherapy procedures cryotherapy, exposure to a magnetic field therapeutic exercises digital facial massage the use of special spacers and mouth expanders to develop and resume movements in the lower jaw.

Keywords: cryotherapy, exposure, magnetic field, lower jaw.

The most common and most painful injury to the facial skeleton is a mandibular fracture. Violation of the integrity of the movable horseshoe bone is accompanied by numerous functional disorders, significantly complicates oral hygiene and often leads to the development of a purulent-inflammatory process. And only reasonable comprehensive treatment and subsequent rehabilitation after a jaw fracture provide a full recovery.

The complex of restorative procedures recommended for patients with injuries of the maxillofacial region includes:

- physiotherapy procedures
- therapeutic gymnastics
- finger massage of the face the use of special
- spacers and mouth expanders for the development and resumption of movements in the lower jaw
- reflexology
- orthotics.

With uncomplicated fractures and timely treatment, the integrity of the bone and the function of the lower jaw are restored within 3-4 weeks. Fractures of the branch, articular or temporal processes of the lower jaw can lead to persistent functional disorders.

Treatment of mandibular fractures is one of the main problems of modern maxillofacial surgery. In the structure of traumatism, this pathology occupies a special place due to both functional and cosmetic disorders. This is due to the fact that the lower jaw, which forms the basis of the lower third of the face, determines its individuality and is the only movable bone of the facial skeleton, is much more often exposed to an external traumatic factor. According to domestic and foreign clinics, fractures of the lower jaw among injuries of the bones of the facial skeleton range from 70 to 85%. One of the most significant factors affecting fracture healing is the development of infectious and inflammatory complications in the post-traumatic period. Their frequency, despite the success in the treatment of patients with fractures of the lower jaw, ranges from 9 to 40%. When comparing the data of the analysis of the results of treatment of patients with

fractures of the mandible in the 50-60s and 90s, it was found that, despite numerous studies of the problem of prevention and treatment of infectious and inflammatory complications, a real reduction in the frequency of their occurrence was not achieved.

According to modern concepts, bone as a highly organized tissue arises and exists in close connection with the circulatory system. The relationship between hem microcirculation and bone tissue is manifested not only in local nutritional processes and in maintaining the general mineral balance of the internal environment of the body, there are reports of the participation of cellular elements of blood capillaries directly in the physiological and reparative regeneration of bone tissue. With a fracture, there is a rupture of vessels of different calibers both in the bone itself and in the soft tissues surrounding it. Acute disturbances in the blood supply to the bone lead to a persistent blockade of the microvasculature, a sudden drop in intraosseous pressure, a sharp slowdown in blood flow, tissue hypoxia, and ischemic stasis in the capillaries. At the same time, foci of ischemic damage in the ends of fragments in the early post-traumatic period do not remain stable.

Intraosseous infusions are based on the use of a close anatomical connection of an open network of peculiar venous capillaries (sinuses) of the spongy substance with a regional extraosseous vascular bed. If the walls of the sinuses, which are the source of the venous bed, are damaged by the needle inserted into the bone, the injected fluid evenly enters the common venous system through the physiological blood flow. Significant advantages of the method were revealed in the surgical treatment of a bone wound. Due to the outflow of fluid through the damaged vessels, it is abundantly washed (lavage) from the depth outward and the contaminated cavity is maximally freed from tissue decay products, the smallest foreign bodies, microbes, the removal of which is difficult in other ways. This contributes to a more rapid relief of the inflammatory process, provides optimal conditions for the healing of obviously infected wounds. A valuable quality of the intraosseous route is the possibility of leaving the needle in the bone for a long time for continuous administration of medicinal solutions.

In patients, in comparison with healthy ones, the subpopulation composition of T-lymphocytes also changed. If in healthy people the ratio of Etf.r - ROL/Etf.h-ROL averaged 2.7, then with an uncomplicated mandibular fracture it increased to 4.4, i.e. T-helpers began to predominate over T-suppressors. As shown earlier, this pattern is characteristic of the first phase of the current inflammatory process [2,7,8]. At the same time, in patients with, in addition to a fracture of the lower jaw, periodontitis and traumatic osteomyelitis, the Etf.r - ROL / Etf.h-ROL ratio increased sharply, and in many patients suppressors were not even detected in the test with theophylline. Apparently, this is a reflection of a more intense inflammatory process in these cases. There were no significant changes in the content of B-lymphocytes in patients compared with healthy ones. There were no significant differences in patients and healthy people and in the levels of immunoglobulins, which did not correlate with the severity of the disease.

The functional activity of neutrophils in patients with uncomplicated mandibular fractures changed little compared to the norm - a decrease ($p \leq 0.05$) was detected only in the load test with theophylline. With the aggravation of the clinical picture, the functional activity of neutrophils decreased. So, in patients suffering, in addition to fractures of the lower jaw, periodontitis, Etf - RON found a significant and significant ($p \leq 0.05$) decrease in the level of E-RON. In patients with fractures of the lower jaw in combination with periodontitis and traumatic osteomyelitis, the phagocytic activity of neutrophils was also reduced. It is possible that such a decrease in the functional activity of neutrophils with an aggravation of the process, which is associated with an increase in the intoxication of the body, since neutrophils react most strongly with a decrease in functional activity to the promotion of toxic substances.

The next stage of the work was the study of changes in immunological parameters during treatment. At the end of the hospital stay (days 15–21), in patients with uncomplicated mandibular fractures, most of the immunogram parameters returned to normal (Table 3). The exception was the content of serum IgA, which increased even more. The Etf.r - ROL/Etf.ch-ROL ratio increased and amounted to 3.4, although it did not reach the norm somewhat. In patients of other groups, immunological parameters also approached the norm, although some of them were far from reaching it. In patients with fractures of the lower jaw against the background of periodontitis, by the end of treatment, the level of T-lymphocytes increased significantly, although it did not reach normal values. The ratio Etf.r - ROL / Etf.ch-ROL has significantly approached the norm. The adhesive activity of neutrophils in the load test with theophylline increased, while the spontaneous activity remained at the same level. Apparently, the remaining shifts can be regarded as characteristic of the immune status of patients with mandibular fractures in combination with periodontitis, against which the changes in indicators occurred (Table 2). In the 3rd group of patients, the level of T-lymphocytes, although slightly increased compared to the initial level, remained significantly reduced compared to the norm. The Etf.r - ROL/Etf.ch-ROL ratio, as well as the E-RON level, also remained low. Such values of indicators most likely indicate an incomplete inflammatory process. Changes in the content of serum immunoglobulins in patients during treatment did not correspond to changes in the severity of the condition.

Immunological parameters in patients with mandibular fractures after the end of treatment, M+m

Index	1st group	2nd group	3rd group	Healthy donors
E-ROL (T-lymphocytes) %	70.0 \pm 1.8	64,3 \pm 3,0	51,2 \pm 2,0	70,0 \pm 2,8

	(40 - 75)	(16 - 90)	(32 - 74)	(40 - 82)
M-ROL (B-lymphocytes) %	17,0 ± 1,2 (6 - 30)	16,2 ± 1,2 (7-30)	15,1 ± 1,2 (8-27)	16,8 ± 1,8 (10-44)
Etf.r - ROL (T-helpers)	54,2 ± 2,4 (31 - 78)	51,0 ± 2,0 (16 - 88)	44,2 ± 2,7 (23 - 77)	50,5 ± 1,9 (33 - 68)
Etf.ch-ROL (T-suppressors)	15,8 ± 1,1 (3 - 10)	13,3 ± 1,2 (4 - 9,0)	7,0 ± 1,1 (22 - 62)	19,5 ± 0,9 (-14 - 32)
E-RON, %	37,1 ± 2,6 (12 - 62)	37,9 ± 0,9 (20 - 72)	36,6 ± 1,9 (18 - 55)	35,5 ± 2,6 (12 - 60)
ETF-RON, %	47,7 ± 1,2 24 - 35	45,3 ± 2,3 (24 - 68)	42,9 ± 1,4 (11 - 74)	47,4 ± 1,9 (32 - 68)
D-NF, %	3,9 ± 1,7 (1,4 - 5,0)	2,7 ± 0,2 (1,1 - 3,3)	2,6 ± 0,2 (1,9 - 3,0)	2,0 ± 0,1 (1,04 - 3,3)
IgA, g/l	19,0 ± 0,8 (10,2 - 24,4)	18,7 ± 0,5 (13,4 - 24,0)	17,9 ± 1,5 (6,3 - 30,0)	19,3 ± 1,8 (9,1 - 25,8)
IgG, g/l	2,0 ± 0,09 (0,5 - 2,8)	1,7 ± 0,03 (0,4 - 3,8)	1,6 ± 0,02 (0,5 - 2,0)	1,5 ± 0,04 (0,4 - 3,8)

Conclusions. Thus, despite the wide spread of indicators in the groups of patients and healthy people, general patterns of changes in a number of immunological parameters in mandibular fractures that are important for the rehabilitation of patients have been identified. Not all studied immunological indicators correlated equally with the severity of these processes. The most distinct correlation with the clinical picture was found for T-lymphocytes and their regulatory subpopulations - T-helpers and T-suppressors. According to the degree of their reduction, it is possible to monitor the severity of the inflammatory process, thereby ensuring targeted rehabilitation measures. So, for an uncomplicated mandibular fracture, a slight decrease in the level of T-lymphocytes and their rapid normalization are characteristic. With a sharp, long-lasting decrease in this indicator, if a mandibular fracture occurs against the background of periodontitis and traumatic osteomyelitis, the doctor deals with fracture complications. With this approach to the interpretation of immunological parameters, the revealed pattern of changes in cellular parameters of immunity in mandibular fractures can significantly help the doctor assess the patient's condition, the further course of the disease and prevent the development of complications.

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