

INNOVATIVE METHOD OF REHABILITATION OF PATIENTS SUFFERING FROM MASTICATORY MUSCLES CONTRACTURES: COMPLEX APPROACH

ІННОВАЦІЙНИЙ МЕТОД РЕАБІЛІТАЦІЇ ПАЦІЄНТІВ ІЗ КОНТРАКТУРАМИ ЖУВАЛЬНИХ М'ЯЗІВ: КОМПЛЕКСНИЙ ПІДХІД

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Анотація

The article analyzes the achievements of scientists involved in the treatment of contractions of masticatory muscles and emphasizes their advantages and disadvantages. Given the exhaustive description of the technical and operational features of the machine for the mechanic therapy of our own design. The complex method, which includes active-passive mechanic therapy, magnet-laser-therapy and reception of the drug "Katadolon Retard" is offered. The study was conducted for 4 years and it was attended by 90 patients with contractures of masticatory muscles, which were divided into 2 clinical groups, depending on the method of treatment. The most striking indicator of its effectiveness was the magnitude of the opening of mouth. In patients treated with the new method, the magnitude of the opening of mouth reached the norm for 14 days, at the same time, as in patients with control group, it was almost twice less. The results of the study allow us to conclude that the proposed methodology is highly effective and competitive on the world market.

Key words: rehabilitation, contracture, mechanic therapy, magnet-laser-therapy, the drug "Katadolon Retard".

В статті проаналізовано напрацювання вчених які займаються лікуванням контрактур жувальних м'язів та підкреслено їх переваги та недоліки. Дано вичерпну характеристику техніко-експлуатаційним особливостям апарата для механотерапії власної конструкції. Запропоновано комплексну методику, яка включає активно-пасивну механотерапію, магнітолазеротерапію і прийом препарату „Катадолон Ретард”. Дослідження проводилось 4 роки і в ньому взяли участь 90 хворих із контрактурами жувальних м'язів, які були розподілені на 2 клінічні групи в залежності від методу лікування. Найбільш яскравим показником його ефективності була величина амплітуди відкриття рота. У хворих, які лікувались за новою методикою величина амплітуди відкриття рота досягла показників норми уже на 14 добу, в той же час як у хворих контрольної групи вона була майже вдвічі менша. Результати дослідження дозволяють зробити висновок про високу ефективність та конкурентноспроможність запропонованої методики на світовому ринку.

Ключові слова: реабілітація, контрактура, механотерапія, магнітолазеротерапія, препарат „Катадолон Ретард”

В статье проанализированы наработки ученых, которые занимаются лечением контрактур жевательных мышц и подчеркнута их преимущества и недостатки. Дано исчерпывающую характеристику технико-эксплуатационным особенностям аппарата для механотерапии собственной конструкции. Предложена комплексная методика, включающая активно-пассивную механотерапию, магнитолазеротерапию и прием препарата „Катадолон Ретард”. Исследование проводилось 4 года и в нем приняли участие 90 больных с контрактурами жевательных мышц, которые были распределены на 2 клинические группы в зависимости от метода лечения. Наиболее ярким показателем его эффективности была величина амплитуды открывания рта. У больных, которые лечились по новой методике величина амплитуды открывания рта достигла величин нормы уже на 14 сутки, в то время как у больных контрольной группы она была почти вдвое меньше. Результаты исследования позволяют сделать вывод о высокой эффективности и конкурентоспособности предложенной методики на мировом рынке.

Ключевые слова: реабилитация, контрактура, механотерапия, магнитолазеротерапия, препарат „Катадолон Ретард”

Introduction. In the era of hybrid wars, terrorist acts and ecological cataclysms in the population is increasing the number of injuries and the most common diseases of the musculoskeletal system, and therefore there is a need to improve the provision of treatment and rehabilitation services [11]. It should be noted that the level of their quality depends directly on the area of body that is damaged. At present, the best developed algorithms for providing rehabilitation care for injuries and diseases of the hands, legs

and trunk, and, much less attention is paid to the restoration of the function of the musculoskeletal apparatus of the maxillofacial area (MFA), whose number of injuries is steadily increasing [1, 3, 6, 7, 14, 15]. Every year in Ukraine, the number of traumatic fractures of bones of the facial skeleton, diseases of the temporomandibular joint (TMJ), neoplasms, abscesses, phlegmon of MFA increases after which the contractions of the masticatory muscles (MM) often develop, which are always accompanied by restrictions on the opening of mouth with varying degrees of severity [4, 5, 9]. The presence of a restriction on the

opening of mouth in humans leads to a deterioration of the function of chewing, a language that significantly reduces its general-somatic status and psycho-emotional state. Patients years eat of chopped food by teaspoon [8]. Treatment of angular teeth for them is a very big problem and in most cases requires a preliminary redistribution operation – forced breeding of the jaws under general anesthesia. Not isolated cases of alimentary dystrophy, aspirational asphyxiation by emesis in such patients, which are a direct threat of a lethal outcome [9]. Also, the procedure for general anesthesia is significantly complicated due to the impossibility of intubating the trachea through the oral cavity. Therefore, in such cases, anesthetists carry tracheostomy [16]. All this makes this problem very actual today.

Due to the absence of a clear clinical algorithm for treatment of this complication in the national clinical practice that would be available to dental surgeons of any level, patients are forced to undergo self-treatment at home after discharge from the department. It should be noted that often such "treatment" is not enough to completely bring the muscular and articular device to normal. Therefore, due to this, a muscle-articular dysfunction, persistent articular contracture, ankyloses may occur in the patient in the future [5, 8, 9].

At the same time abroad, particular in the USA, Germany and Sweden, the problems of rehabilitation of patients with lesions of the MFA are given a fairly significant role and there is a

clear system of unified treatment protocols [8]. In clinics, the patient provides all kinds of care, from the first medical and ending with a sufficiently effective rehabilitation process, resulting in a patient discharge from the hospital mostly healthy. For this purpose, in the United States, for example, there is a enough number of rehabilitation physicians who are trained for four years of study [17, 19]. The requirements for the qualification of a rehabilitation physician include the perfect knowledge of human anatomy and physiology, methods of physiotherapy, classical sports and point massage, manual therapy, reflex-therapy, hardware methods of rehabilitation.

Materials and methods. Clinical research was carried out on the basis of the Communal City Clinical Emergency Hospital in the Lviv city. For the period from 2013 to 2017, 90 patients with contractions of MM that developed after fractures of the angle of mandible and condyle, after operations for purulent-inflammatory diseases and tumors of MFA, with muscular-articular dysfunctions, arthrosis, ankyloses of TMJ, as well as patients with microstome on the background of bullous epidermolysis take part in the study.

We developed pathogenetically sound and clinically effective therapeutic scheme for masticatory muscles contractures in which active and passive jaws mechanical therapy is a dominant factor. In the context of advantages and disadvantages of existing devices we constructed a modern device for active and passive jaws mechanical therapy (patent for invention № 111394 UA, A61S 19/00) [20] (Fig. 1).



Fig. 1. Appearance of the device of own design for dosed active-passive mechanic therapy of mandibl

The main novelty of the device and its difference from the known is in the fact that the lower dental plate is fixed to the body of the device with the help of articulated joints. This ensures the adaptation to the lower jaw occlusal teeth surface in the process of the mechanical therapy session and eliminates the danger of balancing on it.

The perforated surface of upper and lower plates is provided in the design of the device. This, with prior filling of the plates with some silicone, allows the usage of the device for patients with orthodontic pathology and secondary edentia, which is impossible with other modern devices. The design of the device also provides a power supply of two batteries, which are placed in the supporting handle. This ensures ergonomics and compactness.

In order to expand the range of patients who can use this device, the design provides removable dental plates of different sizes according to patients' age and constitution.

We have chosen metal dental plates instead of plastic ones like in the design of other prototypes. This is due to the fact that the elastic properties and its durability are ideal for reliable results of mouth opening amplitude (mm), and the power applied for jaws opening (kg).

Doctor's effective control of mechanical therapy process is achieved with the help of the digital indications screen, which shows the gap between the jaws in cm, and the pressure on masticatory muscles in kg, which allows selecting of optimal treatment mode. Audible alarm of the pain fixation helps the patient to undergo the mechanical therapy session more effectively, which is not provided in any other known devices.

A significant advantage of the device over others is the ability to use it with the mouth opening amplitude less than 5mm due to a minimal thickness of dental plates.

We have created a special computer program with the help of which it is possible to trace the tendencies of the course of different diseases in maxillofacial area. Also, in the future, we plan to use disposable film covers for nailing plates for hygienic purposes [2].

Treatment. According to the common clinical shows of masticatory muscles contractures and the peculiarities of medical tactics within certain stages of the disease, 90 patients were divided into 2 equal clinical

groups: the first control group included 45 patients with contractures who were treated with standard methods. The second main group included 45 patients with contractures who were treated by the new scheme. All patients from the control and main groups with masticatory muscles contractures underwent mechanical therapy, drug therapy and physiotherapy.

The control group patients used the second group mechanical therapy devices every day during 14 days. They made the devices themselves or bought a simple dilator in the medical equipment stores. Also, during the 14 days the patients took „Dicloberl” in injection and underwent electrophoresis with lydazum in the parotid-masticatory area.

The main group members conducted the 14 days dosed course of passive and active jaws mechanical therapy in the hospital or at home. In total, the patient performed 6 rounds of 60 session of opening and closing the mouth daily.

Of course, the usage of mechanical therapy with muscle contracture changes is a rather painful procedure. That is why we have complemented the masticatory contractures treatment regimen with mandatory muscle relaxant and analgesic intake with the central action mechanism – „Katadolon Retard”. The patient took 1 capsule in the morning after meals and before the first mechanical therapy round daily during 14 days.

The results. One of the major clinical parameters in patients with contracture was the mouth opening amplitude dynamics. At the beginning of the treatment, all patients were diagnosed with a rapid mouth opening amplitude limitation from 20 to 5 mm. During the treatment this indicator was increasing wavily, especially in the evening. However, the amplitude of mouth opening reduced significantly 5mm in the morning, accompanied by the feeling of tightness in the masticatory muscles. The moment, when the morning and evening indicators were the same, proved the positive dynamics. At the end of the treatment the amplitude of the mouth opening in patients with reflex contracture of the control group was only $24,82 \pm 0,46$ mm, which is significantly less than in patients in main groups, while the patients of the main group showed the results of $42,55 \pm 0,33$ mm, which is close to a standard (Fig. 2).

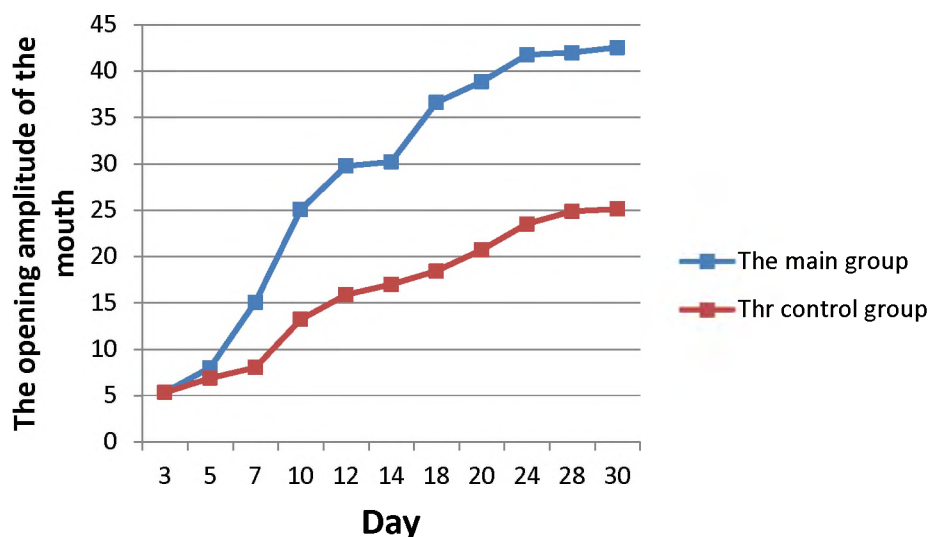


Fig. 2. Dynamics of changes in the opening amplitude of the mouth in patients with the main and control groups, depending on the type of treatment

Discussion. In cases of masticatory muscles contractures local authors recommend the usage of well-known old-fashioned devices, which belong to the first group, namely those that act upon the entire dental arch and spread even pressure on the whole dentition applying dosed load. In particular, these are the Darsisak's device, spoons of Limberg, Mathesis's device, Yadrova's device [12, 13]. But, unfortunately, due to absence of these devices in hospitals and medical equipment stores, the patients have to use the devices of the second group- wooden clamps or wedge-shaped struts, which only apply pressure on particular parts of dental arch and have not dosed load.

The situation is quite different in Europe and the USA where there is a clear system of standardized treatment protocols. For example, the world-known mechanical therapy system TheraBite® is used in Sweden [18]. In the USA two known systems are used- the TheraPacer 3000, which makes continuous passive movements and is effective for the treatment of patients with temporomandibular joint (TMJ) diseases, and after the surgeries in the maxillofacial area, and a biomechanical DTS device, provided for continuous passive mechanical therapy- Dynasplint Trismus System® [17, 20]. All of these devices can be used at home, they are commercially available.

But, along with the advantages each model has its disadvantages, including: dental plates balancing for people with secondary edentia, large

size. Some of the devices need to be plugged into a source of power. The design of all the devices includes the installation of dental plates in the oral cavity when mouth opening amplitude is no less than 5mm. They are quite expensive. In professional literature there are no reports on the creation of medical diagnostic device for jaws mechanical therapy that would allow tracing the dynamics and predicting the time of recovery with various pathologies.

Conclusions. 1. The proposed method of complex treatment and rehabilitation of patients with contractions of MM is aimed at a significant reduction in the cost of the treatment process and also in many cases allows the abandonment of surgical methods of treatment of this pathology.

2. Mechanic therapy is the dominant means in our proposed comprehensive treatment method for contractions of MM.

3. One of the main advantages of the apparatus for mechanic therapy in comparison with other is the dramatic reduction of the terms of treatment. Even with contractures of severe degree in patients after 14 days of treatment, in most cases, the desired effect is observed.

4. The cost of the device for mechanic therapy is moderate and makes it economically profitable.

5. Due to this method, the patient becomes an active subject of the medical process, in particular treatment can be carried out both in the hospital and in outpatient settings.

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