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Reducing treatment by means of physical rehabilitation after lower limb amputation

Abstract. Purpose: the main approaches to the assignment of physical rehabilitation restorative treatment after lower limb amputations. **Material and Methods:** theoretical analysis and synthesis of modern scientific and methodological literature data on methods of comprehensive rehabilitation after lower limb amputations. **Results:** the features of the application of physical rehabilitation after lower limb amputations, tasks and presents the main approaches to the appointment of medical physical training, therapeutic massage and physical therapy in preparation for prosthetics. **Conclusions:** demonstrated that therapeutic physical training, therapeutic massage and physical therapy are effective means of physical rehabilitation of patients after lower limb amputations.

Keywords: injury, rehabilitation treatment, therapeutic physical training, physiotherapy, massage.

Introduction. Nowadays the increase in number of soldiers of anti-terrorist operation of young and middle age is an actual medico-social problem in Ukraine who needs a recovery treatment and a long physical rehabilitation as a result of military operations and a military trauma which will allow to return them to full-fledged life [7].

In the wartime injuries of the musculoskeletal apparatus attached the main place at the application of the mine and explosive devices which are the reasons of permanent violations of functions of an organism which conduct to disability. Injuries of the lower extremities prevail among injuries of the musculoskeletal device (60%), the heaviest of them are destructions, typical for mine and explosive wounds, and separations and, as a result, an amputation of the lower extremity. That fact is also important that disability is established at people of the efficient age who had rather high quality of life before they had trauma, were socially demanded and active. Therefore their rather high harassments on integration into the society have to be considered when carrying out a complex rehabilitation of injured military operations and a military trauma [12].

Medical rehabilitation is the leading direction of a complex rehabilitation of military as a result of military operations and a military trauma which transferred an amputation of the lower extremities [7]. Medical aspects allow the correct an assessment of possibility of renewal of physical activity: a competent carrying out of different types of a recovery treatment for the purpose of the formation of a stump and possible elimination of its defects and diseases, and also renewal or compensation of the lost functions; the correct purpose of a design and a choice of a complete set of an artificial limb for primary prosthetics.

Conservative methods of treatment are a component of a complex recovery treatment of victims after the amputation of the lower extremity that includes: medical physical culture, medical massage, physiotherapeutic procedures [1]. The consecutive and purposeful use of physical methods of treatment allows making active as much as possible patients, most fully to prepare for prosthetics and to teach the use of prosthetic and orthopedic products [2].

Communication of the research with scientific programs, plans, subjects. The work was performed by the priority direction, on the law of Ukraine "About the priority directions of the development of science and technique" by the number 3.5. "Sciences about lives, the newest technologies of prevention and the treatment of the most widespread diseases".

The objective of the research: to consider the main approaches to the purpose of means of physical rehabilitation in a recovery treatment after the amputation of the lower extremities.

Material and methods of the research: the theoretical analysis and synthesis of modern scientifically methodical literary data relatively techniques of complex rehabilitation after the amputation of the lower extremities.

Results of the research and their discussion. One of the leading places in the system of recovery treatment of the lower extremities which were injured after the amputation borrows the medical physical culture (MPC)

[6]. MPC are applied according to clinical and anatomic-functional features of the truncated extremity, according to the motive status of a patient during preparation for prosthetics of means of. During the preparatory period, irrespective of the amputation level, such main *tasks* are solved: the determination of the level of physical activity; the increase of the general tone of an organism; improvements of circulation of the blood and lymph in a stump; the development of force of the truncated muscles of a stump and muscles the high set segments of an extremity; the elimination of contractures and rigidity in joints of the truncated extremity; the development of force of muscles of a trunk and shoulder-girdle; the training of balance and vestibular function; the development of coordination abilities; the improvement of basic function of hands; the development of force of muscles of the kept extremity after unilateral amputations [2].

Gymnastic exercises are the most widespread form of medical physical culture; they own a broad spectrum of the activity on a human body depending on a clinical state. The phantom and impulsive gymnastics, exercises for strengthening of muscles of knee and coxofemoral joints, for the development of coordination of movements and function of balance belong to special exercises. The performance of special exercises is aimed at the development of ability to the differentiation of muscular efforts and any relaxation of muscles. The participation of separate muscular groups in one movement is important when performing exercises. Exercises are carried out in the static and dynamic modes. After the amputation at the level of a hip exercises are necessary which provide an influence on extensors of a coxofemoral joint, after the amputation of a shin – extensors of a knee joint, after the amputation of a foot – extensors of a foot [4,6].

Phantom and impulsive gymnastics – is the isometric tension of muscles of a stump by an imaginary reconstruction of movements by the absent extremity segment. It is one of the few types of training directed on the increase of the function of the truncated stump muscles. The assimilation of this type of gymnastic exercises is demanded by a combination of tension of muscles of a stump to the movements in the kept joints. In the course of a study of tension of muscles of a stump can be followed by bending and extension in the corresponding joint of the kept extremity. The phantom and impulsive gymnastics improves a circulation of the blood and lymph in the truncated muscles, increases exchange processes, and fixes stump muscles. The tension of the truncated muscles has to be dosed by effort and speed. A patient has to achieve the maximum tension, hold it 1–2 s after that it is necessary to apply the maximum relaxation. It is necessary to acquire tension that of one, other muscular group, for example, flexors and extensors, to strain the truncated stump muscles in combination with the performance of movements by all extremity diversely and, in case of need, to keep tension at the fixed position of an extremity under different corners in the relation to a trunk. The phantom and impulsive gymnastics is carried out during 5–10 min, at first individually, then in groups [9; 11].

After the amputation at the level of a hip of tension of the truncated muscles of its back surface it has to be combined with the extension of a stump in a coxofemoral joint. The tension of the truncated muscles has to be dosed by effort and speed of the movement of a stump. The extension of a stump are at a tension of the truncated muscles with different speed and force especially important because it helps to master walking on an artificial limb in the subsequent [2].

Exercises for muscles of the kept extremity. The highest loading is to the kept extremity, than to the amputation therefore to its muscular and copular device the increased requirements are imposed. The lack of purposeful preparation of the kept extremity and the increase in loading are negatively reflected in its functional state. There are joint pains, shin muscles when walking strain, the basic surface of foot is overloaded. In this regard special exercises are used for strengthening of the muscular and copular device for the prevention of a flat-foot. The attention to the development of possibility of any relaxation of muscular groups which needs to learn in different starting positions is paid: lying, sitting, when walking on crutches. Relaxation of these or those muscular groups is reached by means of joggle, swing exercises and exercises on extension of muscles. It is necessary to achieve any relaxation of the kept extremity when walking on crutches and further on an artificial limb, and also a free, not tense situation of a foot. An additional easy plantar bending of a foot promotes the reduction of tension of its muscles [5].

The special important active exercises are directed on the differentiated mastering of the whole scale of muscular activity. It is a study by the minimum muscular tension, renewal of ability to dose muscular tension, the movement speed, the amplitude of the movement and other physical quantities of the movement. Much attention is paid active visual, proprioceptive, acoustical and to other types of control from a patient. Study by purposeful motive acts include in the set of exercises. Each action is carried out at first passively, under visual control of a patient, then 3–4 times actively on a healthy extremity. Further the active movements carry out at the same time both extremities with correction of the movement in the affected extremity. After that the set

movement is done only by the affected extremity. In some cases it is easier to carry out the movements both extremities and alternately healthy and struck not at the same time. Easy actions combine with more difficult [4; 10].

Study to walking – is a difficult process, which progress in many respects depends on the correct stage-by-stage selection of the exercises severely specific to clinical physical action at a specific patient. Special exercises are supplied to the elimination of violations of the coordination of movements. Training of the connected actions in different joints of hands, feet and trunks concerns to them, at the implementation of such important motive acts, as walking, turns on a place and in the movement, movement on the crossed plane (a support inequality, descent and rise, on a ladder, reduction of the plane of a support but other), performance of household and labor purposeful actions. Exercises for renewal and strengthening of functions of balance and special vestibular gymnastics are used [6].

Exercises for muscles of a trunk and a shoulder-girdle. The special exercises are applied which are aimed at the development of force of the weakened muscular groups are turns of the top and lower half of a trunk sideways of the truncated extremity for the prevention of violations of a bearing, elimination of an inclination of a hip, in the frontal plane. Exercises for lumbar muscles – are hip inclinations forward, on the right, on the left. The attention of the development of the basic function of hands is paid that is necessary for providing a support on crutches or reeds [9].

Exercises for the development of coordination abilities. The performance of these exercises promotes the renewal of coordination of movements of the kept extremity and stump, the coherence of movements of different links of the musculoskeletal device. Exercises are carried out in different starting positions, with subjects (dumbbells, stuffed balls, gymnastic sticks) and without them. Imitation of walking in situation can be used, lying on a back, sitting with the movements of hands [8].

Exercises for the improvement of a functional condition of a stump, the development of dynamic and static force. These exercises are carried out in different starting positions: lying, sitting, standing (after the amputation of one extremity), lying and sitting – after the amputation of both extremities. The attention is focused on the development of force of an extensor stump and wire muscles after the amputation at the level of a hip. Simultaneous participation of these muscular groups is important at the performance of movements because it facilitates a further use of an artificial limb. The most intensive influence on these muscular groups needs to be carried out after the amputation of both hips, combining the extension with reduction and internal rotation of a hip [6].

It is necessary to fix extensors and flexors of a knee joint after the amputation at the level of a shin. The attention is focused on those movements which are necessary when walking on an artificial limb. For example, walking imitation is recommended, lying or sitting after the amputation of both shins. The tension flexors of a shin and relaxation of a gastrocnemius muscle randomly increase at the extension in a knee joint; the reduction of a gastrocnemius muscle is carried out when bending in a knee joint. The movements are carried out in turn by each stump. The maximum reduction of muscles is necessary to rotate with their relaxation when performing exercises. Exercises are excluded with a support on a stump, in order to avoid its traumatization in the presence of trophic ulcers, standing out of bone creations [11].

Along with gymnastic exercises the elimination of contractures and rigidity in joints is carried out. The method of a manual redressment is used for this purpose. At the contractures of a coxofemoral joint expressed the bending manual redressment is carried out in situation, lying on a back, thus the kept extremity is bent in a coxofemoral joint; by-pass contractures – in situation, lying on one side on the party of the kept extremity. At bending-drain contractures the patient lies on a back, redressing the movement are directed back and inside, thus the methodologist holds the patient's hip from shift. The redressment can be carried out in situation, lying on a stomach at the insignificant or moderate restriction of extension in a coxofemoral joint. Thus one hand the methodologist squeezes the patient's hip to a couch surface, another covers from below a distal department of a stump and carries out the maximum extension in a coxofemoral joint. Carrying out an annual redressment of a stump demands considerable physical efforts and time. In chamber the patient has to sleep on a rigid bed, more often lie on a stomach, in situation on a back has to try to squeeze a hip stump to a mattress independently or to use additional weight [3; 4].

The manual redressments which are carried out in different starting positions are also carried out t contractures of knee joints, near gymnastic exercises – lying on a stomach, on a back. After their end it is expediently to record the reached result by means of different ortezes. The treatment of contractures is most effectively in combination with physical therapy, in particular, thermal procedures [11].

Physiotherapeutic treatment at a stage of preparation for primary prosthetics. In practical work medical

physical factors are widely used natural (mineral waters and therapeutic muds) and artificial (electrotherapy, light therapy, magnet-laser therapy). It is predetermined, first of all, by that physical factors are natural, physiologic irritants for a human body. As a rule, conservative treatment has a complex character; physical factors are applied in combination with medical physical culture, sports, swimming and other means of kinesitherapy. When using physiotherapeutic procedures the principles of sequence, following adhere, to complexity and multi-staging of treatment which provides the achievement of the greatest possible efficiency and the reduction of terms of treatment and primary prosthetics.

Massage. The use of medical massage prevails from numerous types of massage in the treatment and rehabilitation of disabled people. Dot, segmental, vibration or hydromassage can be applied together with it [6; 7].

Conclusions:

1. The typical wounds of the musculoskeletal apparatus is the destruction and separations of the lower extremity which result in disability of soldiers of the young age at the application of the mine and explosive device in the wartime.

2. The complex recovery treatment allows making active as much as possible the patient, to prepare for prosthetics and to teach the use of prosthetic and orthopedic products after the amputation of the lower extremity.

3. The most effective remedies of physical rehabilitation is medical physical culture, medical massage and physiotherapeutic procedures among conservative methods of the recovery treatment.

4. The conduction of medical rehabilitation actions will give the chance more quickly to carry out return to full-fledged life of young people including the participation in training and competitive process of sportsmen with limited opportunities.

Prospect of the subsequent researches is the introduction of an integrated approach to the creation of the program of physical rehabilitation for patients after amputations of the top extremities.

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