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# Contractures of Spastic Genesis of the Musculoskeletal Structures of the Lower Leg in Infected Children Morphofunctional Characteristics of the Condition

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**Relevance.** A certain attitude to the appearance of the individual % deviation from the generally accepted views was considered "abnormal", that is, it was not invested in the boundaries of the "norm" that this society established. The norm in nature and the norm in human society are two completely different, although related, concepts. In nature, the norm characterizes the most common variants of the manifestation of moral inclinations. The minimum height of women is 152 sm, in some trodes – 147 sm. According to medical standards, the normal height for women and men is not less than 150 sm and 167 sm, respectively. According to the standards of modern society for a successful career and the opinions of others, the growth of women and men should be much higher.

The problem of growth has become especially acute in recent years, when the process of acceleration of adolescents, which has been going on for many decades, has been replaced by eceleration, and the number of children and adolescents with stunting caused by various reasons has increased significantly. People of average and slightly above average height usually do not pay much attention to their height, but those whose height is below average often attribute their height to physical affluence, experiencing, in this regard, constant psycho-emotional tension, attempts to increase growth with the help of hormonal drugs, physical exercises did not bring the proper result. The problem of increasing human growth found its radical technical solution in the second half of the last century thanks to the discovery by G.A. Ilizarov of the general biological tacon "tension tension. The history of the distraction esteosynthesis method has several evolutionary stages. For a long time, the main attention was paid to equalizing the length of the limbs in patients with shortening of one limb.

The next stage in the development of CCDO was an attempt to increase growth in patients with chondroplasia. At the same time, the constant improvement of the methods of the CKDO allowed to increase the lengthening of the lower leg from 10 to 20 cm. However, they gradually came to the conclusion that it makes no sense to fully compensate for the lag in body growth from 120-130 m to 160-170 cm. The next decade was characterized by the fact that under the leadership of Professor V.I. Shevtsov, methods aimed at improving the quality of life were developed.

The maximum improvement of treatment results, which allows improving the quality of life in the long term after removing the device, is achieved with the involvement of all known achievements of other methods: physical therapy, massage, physiotherapy, psychotherapy, reflexology, pharmacotherapy. Limb lengthening in patients with severe growth disorders and in practically healthy people has different indications for surgery, depending on the amount of elongation and the technique of surgical intervention. If a patient has such a pathology as achondroplasia, bilocal elongation of all segments of the limbs is most often performed, trying to achieve the optimal lengthening value from the point of view of the function of the musculoskeletal system. The reason for the increase in growth in practically healthy people is not an objective necessity, but

psychological discomfort about dissatisfaction with their appearance, therefore, when lengthening, it is necessary to maintain normal body proportions, locomotion speed, since we are talking about improving the quality of life.

Therefore, the task of physiological research is to find a compromise between the aesthetic effect of treatment and functional insufficiency, and, consequently, to determine the optimal permissible values of elongation, taking into account the available anatomical reserves of growth, reserves of functional adaptation, which are determined by age, gender, individual characteristics of the patient, as well as the presence of repeated elongation of segments.

In children and adolescents with achondroplasia, the elongation reserve is primarily associated with the presence of age-related features - prolonged heterochronous morphofunctional maturation of muscle tissue, which creates good prerequisites for muscle adaptation at various stages of the rehabilitation process when using BCD; with the presence of a reserve reserve on the part of the soft-tissue component; the reserve reserve during repeated elongation of segments is determined by recovery processes, occurring during the rehabilitation period in soft tissues.

These reserve capabilities on the part of soft tissues, as well as significant technical achievements of the CCDO, create a unique opportunity to extend the segments of the lower extremities by large amounts and obtain good functional outcomes. More complicated is the question of the availability of reserve opportunities for leg lengthening in adults of practically healthy people with "subjectively low or insufficient growth". Reliability of functioning of biological systems is one of the principles of individual development. It is based on such properties of a living system as redundancy of its elements, their duplication and interchangeability, speed of return to relative constancy and dynamism of individual parts of the system. And, if at the early stages of postnatal life a rigid, genetically determined interaction of individual elements of the functional system prevails, then with the improvement of the central mechanisms of regulation and control, plastic connections that create---- for become increasingly important. -dynamic selective organization of system components.

Thus, the biological redundancy of elements present in each organism, their duplication and interchangeability on the one hand, the absence of strict genetic control in adulthood on the other hand, and the dominance of significant plastic connections with environmental components, ensure the presence of some reserve reserve in adult patients during the process of leg lengthening.

The purpose of this study is to provide a physiological substantiation of the concept of structural and functional reserves in the musculoskeletal system in patients with achondroplasia and patients with "subjectively low or insufficient growth"

Modern ultrasound research methods allowed us to evaluate the features of reparative activity, topography and parameters of the visualized vessels of distraction regenerate, as well as the condition of the main vessels during elongation of the segments of the lower extremities in patients with achondroplasia and in patients with "subjectively low or insufficient growth" at various stages of treatment. The effect of limb segment elongation on microcirculation in patients with achondroplasia and in patients with "subjectively low or insufficient growth" was investigated. Metabolic features of tissues in patients with achondroplasia and in patients with "subjectively low or insufficient growth" at various stages of the rehabilitation process are shown. For the first time, both general patterns and differences characteristic of structural changes in the muscles of the segments of the lower extremities in patients with achondroplasia and in patients with "subjectively low or insufficient growth" at various stages of functional rehabilitation were established.

The assessment of the muscles of the elongated segment made it possible to assess the preservation or exhaustion of their structural reserve, to select adequate rates, values of elongation, which subsequently largely determined the functional state of the locomotor apparatus as a whole. As a result of a comprehensive assessment of peripheral blood circulation by ultrasound Dopplerography and microcirculation using laser Doppler flowmetry, as well as transcutaneous determination of oxygen and carbon dioxide stress, it was shown that with adequate use of the CCDO technique, ischemic disorders in the tissues of the lower limb were not detected.

Based on the functional results, physiological criteria for predicting physiological muscle recovery have been developed at various times after the removal of the device, which allow planning the lengthening of limb segments. Biologically optimal values of elongation, age of patients for carrying out stages of operative correction are presented. The physiological justification of the methods of operative limb lengthening is given. Possible field of application: human physiology, clinical physiology, ertopedia.

The functional reserves of skeletal muscle growth determines the permissible limit of operative elongation of limb segments. This limit is greatest in achondroplasia, in conditions of selective delay in the longitudinal growth of limb bones, and the smallest in healthy subjects with subjectively insufficient body growth.

With increasing age of patients, there is a decrease in relative, and after the end of the period of natural longitudinal growth of the body, and absolute reserves of limb muscle growth. An even greater decrease is observed after the first stage of surgical limb lengthening. Functional reserves of contractility of the anterior muscle group of the lower leg in patients with achondroplasia are preserved with elongation of the lower leg up to 9-10 cm, in patients with subjectively insufficient growth - up to 5-6 cm. Based on the analysis of echo signs, 3 main types of reparative activity of bone distraction regenerate were identified. Type 1 with rapid activity is characteristic of sick children with achondroplasia, type 2 is characterized by zonal formation of distraction regenerate. Type 3 with a decrease or absence of newly formed hyperechogenic structures in the intermediate zone of the regenerate, the presence of cystic structures is characteristic of repeated elongation of limb segments in patients with achondroplasia and in the treatment of patients older than 35 years with "subjectively low or insufficient growth". When scanning the distraction regenerate in the energy Doppler and color Doppler mapping modes, single vessels are visualized at the beginning of distraction.

At the end of the distraction period, branches of arteries appear with high values of the pulsator index and the resistance index. With the 3rd type of reparative activity, the hypoechoic areas are usually avascular, which confirms the theory of primary angiogenic osteogenesis. By the method of laser Doppler flowmetry, the presence of stable compensation in the microcirculatory circulation system was established in both examined groups. An increase in PI a, tibialis anterior indicates the development of collateral blood flow or additional branches in the proximal region. The restoration of the dynamometric parameters of the thigh and lower leg muscles is an integral indicator of the quality of treatment, accompanied, on the one hand, by the necessary increase in the length of the lower extremities, and on the other hand, by a decrease in the dynamometric parameters of the muscles.

**Conclusions**

1. The elongation of the segments of the lower extremities in patients with achondroplasia by 20 cm or more allows them to be transferred from the category of people with low growth to the category of people of normal height; the lower border; elongation of the shin bones in practically healthy people with "subjectively short or insufficient growth" allows achieving not only the desired growth, but also the sthetic proportions of the body.
2. Using the ultrasound method, the structural features of the formation of the musculoskeletal system in children and adolescents are shown, it is established that after the completion of the pubertal growth spurt, the bundles of muscle fibers acquire a characteristic orientation, the subchondral plate of the femoral head, the tibia acquire a smooth homogeneous contour with a minimum number of lumpy inclusions.

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