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Exercises of the short-foot as a method of pes planus treatment

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Abstract

The basic functions of the foot are: shock absorption, taking over the body weight, which determines the correct locomotion. Physiologically, the body weight is based mainly on three points of support: the first and fifth metatarsals bone and in the middle of the heel tumor. Improper arching of the physiological arches of the feet leads to the development of flat feet,

which results in improper load distribution on the feet and overloads in all body structures. There are many diagnostic methods to diagnose flatfoot, among them we can distinguish: podoscopy examination and on a podobarography platform. One of the most effective methods of flatfoot treatment are the short-foot exercises. They are aimed at activating the short plantar muscles of the foot responsible for its proper arching. Exercises outside the regulation of muscle work also contribute to the improvement of proprioceptive sensation. Systematically and reliably conducted gymnastics have a beneficial effect on the shape of the feet.

Słowa kluczowe: wady stóp, fizjoterapia, płaskostopie, ćwiczenia krótkiej stopy

Keywords: foot defects, physiotherapy, pes planus, short-foot exercises

Introduction

The gait is a physical activity that is inherent in human life, it accompanies everyone from a young age. In healthy children, gait begins to develop at the age of about one year, it is subjected to constant changes within the nervous and muscular systems until they reach the age of about 10 years old. During this time, the formation of the arch of the feet is subjected to various changes. In some cases, the wrong direction of foot formation results in irregularities such as transverse or longitudinal platystones. Inadequate mechanical function of the foot, in turn, often causes a disorder in the setting of other body elements, contributing to the development of various postural defects [1]. In addition, the basic functions of the foot include: maintaining the body weight, participation in individual phases of gait through propulsion, shock absorption during gait. Proper functioning of the foot is associated with its morphological structure and proper shape of the longitudinal and transverse arches. Appropriately, arched arches of the foot determine proper cushioning while moving, which protects the body from excessive overloads. The whole foot function is its external and internal architecture supported by active and passive stabilizers. The former is a set of muscles located within the foot, while passive stabilization is possible thanks to: ligaments, joint capsules, which maintain the proper position of the foot [2,3]. The role of physiotherapy in shaping the right arches of the foot is of the greatest importance in the child's development period, due to the fact that in the age of about 22-25 there is formulated a complete shape and

the peak of efficiency of the motor system. One of the most effective methods of flatfoot treatment is the so-called short foot training. Systematically repeated, it determines the correct arching of the arches of the feet, and thus the correct cushioning.

Longitudinal and transverse arching of the foot

A properly formed arch of the foot ensures its proper resilience and load resistance. The foot vault consists of five bony longitudinal arches that converge in its back region [3]. Three arches on the medial side pass through the bone, the wedge, reaching for the talus. In turn, the other two arches from the lateral side run through the cubic bone and end in the calcaneus. The longitudinal arch of the foot is strengthened by plantar fasciitis and ligaments and muscles on the plantar side. The tibialis posterior muscle is of particular importance. The foot arch is also composed of two transverse arches, shaped by plantar ligaments and muscles: long sagittal and palpus adductor (transversal head). The front transverse arch connects all the metatarsal bones, while the posterior arch passes through the wedge and cuboid bones [4]. Three support points are characteristic for the feet: heel bone I and V metatarsal bone. Excessive overload, largely related to lifestyle, leads to weakening of muscle and ligament functions, which contributes to the formation of irregularities in the formation of the arches of the feet. This results in the occurrence of various pathologies such as: transverse, longitudinal buttocks [5].

Longitudinal and transverse flat feet

Among the newborns, flat feet are a physiological and typical condition associated with the adipose tissue localized in the middle area of the foot, which gradually disappears at the age of 2 years. After this period, the development of proper arching of the foot begins, which is associated with the improvement of gait. The greatest risk of pathological flatfoot development occurs at the age of about 7 years, because it is the period of the fastest growth. Moreover, at this age, due to the beginning of education, the child reduces the level of physical activity, which is also related to overweight or obesity [6]. Except having inappropriate body weight, also excessive involvement in various sports may be the reason for the incorrect shape of the longitudinal arches of the foot. There are two types of longitudinal flatfoot: rigid and flexible. The first of these occurs when the medial longitudinal arch decreases under static conditions and load. In turn, elastic flatfoot is the case when the medial longitudinal arch is flattened when the foot is loaded in static conditions and when it is deformed in the situation of motion [7]. In turn, in transverse flatfeet occurs a pathological

reduction of the transverse arch of the foot as a result of which all the heads of the metatarsals rest flat against the ground under load conditions [8].



Fig. 1. Longitudinal flat feet

Diagnostic methods of flatfoot

There are many methods used to assess the arch of the feet. One of the most popular is the suboscopic examination. This method allows to diagnose foot defects in a very easy and quick way. During the test, you can evaluate: foot symmetry, arch arches of the feet [9]. Another, more accurate examination is the assessment of the arching of the feet on the sub-camera platform. This method allows the assessment of pressure distribution on the plantar side of the foot. In addition, it helps to assess the shape of rates and set specific indicators [10]. In evaluating the arching of the longitudinal foot, there can be used the Clarke angle, shown in Figure 2, which is formed by a straight medial foot (connecting C and S points) and a straight line connecting the points of the largest foot recess: Q and q. In adults, the correct value of this indicator is 45° - 50° . Longitudinal flat feet is observed when the angle is 30° [11, 12].

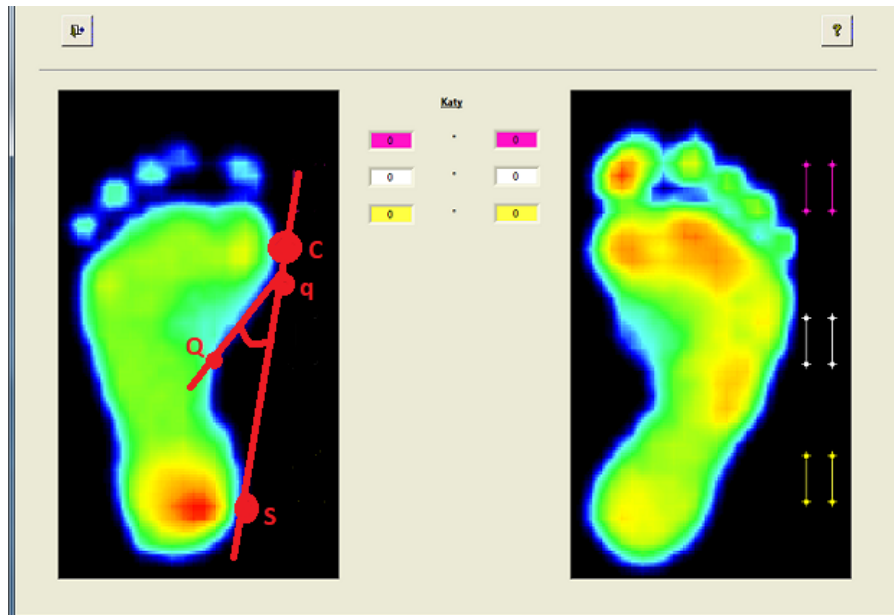


Fig. 2. Designated Clarke angle based on a study performed on a photographic platform.

Exercises of a short foot

One of the effective forms of flatfoot therapy are the so-called short foot exercise. This method affects the deepening of the longitudinal and medial arches, which is triggered by the work of the internal muscles of the foot [13]. During the exercise, the short muscles of the foot activate: the abductor of the toe, the four-sided soles and the tibial back and sagittal long, which are responsible for supporting the longitudinal and transverse arch of the foot. Obtaining the correct arching of the feet positively affects the stability and posture of the body. In addition, these exercises are proprioceptive, thanks to which they contribute to the improvement of deep feeling [14].

During short foot exercise, therapy is carried out by enforcing the three support points:

- I metatarsal bone,
- V metatarsal bone,
- The middle of the calcaneus.



Fig. 3. The main points of the foot support

It is essential that to carry out exercises without socks to be able to control the quality of their performance. Therapy starts with a sitting position, it is important to remember to keep the right angle between the foot and the lower leg as well as your thigh and lower leg. Lower limbs should be set to the width of the hips. Then, because we obtain certain skills, we continue to work in a standing position and stand on one leg [15]. Performing short foot exercises determines the correct positioning of the entire lower limb: ankle, knee and hip joints.

During the exercise, one should focus on pressing the first metatarsal to the ground and keeping the position to shorten the metatarsus. This can be compared to the movement that aims at bringing your fingers closer to the heel. It is important not to press your fingers against the ground. Properly performed exercise should give a feeling of tension on the plantar side of the foot [16].

Examples of short foot exercises:

1) Exercise in a standing position on one leg. The lower support leg is loaded on three basic support points. The exercise is based on lifting the ball, which is located on the outside of the support leg. During the exercise, the arch of the longitudinal foot is supinated and raised. The exercise is presented in figure 4.

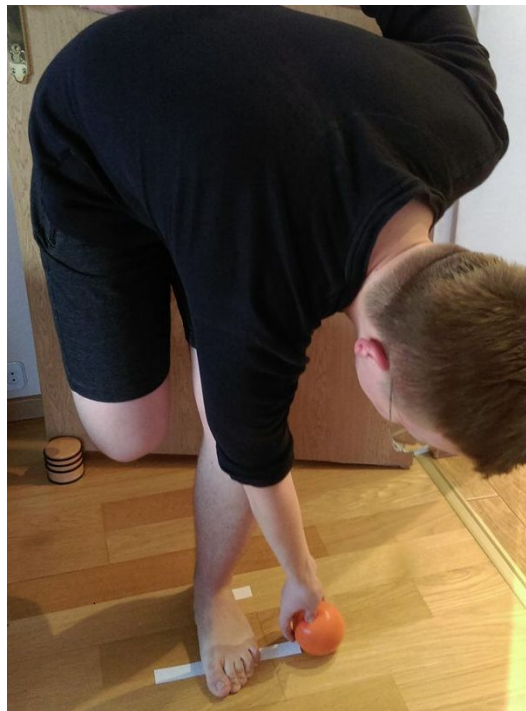


Fig. 4. Exercise of short feet in one leg standing position.

2) Exercise in a standing position. The feet set in the supination keep the ball between them. The patient's task is to walk forward while keeping the ball between the feet. The exercise is presented in Figure 5.



Fig. 5. Exercise of a short foot using the ball while walking.

3) Exercise in standing position one-legged. Upper limbs dissuaded sideways. The patient's task is to maintain this equivalent position while focusing on shortening the muscles of the short foot, trying to bring the first metatarsal bone to the heel. The exercise is presented in Figure 6.

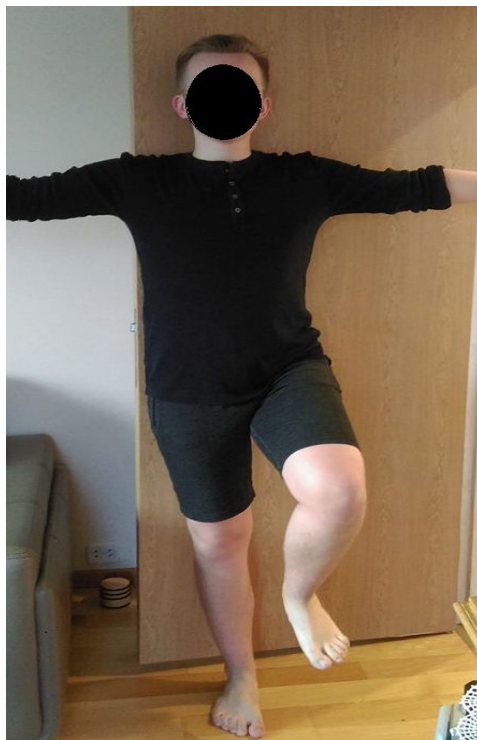


Fig. 6. Exercise of a short foot in an equivalent position in a single-leg condition.

Summary

The problem of flatfoot affects both children and adults, but its leveling is most effective at an early age. Incorrect shape of the arches: the longitudinal and transverse stop affects the arrangement of all parts of the body. In addition, flatfoot reduces the effectiveness of foot cushioning, walking and other activities requiring body weight, which may eventually lead to overloading changes. The proper therapy for transverse and longitudinal platypodia is the so-called short foot training. Systematic exercise, which use the three basic support points on the feet results in the activation of the muscles responsible for arching the arches of the foot. These exercises should be performed precisely, in various positions starting from sitting and repeated many times bring the desired effects.

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