Physical treatment of foot deformities in childhood

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During the period of development foot deformities can occur, not only during the growth and development, but also in the later age. The most frequent foot deformity is flatfoot, congenital club foot and hallux valgus.

Prior to the decision on surgical treatment of the deformity, whenever possible the patient should be referred for physical therapy that may yield acceptable results in specific treatment phases. The basis of the treatment involves kinesitherapy, application of certain agents (thermotherapy, electrotherapy, ultrasound) and orthosis for maintaining corrections.

If such therapy does not yield satisfactory results, the deformity is surgically corrected. After surgical correction, physical procedures can contribute to more rapid recovery and decrease possible complications (pain, edema, complex regional pain syndrome - Mb Sudec), which can follow the surgical correction of the deformity. In addition, the obligatory form of rehabilitation also involves kinesitherapy.

Keywords: flatfoot, congenital club foot, hallux varus, physical therapy

INTRODUCTION

In the developmental period foot deformities may occur, not only during growth and development, but also in later age. The most frequent deformities involve flatfoot, congenital club foot and hallux valgus deformity.

FLATFOOT

Deformity known as flatfoot is characterized by the flattening of the arch, with the back foot held in a valgus position. Mostly there is a collapse of the longitudinal arch, although transverse arch flattening may also occur. Basically, we are talking of weakened ligaments, which may also involve other joints. The problems cause static disorders, so that the patient walks with the forefoot curved inward. Causes can be obesity, inactivity and inadequate footwear.

It is considered that all children are born with a minimal foot arch and over 30% of neonates have a calcaneovalgus deformity of both feet. With growth and development, the arch becomes higher, so that in adulthood flat feet do not have to be registered. In children a flatfoot is diagnosed at about the third year of life. Usually the condition is not painfully sensitive and in most cases it is resolved without any extensive intervention. Most children with flatfoot diagnosis have a flexible weak flatfoot.

There are no clear criteria, clinical or radiological, to differentiate symptomatic from non-symptomatic flatfoot. It would be best to say that the flatfoot is absent or low arch only. However, some authors have indicated that there are parameters which can indicate flat feet. In adults the flatfoot can be either unilateral or, which is more frequent, bilateral.

Flatfoot is a frequent static disorder, which in older age, can have different causes, but it can also be the associated incidence of metatarsalgia and hallux valgus. In adults a frequently mentioned cause is insufficiency or dysfunction of the posterior tibial ligament.

Beside by clinical examination, the flatfoot can be also recognized by footprint or computerized analysis of the footprint, as well as by x-ray diagnostics, computerized tomography (CT) and magnetic resonance (MR).

Not every flatfoot will disclose symptoms in older age as well. On principle, the flatfoot without symptoms does not require any special treatment. Treatment can involve orthopedic shoes, insoles, but above all physical therapy, basically kinesitherapy. Kinesitherapy should be initiated as early as possible, primarily the strengthening of foot muscles, exercises of heel-toe gait and walking on uneven surface.
A symptomatic painful foot can be associated with some other pathological conditions, and thus it requires full attention. In children the painful flatfoot can be caused by tarsal coalition, which is a fusion of two or more bones. Such a foot has limited motion and leads to the flatfoot. In young persons with a rigid flatfoot attention should be paid to congenital anomalies, such as congenital vertical talus or some other disorders.

Patients with asymptomatic flat feet may develop a symptomatic painful flatfoot which can be caused by degenerative changes that can turn the flexible flatfoot into a rigid one. Degenerative rheumatism, vascular processes, bone and soft tissue trauma can provoke the occurrence of flatfoot, as well as neuropathic diseases, such as polyneuropathy, Charcot-Marie-Tooth neuropathy and other forms of neuropathies.

In the acute painful phase, non-steroid anti-inflammatory medications, physical therapy (for example electrotherapy) and also as a rule kinesitherapy can be applied. In more severe cases orthotic and other corrective appliances, and in the last stage, surgical intervention as well can be applied. A symptomatic painful flatfoot can be treated as suggested, or by surgical procedures.

After surgery, physical treatment can be suggested, primarily for more rapid recovery or in order to prevent the development of possible chronic regional pain complications.

CONGENITAL CLUB FOOT

Congenital deformity of the foot characterized by a shortened and twisted foot turned inward and with muscle hypotrophy of the lower leg. It is one of the most frequent congenital deformities of the foot, mostly affecting boys, and often with previous familial occurrence. It can be frequently associated with other anomalies of locomotor system. The diagnosis is made based on clinical, x-ray, ultrasound (US), CT and MR findings.

The aim of the treatment is to establish by correction anatomically normal painless foot as much as possible, with acceptable range of motion, not requiring special corrective footwear. Treatment is initiated immediately, already on the first day after birth, by physical procedures (kinesitherapy, thermotherapy, electrotherapy) and corrective splints.

The first three weeks of life are particularly significant, because it is considered that soft tissues are very elastic at this period. After 3-6 months the decision is made on further treatment either surgical or conservative. There are still no full recommendations as to the initiation of surgical treatment. Since soft tissue shortening and muscular contracture is involved, it is necessary to perform stretching exercises. To achieve better effect of the exercises, to decrease pain during exercising and to increase tissue elasticity, thermotherapy can be applied prior to kinesitherapy. Therapeutical procedures contribute to the relaxation of muscles and soft tissue structures. Introductory thermoprocedures can involve paraffin packaging applied from the tenth day of life, or if unavailable, instead the infrared lamp can be used. To improve lower leg muscle hypotrophy electrotherapy (muscle electrostimulation) is also introduced after the tenth day of life. The achieved correction is maintained by placing splints which are removed during therapy and bathing of the child. The splints are applied on the upper leg, and initially they are changed every week and later every two weeks.

Surgical intervention is performed if physical treatment failed to yield satisfactory results. Physical therapy is also applied after surgical corrective intervention. Rehabilitation also involves thermoprocedures as the introduction into kinesitherapy, muscular electrostimulation and wearing corrective splints. With onset of weight-bearing, the child starts wearing orthopedic shoes and will do so in later life as well. Surgical treatment of this disorder is performed step by step; thus, in the child's later age corrections (soft tissue, osteotomies) can be done, which will be also necessary postoperatively. Special attention should be paid to rehabilitation after the removal of plaster cast worn for a longer period of time so as to maintain the corrected position.

Despite all efforts of parents, physiatrist and orthopedician, the parents should be told that such a foot can never be normal, that it will remain shortened, with a certain degree of muscular hypotrophy.

HALLUX VALGUS DEFORMITY

The appearance of bunions is a frequent structural deformity of the foot which presents with the deviation of the hallux of over 15 degrees, with a dislocation of the first metatarsal bone and retraction of the metatarsal head. It is considered that several factors can attribute to the occurrence of the deformity: structural disorders, sex, age, body weight, foot deformities (such as flatfoot), inadequate shoes, but also genetic predisposition. According to Coughlin, genetic predisposition is most essential factor. The disorder is more frequent in females with the frequency of about 58% (twice more frequent than in males, 25%), and at older age in addition, it is considered that increase in body weight contributes to the development of the deformity, as well as already present flat and painful feet.

It is necessary to have knowledge of risk factors so as to be able to work on prevention. Wearing high heels is accused as a cause, however, various authors report doubts about their influence, which can be explained by different criteria for heel height (some included those over 2.5 cm). Flatfoot occurs with high frequency of hallux valgus in males, but not females, however, as well as in males with increased body weight. Hallux valgus is more often present in women without flat feet. Possible explanation could be that men have larger bones, while women show greater mobility of metatarsal bones.

It is usually considered that foot bunions can be detected in females with history of wearing high heels at ages 20-65 years, and without primary flat feet or increased body mass.

Prior to surgical treatment of hallux valgus deformity some preventive measures can be applied. Adequate footwear, above all avoiding tight footwear. Use of corrective
appliances, insoles with metatarsal arch support, and correction of flatfoot if present. In painful phases, prevention of pain and edema by applying anti-inflammatory medication (systematically or locally), as well as physical procedures (electro procedures, sub axial ultrasound and foot massage). After surgical intervention, physical agents can be used to decrease swelling, pain if present (electro procedures, sub axial ultrasound, massage), but also physical therapy in case of complication development, such as the occurrence of complex regional pain syndrome - Mb. Sudeck.

Mobilization of the patient in regard to getting up should be immediately initiated already on the first postoperative day. Wearing footwear which holds the feet firmly is obligatory. Physical procedures can be applied four weeks after surgery. Concurrently with rehabilitation, strengthening of foot muscles (flexor digitorum longus and brevis) should be performed by active training. Also, muscles, such as the peroneus longus, should be strengthened, because if this muscle is too weak people compensate pushing the knee into a varus position to achieve midfoot pronation. It is also most important to maintain the mobility of metatarsal arch muscles.

Despite the success of the intervention and the application of other measures, nevertheless, even after surgery, there is a possibility of bunion relapse.

**REFERENCES**