

Feet - the Base of the Human Body

By David Pomarino



Introduction

Toe-walking is a frequently occurring gait deviation of children and, in a different form, of adults. Unfortunately, this topic is being deemphasized as a “quirk” or something similar, although even in infancy consequences might include back pain and a slipped disk. Previous therapies only had limited success, but there are newer, very successful holistic concepts of therapy.

Potential causes of idiopathic toe-walking

Potential causes of idiopathic toe-walking are:

- a) biomechanical changes of the spine in connection with pneumonia
- b) hypotony in connection with a dysplasia of the hip
- c) tactile dysfunction

Etiology: Last year David Pomarino did six months of research on the causes of toe-walking. A total of 67% of the 60 probands suffered from pneumonia before they learned to walk, 20% of the children had an early dysplasia of the hip. Familial accumulation was found only in 3% of the affected children (Fig. 1).

Biomechanical changes of the spine in connection with pneumonia

A disorder of the pulmonary system may cause a hardening of the diaphragm, which exerts a draft on the pars lumbalis of the muscle. This results in a massive hyperlordosis, which may be responsible for toe-walking. With hyperlordosis the pelvis flexes and is being kept in that position. The legs are in extension position. The changed static conditions in the caudal area of the body may also have a negative influence on the systems above the diaphragm (see picture 1).



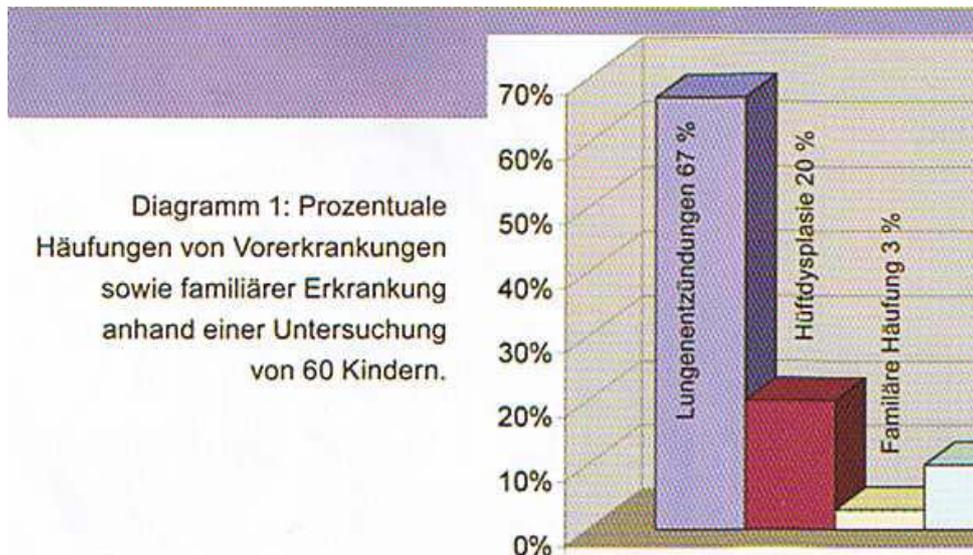


Diagram 1: Showing percentage of previous illnesses and of familial illnesses on the basis of a research project with 60 children; pneumonia 67%, dysplasia of the hip 20%, familial accumulation 3%.

Hypotony in connection with a dysplasia of the hip

Because of the changed collum-diaphysis angle the musculature of the hip exerts a different draft on the system of the pelvis. This can result in a defective position of the pelvic girdle (flexion position). This probably results in a misbalance of the muscles around the hip and in a shortening of the leg, which cause the compensatory toe-walking. In addition, a child's low tone causes the regulation mechanism of toe-walking.

Tactile dysfunctions

Because of a hypersensitivity of the sole of the foot the child avoids treading with the whole foot. In order to achieve a minimal contact surface, the patient preferably walks on the forefoot.

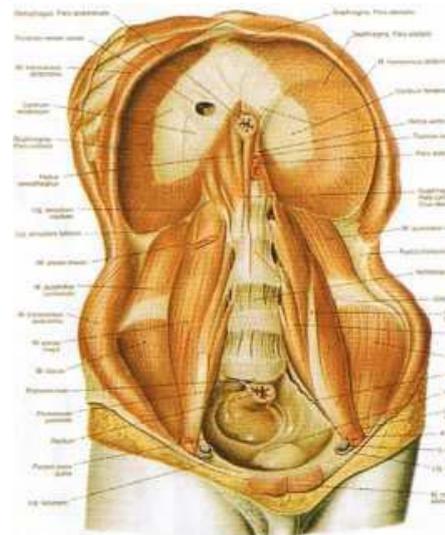


Fig. 1: Position of the diaphragm seen from the stomach cave (Sobotta, Anatomie des Körpers, 1996).

Clinical picture of idiopathic toe-walking

The clinical picture of idiopathic toe-walking shows the following symptoms (Fig. 2):

Head and cervical spine: slight displacement of the head towards the front and lordosis of the cervical spine; shoulder girdle and thoracic spine: retracted shoulder girdle; thoracic spine in middle position pelvic girdle and lumbar spine: strong flexion of the pelvis; hyperlordosis of the lumbar spine.

Upper ankle joint and feet: plantar flexion of the feet; cranial draw of the heel caused by the strong draw of the musculature of the dorsal muscle chain; broad contact surface of the forefoot; pressure is only on the forefoot.

Up to now common therapies of toe walking are the support with insoles, the conventional physiotherapy with stretching, the administration of botulinum toxin, treatments with plaster casts and operations.



Fig. 2: idiopathic toe walking



Fig. 3: position of the feet on Conventional insoles

Insoles

Hitherto common insoles are hardly effective because toe-walking puts pressure only on the forefoot. The supporting parts of conventional insoles are attached to the back of the insoles and hence the patient does not put pressure on this place.

Conventional physiotherapy with stretching

The conventional therapy which is only concerned with the regulation of the feet ("foot training") serves only as a treatment of the foot musculature and of the structures of the foot. It does not consider the patient's holistic problem (Fig. 4).



Fig. 4: conventional physiotherapy with stretching

Botulinumtoxin

In Germany the toxin was approved in 1993 for selected indications, e.g. spasticity therapy. The injection of botulinumtoxin into the musculature of the calf causes an atony of the muscles. However, the effect of the toxin is only temporary, which often causes improvement only for a short time.

Serial Casting

Serial casting is a static therapeutic method and toe walking is essentially a dynamic gait deviation. Therefore, this approach will not succeed, and a temporary immobilization of the foot will not necessarily translate into a sustained therapeutic success.

Operation

Severe cases require an achillotenotomy; but this surgical proceeding should only be the patient's last resort.

Alternative therapy according to Pomarino

Below we want to introduce an alternative to the common treatments, which has been developed because of my long practical experience and which has proved to be of value. The alternative therapy is decisively based on the use of a special pyramidal insole (according to Pomarino).

Description of the pyramidal insole

Every insole is being adjusted individually to the patient's foot. The insole's upper side is made of a skin-friendly, resilient material; therefore they are being well accepted by children. Supporting elements are included under the heel bone for the hindfoot's position as well as under the forefoot, which is under pressure at toe-walking. The elements supporting the forefoot are of different size and they are being brought into position exactly according to the position of the bones and joints. The supporting elements under the forefoot are pyramid-shaped, which gave name to the insole. They are made of a flexible material, which, however, loses shape only after long usage (Fig. 5).



Fig. 5: Pyramid insoles according to Pomarino.

Mode of action of the of the pyramidal insole

The mode of action of the pyramidal insole is different from the mode of action of common insoles. The insole's main sphere of action is on the forefoot, which with toe-walking is extremely under pressure. On the one hand they function passively, because the foot - adjusted to the individual patient - is being brought into normal position by the different sizes of the supporting elements. At the same time they also function actively, since they change the structure of the foot by forcing the muscles and ligaments into normal position through passive support.

Through support under the heel bone the insoles also affect the position of the hindfoot and influence the plantar torsion. The lifting of the arch and an improved proprioception of the foot has a positive effect on the tonus relations in the body. Thus, the patients straighten, e.g. with serious lordosis the pelvis straightens.

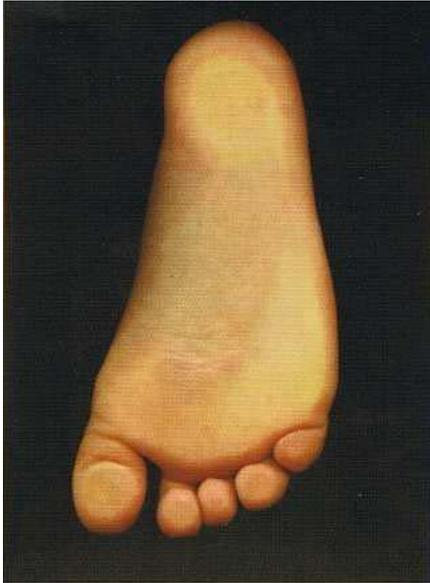


Fig. 6: foot without wrinkles



Fig 7: foot with wrinkles

Physiotherapeutic analysis and finding

Among other things the analysis includes the segmental flexibility of the spine in all directions and segments as well as the measurement of the tension of the muscles around the spine. Furthermore, the sacroiliac joint has to be checked on both sides, e.g. with help of the Patrick-Kubis-Test. In order to discover misbalances, all components of movement should be considered. The upper ankle joints are being checked for constraints with and without the musculus gastrocnemius elimination. The feet are being checked for their ability for torsion and movement.

Visual methods (photo/scan)

Pictures of the spine, the feet and the static of the whole body are being captured. The results serve for the individual adjustment of the insoles and for the checking of the therapeutic success. The scan captures the formation of wrinkles on the plantar region of the foot. A non-lifted foot has no wrinkles, or the wrinkles are at right angle to the foot. On a developed foot, spiral wrinkles can be seen (see pictures 6 and 7, and pictures 11 and 12, respectively).

Photographic displays are the basis of the surveying of the lumbar spine. By marking four defined points (Th 12, L 5, spina iliaca posterior superior) the degree of a, most of the time existing, lordosis and the child's development in the therapy are being determined (Fig. 8).

Physiotherapy with pyramid insoles

The administration of insoles is most effective if it is accompanied by a therapy. Straightening out the patient should be the primary goal of the therapy. At first, the gentle removal of blockings may be helpful. Only when the body is in balance, the patient should wear insoles. Otherwise they would only strengthen the asymmetry. In order to avoid grave consequences for static and motor function, an early beginning of the therapy of toe-walking is important.

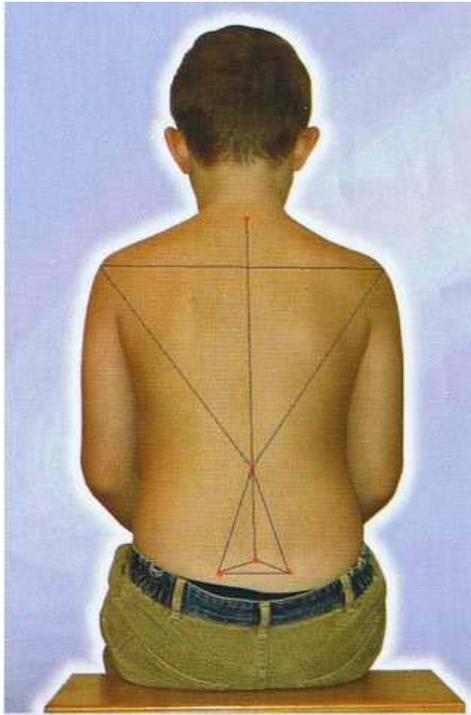


Fig. 8: marking of the lumbar spine in order to check the straightening of the pelvis.

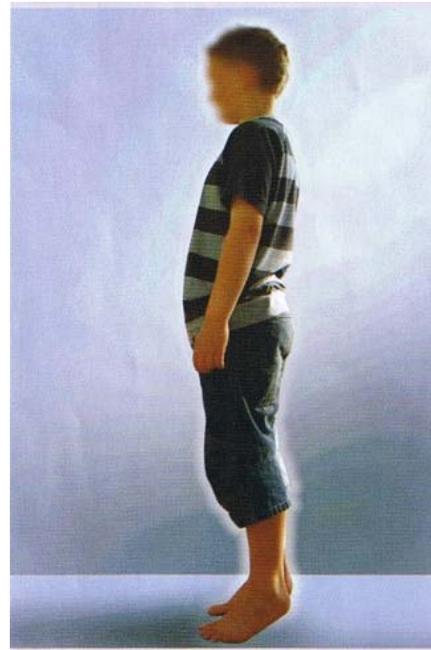


Fig. 9: Marco at the beginning of the therapy.

Case study I

Marco (patient's name changed) is eight and a half years old. He came to my medical office in May 2003 with the diagnosis of idiopathic toe-walking with sensomotoric disorder. The patient has been walking on his toes from the very beginning; under certain circumstances such as loading this toe-walking is being intensified. At the age of twelve months the child suffered from pneumonia. The child complains about pain in the calves. Marco has been wearing common insoles without success and he is suffering from bronchial asthma, which has to be medicated.

Particularities of the finding: static and dynamic toe-walking; blocking of the right sacroiliac joint; serious hyperlordosis and increased tonus of the musculature of the calves; Pressure on the shortened muscles caused pain, and in relaxed state both upper ankle joints passively could only reach a dorsal extension of 0 degrees. Actively Marco could not bring his upper ankle joints into zero position (Fig 9).

The therapy started with the removal of the blocking of the sacroiliac joint in order to straighten out the child. Next, a scan of the feet was made in order to make the insoles. Marco got his first insoles in April 2003. After having used the pyramidal insoles for three weeks the child showed serious toe-walking when he was barefoot, but there was already pressure on the heels, as can be seen on the insoles, which showed traces of wearing. According to his mother, during these three weeks Marco had trouble walking with the insoles and often stumbled, especially when he climbed stairs. As long as he was wearing the insoles, the toe-walking was not visible anymore.

After nine weeks of consequent use of the insoles he was walking on the whole foot barefoot as well, though only for the first 20 minutes. After that, he reverted to the old pattern of toe-walking. After 21 weeks of therapy the toe-walking had almost disappeared. It appeared only under extreme physical effort.



Fig. 10: worn out pyramidal insoles showing weight on the heels

Case study II

The therapy not only concentrates on the foot as it is at the moment of reception. It also takes into consideration the child's sensomotoric development and its possible disorders. The therapy has to be developed after an anamnesis, clinical findings and a certain period of observation.

Case study: Lisa is three and a half years old. Her anamnesis shows relapsing pneumonias between her sixth and tenth month. Concerning her sensomotoric development, her motoric development shows a slight delay. She started walking at the age of 19 months. Right from the beginning she showed serious toe-walking. Clinical findings showed a serious hyperlordosis of the lumbar spine when she was standing and lying on her back. The upper ankle joint shows an imminent limitation of plantarflexion. Furthermore, there was a blocking of the sacroiliac joint, which resulted in a tilting of the pelvis.

First, it was important to straighten out the pelvis with the help of soft impulses on the spina iliaca posterior superior. Pyramidal insoles were being adjusted; furthermore 10 sessions of physiotherapy followed, where the treatment concentrated on the sensomotoric development. This was aimed at an improvement of the movement between prone and dorsal position and at stimulating the loading of the foot when she was sitting on the heels or in kneeling position. As it is familiar, with infants the differentiation of the pelvis and of the feet takes place in these positions.

After six months of treatment with a combination of pyramid insoles and physiotherapy the toe-walking was not visible anymore. The hyperlordosis was much more moderate. A holistic treatment with various therapy approaches in combination with insoles made Lisa's problems disappear after a relatively short time.



Fig. 11: right foot at the beginning of the therapy



Fig.12: right foot at the end of the therapy (development of wrinkles)

Conclusion

The use of insoles in combination with a physiotherapeutic treatment is a soft cure with a high rate of therapeutic success for the therapy of toe walking. An operation with all its burdens and risks is not necessary for most of the children. The same is true for the treatment with plaster casts, which is unpopular with children and has only static ways of influencing the extremity. A combined application of insoles and physiotherapy is much more successful for toe-walkers than a sole treatment with insoles.

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