DEFORMATIONS OF THE FEET, KNEES, HIPS, PELVIS IN CHILDREN AND ADULTS WITH MINIMAL BRAIN DYSFUNCTION. CAUSES. TREATMENT. PROPHYLAXIS

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SUMMARY

In the paper we present observations from the years 1995–2015. Material contents 955 children and youths aged between 2 and 18 years. In the article there are shown clinical and X ray symptoms of the dysfunctions of the movement system caused by Minimal Brain Dysfunction [MBD] – valgus deformity of the feet, hyperextension of the knees, anterior tilt of the pelvis, hyperlordosis of the lumbar spine.

The authors have given methods of therapy in the context of the feet, hips and pelvis deformities. Proper and successful treatment of these deformations we can treat as best prophylaxis of pain syndromes in people of adult age.

Key words: minimal brain dysfunction, valgus of the feet, hyperextension of the knees, anterior tilt of pelvis, hyperlordosis of the lumbar spine

INTRODUCTION

Almost 7%–11% of the population of children and youth in Poland in the last years of the XX century and in the XXI century are children born with various changes in the central nerve system (CNS). This happened because pregnancy and delivery in many cases in our time are not correct. Asphyxia of the central nerve system at the time of pregnancy and birth can appear and this happens very often. The status of such cases we described as Minimal Brain Dysfunction (MBD). Next, we observe secondary changes in the movement system. Clinically there is a 90% of spasticity or sub – spasticity. Only in 10% of such children there are "flaccidity" what had reported Prof. Harald Thom from Heidelberg [1973–1974] and next Rummelsberg ([1985] – T. Karski – (personal contacts).

In this paper the authors discuss the idea of many Polish rehabilitation doctors about "low tension of the muscles" and the necessity to strengthen the muscles, necessity to form "a special master of brain to influence the muscle function". Our point of view to these ideas we present in the chapter "Discussion". We clarify these problems according to our research and we see it a special important for the chosen method of therapy.

We underline that the methods of therapy are proper only in situations when the diagnosis is correct and pathogenesis of illness, or deformity is properly presented, only then we can plan the proper therapy.

CLINICAL FORMS OF MINIMAL BRAIN DYSFUNCTIONS (MBD) IN MOVEMENT APPARATUS

The oncoming after MBD, deformations of the legs, arms and spine in children can persist to the older years of life. There are: valgus or plane valgus deformity of the feet, recurvation of the knees, anterior tilt of the pelvis with hyperlordosis of the lumbar spine. All these abnormalities should be fully treated in infants and throughout a child's period of life. If the children are not treated fully – they will be exposed to a big problem in their adult life – pain and even handicap situations connected with pathology in the feet, knees, pelvis and spine.

Diagnostic tests in MBD

To make a proper diagnosis we should firstly ask about the details of pregnancy and delivery period. Before planning any treatment we must present the correct diagnosis. To find the proper diagnosis we should use the examination tests. Here we must answer the question – was or was not the asphyxia of the child in both periods - pregnancy and delivery. Next we should use the tests similarly in orthopedic and in neurology to a precise diagnosis.

There are the following list of tests: quick stretch test (QST), Elly Dunkan test (others names Staheli or Thom test), Holt test, Thomas test **(Fig. 1, 2a, 2b, 3).** Especially important is the QST.

Fig. 1. Quick stretch test (QST). Test of provocation of spasticity of m. triceps surae. Repeated quickly dorsal flexion of the foot by the hand of the doctor shows increasing of equines position of the foot (A), (B), (C).

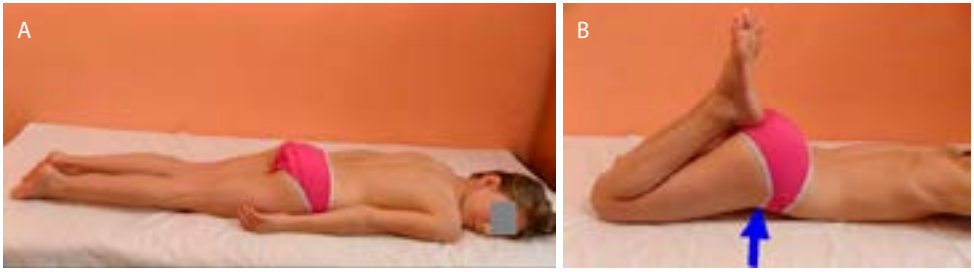

Fig. 2. A – Elly Dunkan test. Wiktoria H. Born 28.01.2006. 10 years old. MBD. Laxity of joints and at the same time contracture (shortening) of m. rectus on both sides – see Fig. 2B.
B – Wiktoria H. Elly Dunkan test. Flexion of the knees. Shortened m. rectus is the cause of the lifting of the pelvis. In result – anterior tilt of the pelvis and hyperlordosis of the lumbar spine.

Fig. 3. Test showing the laxity of joints (one of the ten tests according Wynne Davies). Child – Martyna W. Age 9 years. Born 21. 02. 2007. Laxity as typical clinical symptoms of Minimal Brain Dysfunction (MBD) because of biochemical changes in collagen, but not the sign of weakness of the muscles.

Fig. 4. A – Child with the shortening of the Achilles tendon on both sides. Result – equines deformity of the feet. B – Child with the shortening of the Achilles tendon on both sides and laxity of the joints. Result – valgus deformity of the feet.

After completing the tests we can properly diagnose the "malposition of the joints and parts of the body", this means properly describing the deformations of the feet, knees, pelvis and spine. Mostly as the cause of these deformations we see the shortening of tendons, capsules, muscles, fascias, but not "weak muscles".

MATERIAL

The observations are based on the material of 955 children and youths in age of 2 to 18 years. The presented cases come from the years 1995–2015. They were treated in Pediatric Orthopedic and Rehabilitation Department of Medical University in Lublin (1995–2009) and in Orthopaedic Praxis of authors (1995–2016).

Valgus or plane valgus deformity of the feet

The causes of feet valgus deformities presented in literature are various:

a) spastic shortening of pronator muscles – m. peroneus brevis and m. peroneus longus,
b) anomalies of the bones
c) a laxity of the joints.

According to the authors observations – the main cause of feet valgus deformities is the shortening (contracture) of the Achilles tendon, of m. triceps surae and other flexors of the feet.

Mostly this influence is coming because of the MBD and there are similarly affected both legs. When there is only a shortening of the Achilles tendon and m. triceps surae, the child is walking on the equines position of the feet or one foot **(Fig. 4a)**. Quite a different is when a shortening of the flexors of the feet and at the same time exists laxity of the joints appears. In such situation, with every step while walking, in the phase when the leg is behind of the body and foot fully in contact with floor, will come to the prone position of the feet and with time will fix the valgus deformity **(Fig. 4b).** Mostly there are complex deformity – valgus and plane deformity of feet. The described deformity of feet is very common among Polish children, even 7%–11%.

What is the explanation for such a deformity?

Answer:
1. during walking we need by every step dorsal flexion of feet 15 or 20 degrees,
2. in a situation of the shortening of the Achilles tendon and m. triceps surae and accompanying the laxity of joints, the needed dorsal flexion is possible only in prone position of the feet,

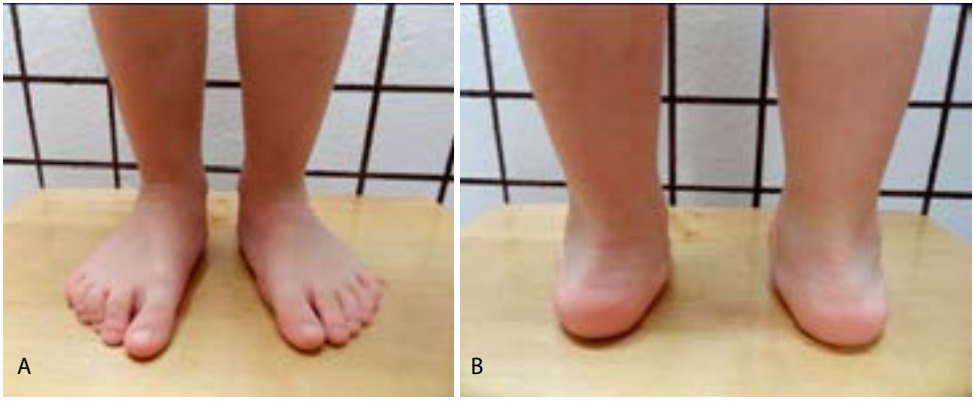

Fig. 5. Alan S. 2 y. Born 19.03.2013. Not proper pregnancy and delivery. Typical changes for Minimal Brain Dysfunction (MBD). Planus and valgus deformity of feet. Laxity. Shortening of the Achilles tendon and m. triceps surae on both sides. Treatment from 2013.

3. such repeated "dorsal flexion in prone position" since the first steps of a child walking, after some years give the "full fixed valgus, or plane - valgus deformity" of the feet **(Fig. 5a, 5b).**

When these children are not treated early enough, next they need a longer time for therapy, even many years and it is difficult to achieve good results. Deformity in mild form can be treated only with physiotherapy. When the deformity is fixed and the child is older – it is necessary to make surgery. No treated valgus deformity of feet in child's period of life, makes big problem in adults – pain, limping, difficulties in walking **(Fig. 6a, 6b).**

Recurvation and valgus deformity of the knees

Recurvation of the knees **(Fig. 7a, 7b)** is very often accompanied symptom by a valgus deformity of the feet. Such deformity of the knees is also the effect of a shortening of the Achilles tendon and m. triceps surae and there is also a compensatory deformation. Explanation: a small limitation of the dorsal flexion of the feet during walking, typical for children with MBD, at the moment when the foot is in full contact with the floor, cause hyperextension of the knees, together with prone position of the feet. Such a knee deformity we see very often in children with MBD. Summarized, in these children the first problem is MBD, second shortening of the feet flexor, accompanied symptoms a laxity of the joints, resulting in a slow development of the feet deformation and recurvation of the knees.

The cause of the valgus deformity of the knees in children with MBD is shortening of tractus iliotibialis or permanent improper sitting with the legs directed to sides and to back of the body. Such incorrect sitting of children with MBD we called "the TV sitting" (German: Najadesitz) and it is very common by all children with generally laxity of the joints.

Fig. 6. Female Marianna M., 61 y. Extended valgus and planus deformity of the feet. The patient in childhood was never treated. Hypertrophy of soft tissues in the tarsus region. Halluces valgi. Plantar flexion of the toes extremely limited. Pain. Difficulties during gait.

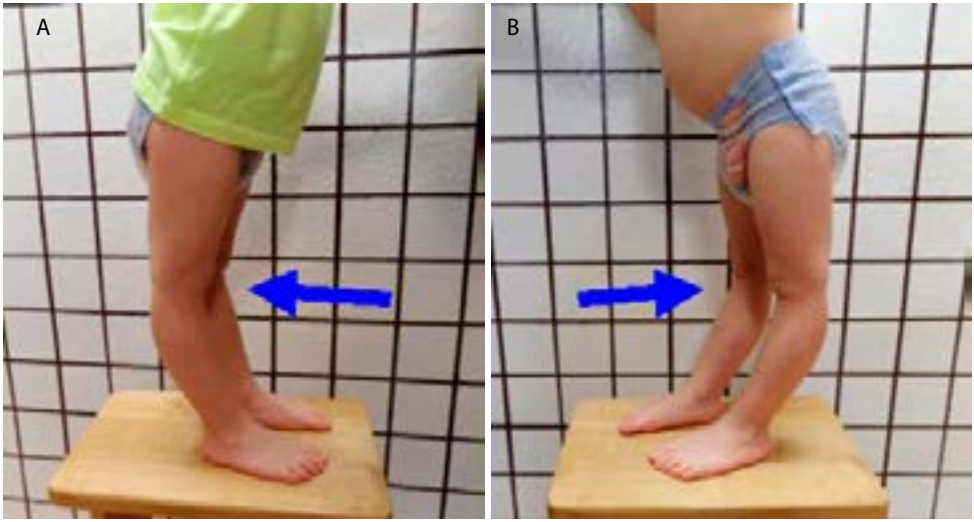

Fig. 7. Alan S. 2 y. old. Born 19.03.2013. Problems during pregnancy and delivery. Typical changes for Minimal Brain Dysfunction (MBD). Recurvation deformity of the knees (arrows). This secondary deformity is because of the shortening of the Achilles tendons and m. triceps surae on both sides. Such deformity develops as compensation deformation in moment of contact of the feet with floor during every step in walking.

Finally the fixed valgus deformity of the knees is caused by a shortening (contracture) of m. tensor fascia latae, fascia lata, tractus ilio-tibialis and capsules of the knee joints. In adults age the valgus deformity of knees is connected with lateral instability of the joint, pain and difficulties in walking.

Hip dysplasia

Hip dysplasia appears in two pathological conditions:

1. in the situation of general laxity of the joints (10% of all dysplasia cases in Poland) and
2. in Syndrome of Contractures and Deformities (SC&D – H. Mau, T. Karski & J. Karski) – 90% of all cases in Poland. This second group of deformity Prof. Klisic from Yugoslavia (60-years of XX century) called "Developmental Dysplasia of the Hip" (DDH). In this group dysplasia develops slowly, not because of primary undeveloped roof of acetabulum, but because of incorrect position of the femoral head in acetabulum. Explanation: deficit of abduction, in other words permanent adduction position of the femoral head in acetabulum, leads to "secondary dysplasia of the hips roof" what Klisic called DDH.

In both dysplasia groups can coexist sub – spastic or spastic contracture (shortening) of adductors muscles of hips. In such a situation the dysplastic hip therapy is longer and more difficult. In order to achieve better therapeutic effect it is important to inform the parents about this coexistent spasticity of adductors of hips to receive better cooperation in the therapy.

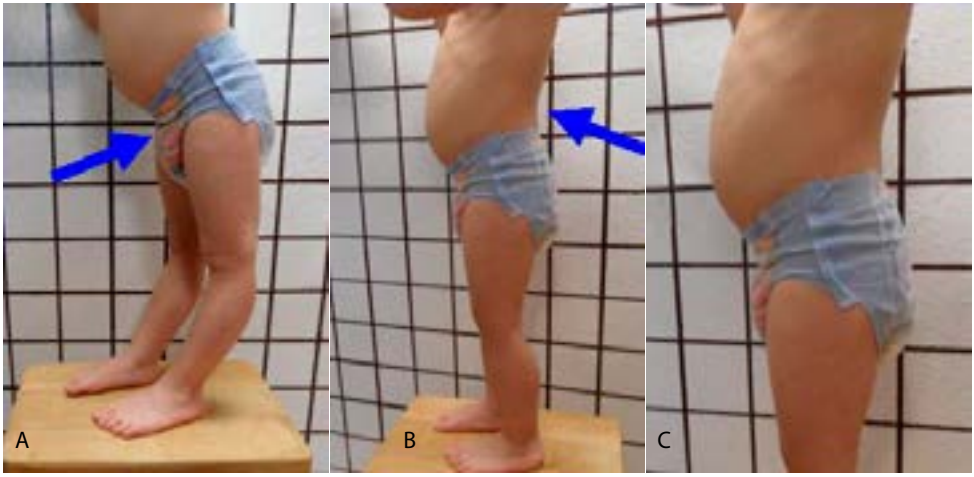

Fig. 8. Alan S. 2 y. old. Born 19.03.2013. Problems during pregnancy and delivery. Typical changes for Minimal Brain Dysfunction (MBD). Anterior tilt of the pelvis (A – arrow) as a result of the shortening of m. rectus on both sides with hyperlordosis of the lumbar spine (B – arrow) and extended forwards movement of the abdomen (C).

Anterior tilt of the pelvis and hyperlordosis of the lumbar spine

In children with minimal brain dysfunction independent of valgus deformity of the feet and recurvation of the knees anterior tilt of the pelvis with hyperlordosis of the lumbar spine is often observed **(Fig 8a, 8b, 8c).** Spasticity or sub spasticity concerns not only m. triceps surae but very often also m. rectus, one part of the m. quadriceps. M. rectus is the muscle which includes two joints – knee and hip joint. For the knee this muscle is extensor, for the hip it is flexor. When this muscle is spastic and with the time – shortened – it makes an anterior tilt of the pelvis with hyperlordosis of the lumbar spine. This deformity is very frequent in children with MBD. We observe this deformity of the pelvis and the spine in 11% of people in Poland. When this deformity is not cured in childhood, or in the youth period of life, it is the cause of back pain in adults. These problems cause a very large scientific and clinical subject and need a new paper.

Others orthopaedic and psychological problems in children with MBD

In observations of many orthopaedic surgeons, paediatricians, neurological and psychological doctors is to state that the children with MBD are very often nervous, they cry without any cause and at the same time they very willingly look for close contact with mother, father or grandparents. These children like also to jump off from various high objects such as chairs, sofas, window-stills, tree branches and other objects in their environment. The jumping repeated for many times causes Perthes disease that is necrosis of femoral head **(Fig. 9).** During repeated jumping the cartilage is resistant but the bone can be fractured and this is a moment of the start of the whole process of Perthes disease.

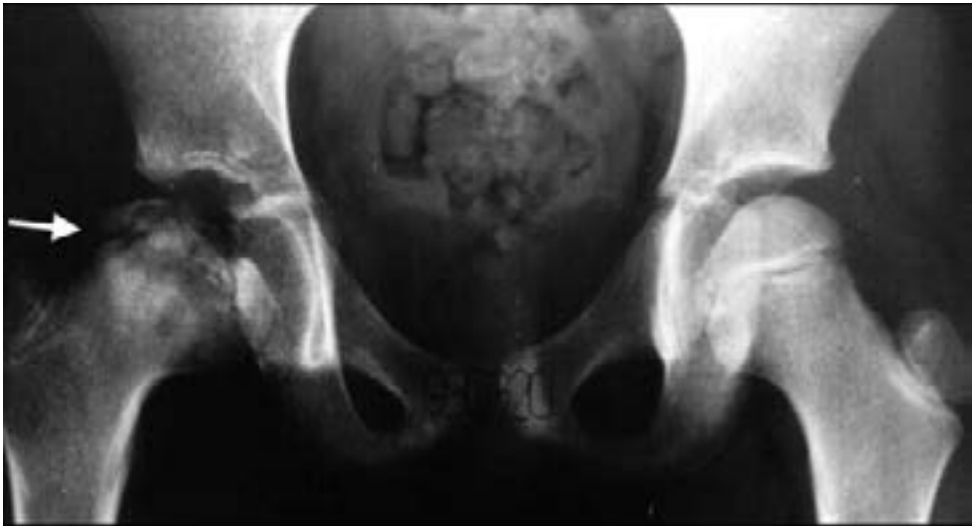

Fig. 9 Patient, male, 8 years old. The Perthes disease (arrow) comes by the children with MBD who has the habit to jump frequently from furniture, stairs and other objects. The cartilage is resistant but the bone can be fractured and this is a moment of the start of the whole process of Perthes disease.

When the illness first appears, it usually lasts 3 or 4 years. It makes long-lasting changes of the shape and structure of the femoral head, and later it triggers the development of coxarthrosis. Such data concerning the etiology of Perthes disease indicates the method of causal prophylaxis to be recommended during course of the illness. Parents should be informed that repeated jumping is dangerous for the hips especially for children aged between 4–11.

Method of treatment of valgus deformity of the feet	**Method of treatment of anterior tilt of the pelvis and hyperlordosis of lumbar spine.**
1. Stretching exercises of the Achilles tendon and m. trices surae.	1. Stretching exercises in the prone position of the body. The knees in flexion – now appear stretching of m. rectus (part of m. quadriceps).
2. Stretching exercises in geothermal water. Massage in water.	2. Stretching exercises in geothermal water. Massage in water.
3. Thermotherapy of the shank.	3. Thermotherapy of the frontal part of the hips and pelvis
4. Sports like karate, taekwondo, aikido, yoga.	4. Sports like – karate, taekwondo, aikido, yoga

Table 1: Method of treatment of valgus deformity of the feet and anterior tilt of the pelvis and hyperlordosis of lumbar spine.

Physiotherapy in treatment and in prophylaxis (Table 1)

In the treatment of deformed feet, knee and pelvis as well hips the first role play stretching exercises to receive symmetry of anatomy of soft tissues, length of tendons, fascias, muscles, capsules, symmetry of movement of joints as well the symmetry of function in every day activities at school, at home or at work.

For correction of valgus deformity of feet it is important to makes stretching exercises for Achilles tendons and for m. triceps surae**.** Only such exercises are proper in therapy. Some rehabilitations doctors in Poland recommend the strengthening exercises for opposite group of muscles, for example – exercises of extensors of the knees in their flexion contracture position. In ours opinion it is "mistake of the therapy". Such incorrect therapy never bring good results. More about such harmful, iatrogenic therapy we present in chapter "Discussion".

Special important is proper therapy of dysplastic hips, especially if on the same time exists spasticity or sub – spasticity of the muscles. In treatment of these children the good cooperation of doctor and parents is of great importence. These children need permanent proper carrying on hands of parents, face to face, with maximal abduction and flexion of the child's legs and using the orthopedic devices. Recommended by "modern overeducated doctors / rehabilitants" the carrying of children with their "face to front", to street, to shops is totally wrong and incorrect, is deny to old, but proper orthopedic rules.

Only abduction of hips through the first 12 months of life of child prevent and treat the dysplasia of hips and enable the good function of hips for the whole life.

In the course of treatment of the MBD children, a number of other positive elements should be included. In addition to well-adjusted orthopaedic and rehabilitation program we should include the occupational therapy and positive psychological stimulation. The complete program should be made both for kindergarten, school and home.

DISCUSSION

In discussion of many doctors, physiotherapist and other group of researches appears very often the term "low tension of muscles" by the children with MBD. After such incorrect diagnosis they recommend also "the incorrect strengthened" exercises. In our opinion there is not problem of "the low tension of the muscles" because of the laxity of soft tissues caused by biochemical changes in collagen, but because of asphyxia in CNS in pregnancy or in delivery period.

According to our observation – the tension of muscles is bigger, even can be full spasticity or sub – spasticity. The laxity belongs to the collagen in soft tissue in capsules, tendons and fascias. Clinically the problem is the spastic shortening of soft tissue and as result incorrect position of joint – what is

in orthopedic term we called – "contracture". The treatment of contractures was presented in previous chapter.

The treatment of laxity of joints is difficult, but beneficial are active exercises in geothermal water (mineral warm water).

CONCLUSIONS

1. In Poland from 7% till 10% of children and youth have the symptoms of Minimal Brain Dysfunctions (MBD).

2. Clinically in MBD there are shortening of muscles, tendons, what we named "contracture" and on the same time can appear laxity of collagen that means laxity of fascias, capsules, joints.

3. In situation of doubly (two fold) pathology – shortening and laxity – can develop valgus or valgus – planes deformity of feet, recurvation of knees, anterior tilt of the pelvis with hyperlordosis of the lumbar spine.

4. When the valgus deformity of feet, hyperextension (recurvation) and valgus deformity of knees, and anterior tilt of pelvis with hyperlordosis of lumbar spine is not treated in child's and youth period of life, it can be the cause of strenuous pain syndromes in adults age.

5. Early treatment of all above mentioned deformities just in childhood is the best prophylaxis of pain syndromes and arthrosis in feet, knees, hips and spine in adults.

6. In the treatment of all deformities caused by MBD the best method are stretching exercises to receive full and symmetrical range of movement of joints as well thermotherapy. Only by 5% of patients the surgery is necessary.

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