

Early Use of Vojta Therapy in Children with Postural Asymmetry, at Risk of Hip Dysplasia

Artur Edward Polczyk*

Department of Physiotherapy, Wrocław Medical University, Poland

*Corresponding author: Artur Edward Polczyk, Department of Physiotherapy, Wrocław Medical University, Aleja Matejki 26/13 street, Wrocław 50-333, Poland, Tel: 0048793019099; E-mail: artur.polczyk@gmail.com

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Abstract

Hip dislocation occurs in 1.5% of new-born babies. Symptoms of dysplastic hip are often connected with infant's asymmetrical body posture, psychomotor delay and muscular tone dysfunction. Orthopedic supplies improve the positioning of the femur head in acetabulum but do not solve or even make worse the asymmetry, support functions and muscle tonus problems. This study presents 3 different cases of patients with such symptoms which has the Vaclav Vojta neurophysiological stimulation as based or supplemental treatment. The results are supported by ultrasonographic studies and evaluation of the spontaneous motility of the child in subsequent weeks of treatment. The use of the Vojta method is a helpful complement to the treatment of dislocated, unstable and dysplastic hips.

Keywords: Vojta method; Pediatric physiotherapy; Hip dysplasia; Postural asymmetry

Introduction

Preventive hip examination in the first weeks of new-born's life, now a standard, allows to detect abnormalities of the hip joint and to provide an early therapy.

Usual symptoms of dysplasia occur in about 4% of new-borns, hip dislocation occurs in 1.5% of new-born babies. Dysplastic joint problems are more common among girls than boys. Statistically, the left hip is twice more likely to be dysplasia than the right [1].

In addition to a physical examination, Barlow test (a test which provokes dislocation of the femoral head from the acetabulum) and Ortolani test (which reposition the head of the femur head to the acetabulum), examining range of motion of lower limb abduction and external rotation, the symmetry of the gluteal and inguinal folds, and the difference in limb length, ultrasound examination is important. Based on Graf Method maturity of hips can be evaluated [2-4].

Integrity joints disorders [5] often are not noticed in the preliminary physical examination at the neonatal unit. The first symptoms of abnormal postural control, not only in the lower limbs, excessive tension of adductor muscles and internal rotation of the femoral head in the acetabulum, but also frequently associated asymmetrically expressed reflexes and neonatal automatism, limited mobility in the neck spine with constant asymmetry in the trunk, are recognized in the early physiotherapeutic evaluation. The more accurate assessment of spontaneous motorical activity, seven postural Vojta's reactions, reflexes and neonatal automatisms examination is done, the easier is to find the exact location of therapeutic problem and the right choice of therapeutic target [1,6,7].

Mainly factors which affect abnormal development of the hip joint are gluteal fetal positioning, oligohydramnios, high fetal mass, mother's hormonal disturbances which relax the joint capsule and genetic factors. Dysplastic hip joint may occur in the youngest patients

with postural and functional asymmetry or psychomotor delay. The treatment of choice for hip dysplasia is the use of various types of orthosis supplies, mainly Frejka's cushions and Pavlik's suspenders [8-11]. Good results are obtained with the Tübingen's rails, giving the opportunity to more closely match for the patient's dimensions and condition [12].

The use of the aforementioned supply is not without influence on the qualitative and quantitative motor development of a child. Most of the patients during and after treatment show significant deviations in the support function and antigravity capabilities in both the back and abdomen positions [13].

The aim of the study is to present cases of patients with abnormalities in the hip joint coexisted with features of asymmetry, psychomotor delay and muscular tone dysfunction. The treatment was either based on or supplemented by the Vaclav Vojta neurophysiological stimulation.

Graf's Scale

Depending on the alpha and beta angle values obtained in the ultrasound test, the baby's hip joints are evaluated as follows:

- Type I (Ia, Ib): Healthy joints.
- Type IIa: Described as "doubtful", can sometimes lead to dysplasia (Found up to 3 months).
- Type IIb: Dysplastic type.
- Type IIc: Joint with large acetabular dysplasia, while the femoral head is properly centered.
- Type III: Subluxation hip.
- Type IV: Joint is dislocated [2,3].

Vojta Therapy and its Influence on the Formation of Hip Joints

Two large movement complexes are used in Vojta therapy-rolling and creeping reflex. The rolling reflex is divided into four phases,

creeping reflex can be released in different variations, depending on the selected main therapeutic problem or the patient's responses for the stimulation.

During the stimulation of the rolling reflex from the supine position (Figure 1), by using the thoracal zone, released is not only segmental extension of the spine, but also motor responses of the lower limbs are visible. At the moment of obtaining a stable position on the back, external rotation in the spherical joint and antigravity processes of the limbs are observed. External rotators and adductors of the lower limbs in the rolling reflex act as synergistic antigravitators. Lower limbs bend in hip joints to 90°, abduct and rotate in the external direction [6,7].



Figure 1: I Rolling reflex: Basal position and localization of the thoracic zone (author's picture).



Figure 2: Triggering rolling reflex: Expected reactions in the lower limbs and the occipital upper extremity are visible (author's picture).

Such position of the hip helps to align the axial position of the acetabulum and the femoral neck and to adjust the hip joint surface (Figure 2). The lower limbs in the starting position (before applying the thoracic zone), stay in the extension and adduction (Figure 3), whereas

during the activation child breaks down this setting and works in the opposite direction (Figure 2).

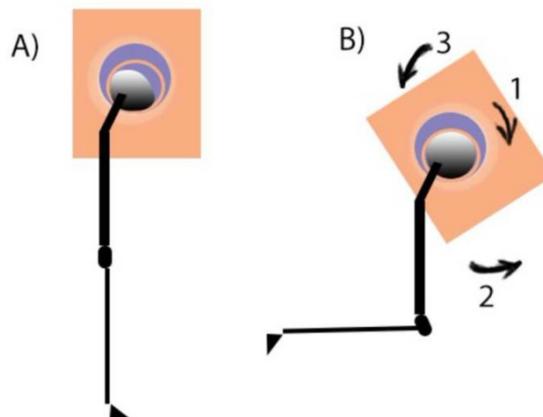


Figure 3: Placement of the articulation surface; (A) Upright position: The violet crescent represents the exposed sphere; (B) Linear alignment of the articular surface in rolling reflex after activation of the flexion-arrow No.1, extension-arrow No. 2 and external rotation-arrow No. 3. (Own drawing inspired by AI of Kapandji [14]).



Figure 4: The creeping position of the child in the age of seven months (author's photo).

In regard to the spontaneous motivation of a healthy child, this situation takes place in the eighth month of life during the crawling. In a standing position this situation does not occur-the upper and the frontal part of the cartilage is exposed, which proves in a certain way that our ancestors used "four-pointed-support" model of locomotion [14]. Adjusted position and proper load of hip articulation in quadratic position, is one of the many arguments in the discussion, why the

reciprocal, quadrangle pattern should not be neglected in the development of the child (Figure 4).

In a study by Sun-Young Ha and Yun-Hee Sung, a statistically significant improvement in trunk stability was observed by activation and volume change of transversus abdominis muscle, during thoracal zone stimulation, in patients with cerebral palsy [15].

Stimulation of the muscles which steer the pelvis and their inclusion in active postural control increase the patient's ability in any position, directly affecting the position of the femoral head in the hip joint. This gives us the therapeutic possibility of getting the pelvic girdle to the middle position in sagittal plane, which implies the position of the femoral head in the hip joints, determining the external rotation associated with the abduction and the flexion [1,6,7].

During the activation of the creeping reflex we have the ability to proper load the lower limb on the occipital and facial side, even if the baby does not use the lower limbs spontaneously to active body weight transfer or is unable to use this pattern. The shaping effect on articular acetabulum can be described in the muscle game during the phase of bending and standing on the facial and in the standing phase of the occipital leg (Figure 5) [16].

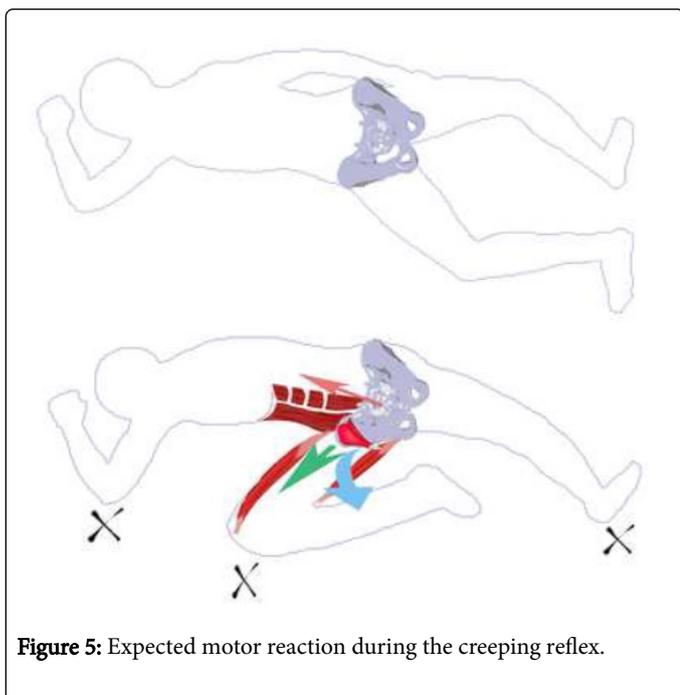


Figure 5: Expected motor reaction during the creeping reflex.

- Obtaining three points of support-letter x.
- Direction of rectus femoris muscle work after obtaining support function on the facial knee-green arrow.
- Pelvic movement direction in the sagittal plane and direction of rectus abdomin work-red arrow.
- Vector of rotating and adducting muscles work of the facial leg-blue (Own drawing).

During the bending action of the facial leg, external rotators and adductor muscles make the sliding movements of the femur's head on surface of articular cavity.

When the lower limb gets the support on the epicondylus medialis femoris, the muscles surrounding the hip joint change the vector of their work and start to pull the pelvis in the direction of the femur. This

action has an impact on tightening the articular cavity to the femoral head. An important role in this pattern has gluteus medius muscle; some of its fibers make external rotation, some of them make abduction. Muscles which have a significant influence on positioning and keeping the pelvis on the femoral head during the knee support by pulling the proximal holds within the pubic crest toward the femoral crest, below the lower trochanter are the adductors muscle, including the pectineus and gracilis muscles.

Proper use of triggering Vojta's zones and initial position in creeping reflex provides the opportunity to obtain support at three points, including the foot of the occipital side.

During the standing phase of the occipital leg, the shaping influence on the hip joint will not only have the rotating muscle. While simultaneous contraction of the adductors (blue arrow Figure 5) central muscle of the torso, including the abdominal muscles (red arrow Figure 5), will synergistically pull the pelvis in the direction of their ribs and sternum's holds. This muscle game sets middle position of the pelvis by moving it in the flexion direction, which directly affects the positioning and sliding movement of the acetabulum on the femur's head [6,7].

Case Presentation

Patients in this work did not develop cerebral palsy. They have had just an abdominal problem. During every session range of motion, Barlow and Ortolani test was examined in both hips. Control ultrasound was always performed by the same operator. Tubingen rails were used only in first case-Zofia.

Zofia

A child was born on time, day 11.01.2017, 9 Apgar points. It was mother's first pregnancy and first childbirth. Parents visited the orthopedic clinic for routine hip examination on 17.03.2017. During the ultrasound examination, the left hip joint was assessed as subluxed. On the Grafa scale the left hip was described as type IIIa (a angle 40°, b angle 66°), hip right at IB. A request for an orthosis was issued (Figure 6).

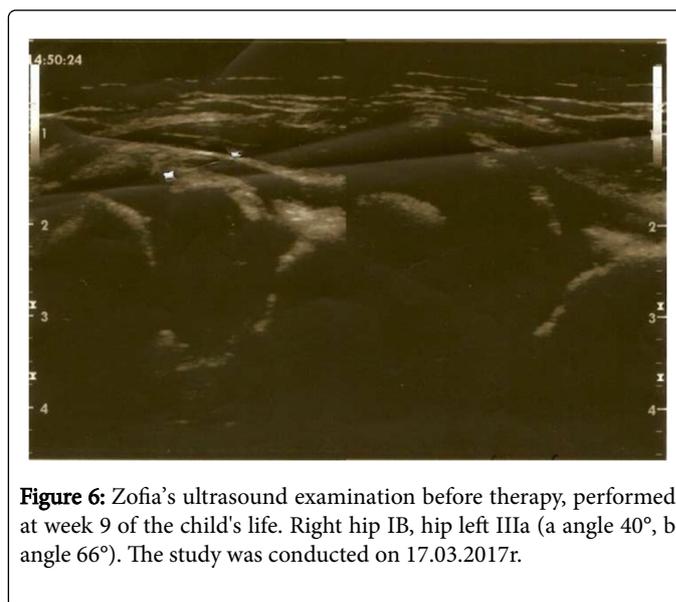


Figure 6: Zofia's ultrasound examination before therapy, performed at week 9 of the child's life. Right hip IB, hip left IIIa (a angle 40°, b angle 66°). The study was conducted on 17.03.2017r.

In physical examination as well as in postural reactions the child presented left-sided asymmetry, shortening the entire length of the spine to the left. The left hip joint, both in the tests and in the spontaneous motor assessment, was characterized by a restriction of the abduction and a tendency to internal rotation with limited movement of external rotation.

Patient showed deficits in the supportive mechanisms in the pronation, constantly returning to the newborn patterns with the features of constant asymmetry. The baby briefly stood up on her stomach and quickly responded with tears. Significant asymmetry of inguinal folds was observed. In supine position, the partial patterns were quantitatively higher. A significant difference was observed between the antigravity work of the left and right extremities.

Also in this position the baby presented clear features of asymmetry, particularly visible in the pelvis, lower extremities and the cervical segment. In addition to the description of spontaneous motor and hip joint evaluation, during the first meeting the mother was instructed how to perform therapy at home. Stimulation consisting of rolling reflex from the supine position was practiced by the mother practically in the office (Figure 1). Correct motor responses were indicated to parents, with particular emphasis on reactions of the head, pelvis and lower extremities, especially in the left lower limb.

The parent was advised to perform the stimulation four times daily. Immediately after stimulation the parent was to activate the child without Tübingen's rails in prone and supine position for a period of 15-30 minutes. The rest of the time the child spent in orthosis supply on.

During the control visits at the orthopaedist, the supply was adjusted to the child's condition and size. The parents met the therapist once a week to assess the effects and quality of the home therapy.

rated as: IB (Right hip, angle a 60°, angle b 56°) and IIB (Left hip, a angle 56°, b angle 58°) (Figure 7).

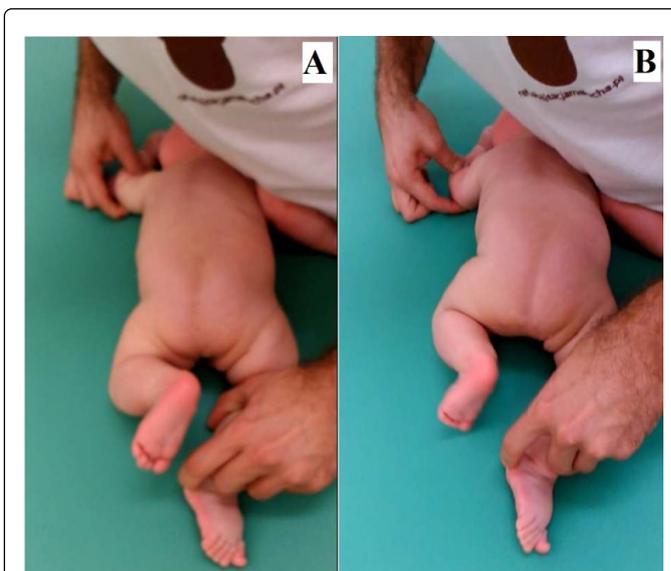


Figure 8: Creeping Reflex: A) Starting position and location of the heel and medial epicondyle of the humerus zone, B) Triggering of creeping reflex; visible expected motor responses left lower extremity (Own photos).



Figure 9: Ultrasound examination of Zofia's hips at week 16 of the child's life. Right hip joint IA (a angle 63°, b angle 54°), left hip joint IIB (a angle 61°, b angle 54°). The study was conducted on 28.04.2017.

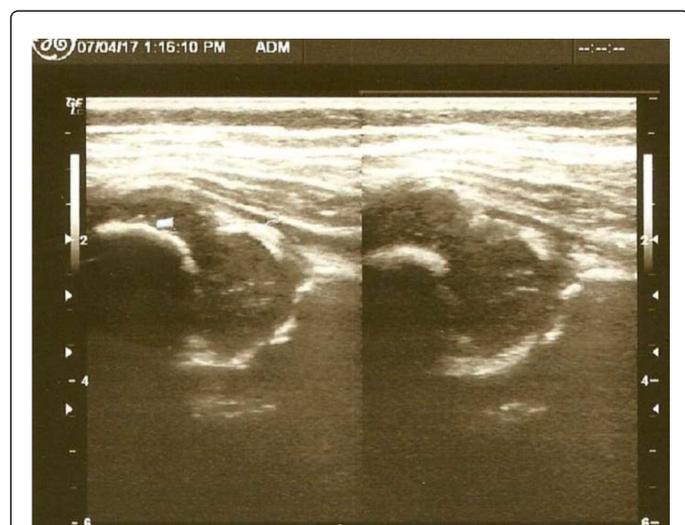


Figure 7: Zofia's ultrasound examination performed at week 12 of the child's life. Right hip joint IB (a angle 60°, b angle 56°), left hip joint IIB (a angle 56°, b angle 58°). The study was conducted on 07.04.2017.

Three weeks after the first ultrasound examination, the baby's hips were re-examined by an orthopedist. In the examination, the improvement of the acetabular configuration was evaluated. Hips were

After three weeks of therapy, the parent was trained to perform variation of creeping reflex at home (Figure 8). When the left lower limb was the occipital limb, the mother stimulated the classical position to trigger the complex from the medial epicondyle of the humerus and the heel zone. On the other side, left hip and knee were maximally bent. In the assessment of spontaneous motor functions, child improved the quality of support and reduced asymmetry. The baby was able to keep his head in the center line for a longer time, and the pelvis was spontaneously coming out of the slanting position.

In the ultrasound examination conducted on 28.04.2017, hips were described as: IA-right hip joint (a angle 63°, angle b 54°) and IIB-left hip joint (left hip joint angle 61°, angle 54°). The acetabulum was not fully reconstructed (Figure 9).

It was recommended to continue the therapy with the possibility of using the position on the side. During the therapy, the parent received exercise instruction of rolling reflex from the side position, with particular regard to leg control when the child is lying on the right side. The rest of the locomotive reflexes were modified according to the child's reactions, during weekly sessions.

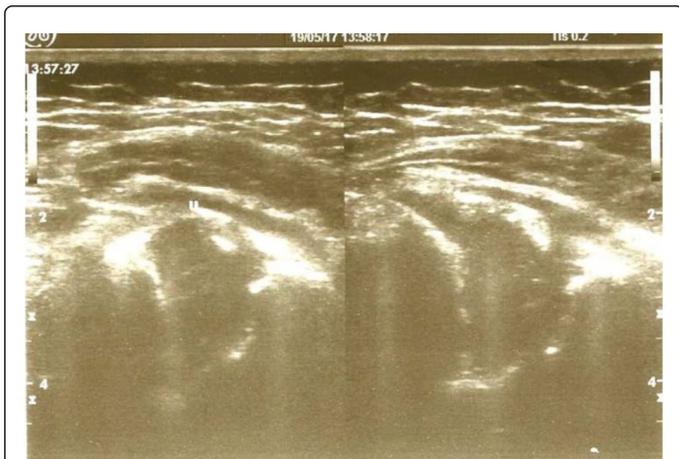


Figure 10: Ultrasound examination of Zofia at 19 weeks of the child's life. Both hip joints are rated in the Graf scale at IA. The study was conducted on 19.05.2017r.

On 19.05.2017 both hips were evaluated as IA with blunted bone margins, properly sprung acetabulum and well covered with articular labrum (Figure 10). The use of Tubingen rails was discontinued, but it was recommended to continue stimulation until the next follow-up visit. The child spontaneously presented patterns suitable for the age, including the lateral grip on both sides of the body, supports within the medial epicondylus of the humerus bone without clearly visible features of asymmetry.

Ula

The girl was born on time, it was the mother's first pregnancy and childbirth.

During the orthopedic examination on 13.02.2015, asymmetrical proposition of the spine was observed, Galeazzi test >5 mm on the left side and sickle left foot, which was permanently set in the supine position. The child was at 42 days of age. In the ultrasound examination, the right hip was evaluated as IIA, the left hip joint was rated as IIA "-". Due to the intense features of the asymmetry and the result of the left iliac ultrasound examination-alpha angle was 52° (Figure 11), the child was referred for Vojta stimulation. At the first meeting of the 6-week-old child, patient demonstrated the "fencer's pattern" only to the right, with limited movement of the head rotation to the left, with the tilt to the left shoulder.

During physical examination significantly reduced range of abduction and external rotation in the left hip joint were observed. The position on the back was rated as unstable, the girl "overturned" to the right side of the body, losing balance and triggering Moro reflex in this

way. In the pronation the asymmetry features were also present, the head set in admission with a constant tilt to the left shoulder, upper limbs with tendency to internal rotation, set in the extension and adduction in the shoulder. The elbows were maximally bent.

After a dozen or so seconds, the child displayed aversion to the prone position, started to cry in a neonatal position, constantly loading the left cheek with her head rotated to the right.

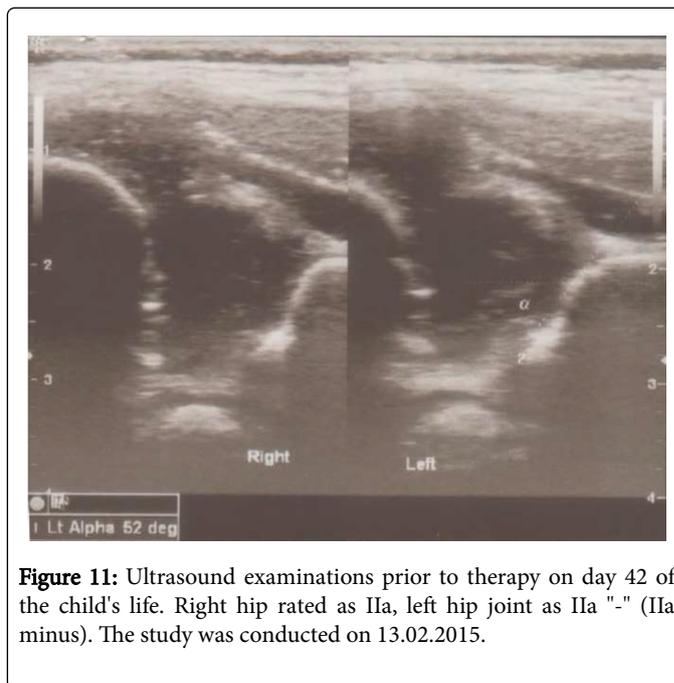


Figure 11: Ultrasound examinations prior to therapy on day 42 of the child's life. Right hip rated as IIA, left hip joint as IIA "-" (IIA minus). The study was conducted on 13.02.2015.

During the first two weeks of therapy, parents performed the first phase of the rolling reflex, triggering with the thoracic zone. Parents were taught to pay attention to the child's tendency to tilt the head to the left side and to intensify the load on the right side, especially when the head was rotated to the right (Figure 2). Therapy was under the control of the therapist once a week. Parents were advised to repeat the stimulation up to 4 times a day with paying attention not only to expect reactions in the head and upper extremity, but also in the hip joints-mainly left hip. After first two weeks of therapy, a creeping reflex pattern was added to improve the quality of the elbows support and to actively center the femur head in the acetabulum in the abdominal position (Figure 8).

Each element of the creeping reflex parents performed twice on each side (recycle), up to 60 seconds in each repetition. The total time of child stimulation during the day did not exceed 32 minutes. Home stimulation was recorded with a camera, which allowed for online treatment counseling, in case of problems with triggering the correct pattern.

After a month of therapy, the child in the assessment of spontaneous motility presented the position of stable lying on the back, without any intense features of asymmetry, qualitative and quantitative improvement of elbows support-the child longer and more willing remained in the pronation with active support functions. The rotation of the head in both directions was equal. Lower limbs were spontaneously held against the gravitation with a flexion in the hips and knees, without losing of stable lying on the back and right side turning.

In an ultrasound examination performed one month after the first test, both hip joints were evaluated as Ia (Figure 12).

In the physical examination, Barlow, Ortolani and Galleazzi symptoms were absent. Child did not show any signs of asymmetry in the length of the lower limbs.



Figure 12: Ultrasound examination after one month of therapy, made on day 71 of the child's life. Left and right hip were rated as Ia in the Graf's scale. The study was conducted on 16.03.2015.

Simon

The boy was born on October 9. It was mother's first pregnancy and delivery. The boy got 10 Apgar scores.

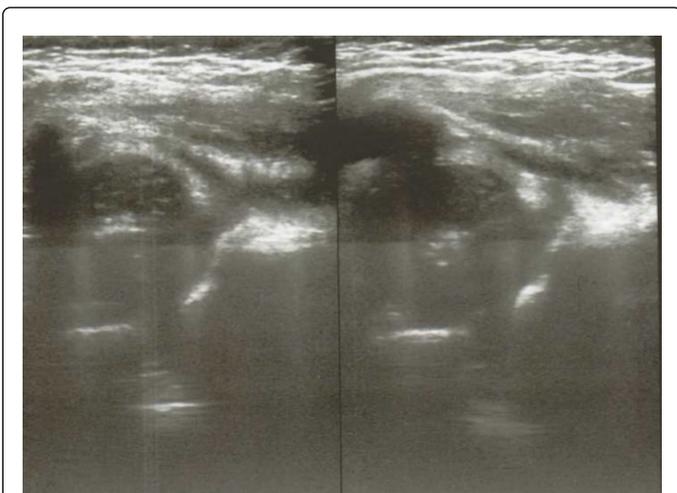


Figure 13: Simon's ultrasound examination prior to initiation of therapy at day 47 of the patient's life. Left and right hip in Graf's scale were rated as IIa with restriction of abduction in the right hip. The study was conducted on 25.11.2014.

In the medical examination of 25.11.2014, there was a limitation of abduction in the right hip, increased tone of the adductor muscles of the right hip and postural asymmetry. Ultrasonography of the hip was assessed at IIA (Figure 13). Due to the incomplete range of motion in

the right joint and asymmetrical posture, the patient was referred for Vojta therapy.

During the assessment of spontaneous motor function the patient was unable to show support in the prone position. The cervical spine in the frontal plane was constantly bent to the right with the tendency to rotate to the left side. In the sagittal plane the cervical lordosis was excavated. The head alignment influenced the setting of whole body, with the shortcut on the right side and the tendency to set the right hip in adduction and internal rotation.

Mother was trained to perform stimulation of rolling reflex from supine position, with particular focus on the control of the head. During the stimulation the improvement of cervical spine in frontal and sagittal plane by the activation of the ventral muscles of the cervical segment (m. longus capitis, m. longus colli, m. scalenus and m. sternocleidomastoid) was expected. Triggering was repeated on each side three times a day by parents, who were taught to recognize correct motor responses with special attention of lower limbs patterns: Actively bending, abduction and external rotation in both limbs in the hip joints, connected with the above-mentioned head reactions.

In the orthopedic control examination conducted on 15.1.2015 both hips was rated as Ia in Graf's scale with physiological ranges of movement on both sides (Figure 14).

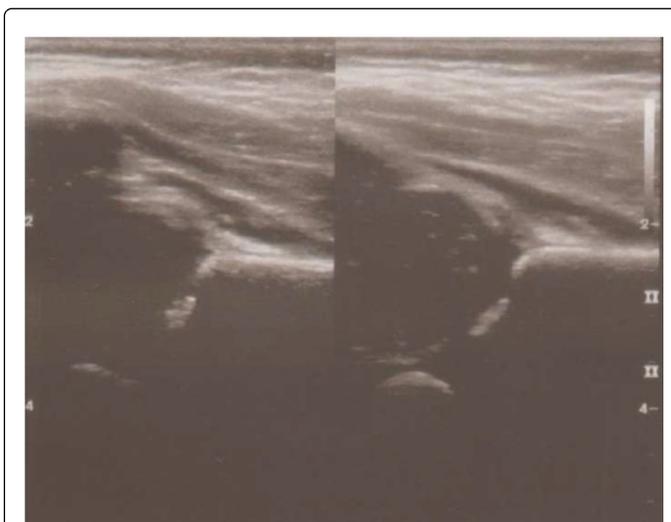


Figure 14: Ultrasound examination after three weeks of stimulation at day 89 of the patient's life. Left and right hip in Graf's scale were rated as IA. The study was conducted on 15.01.2015.

In spontaneous motility, the patient demonstrated a significant improvement of body symmetry and support capability. Simon showed a pattern of long support on the forearms (6-8 weeks of child's life) and upper limb joints were able to connect under visual control with simultaneous antigravity work of the lower limbs in the lying on the back position (standard for 12 weeks of child's life).

Discussion and Conclusion

The use of the Vojta method is an excellent complement to the treatment of dislocated, unstable and dysplastic hips. Crawling and rolling reflex has a positive effect on the hip joint development of children at risk of hip dysplasia by centering the femoral head in the

hip joint, normalizing muscle tension and increasing the range of motion in the occupied joints.

Using the Vojta therapy reduced both the duration of treatment and the effects of long-term immobilization of the lower limbs in orthosis supplies [1,7,17].

Each of the described patients presented a distinct asymmetry, which significantly influenced the quality of the presented global patterns and made it difficult to obtain further age-appropriate global patterns. This situation often resulted in babies frustrations and crying, especially in the abdominal position. The results of the ultrasonography in all three cases corresponded to the patient's asymmetry. By analyzing the evolution of the patient's condition during therapeutic sessions, it can be seen that the effects are not only visible locally within the hips, but are inseparably connected with changes in the whole body position and normalization of the muscular tonus [13].

The improvement of ultrasonographic examination in each of these cases was paralleled with the segmental spine extension (in three planes) and increased pelvic control.

Improvement of the pelvis and the lumbar spine control directly affects the centering of the femur head in the hip joint, which gives the patient a better chance of more effective use of the lower limbs during movement, including children with cerebral palsy stimulated with Vojta method [18]. At the same time, favorable changes in the quantitative and qualitative assessment of the spontaneous motor function were observed, which increased the ability of the child to meet and satisfy his mental needs. Children gaining better support capabilities stop crying and focus on getting to know and interacting with the outside world.

The therapeutic team of the child, in addition to the leading doctor and physiotherapist, also includes the parent. Their active attitude and reliable exercising in the home environment, projecting on the pace and quality of the effects, also in relation to other methods including NDT Bobath [19,20].

Therefore, didactics skills are so important. Therapist must adapt the stimulation variants both to the needs and capabilities of the child and the parents [6,13].

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