FIRST CLINICAL SIGNS OF CEREBRAL PALSY AND TRANSIENT NEUROMOTOR ANOMALIES

ABSTRACT

Clinical signs for Cerebral Palsy (CP) can be identified in three situations: examination of spontaneous motor function, clinical evaluation (assessment) of innate motor skill and passive mobilization.

Keywords: Cerebral palsy, spontaneous motor function, clinical evaluation (assessment) of innate motor skills (postural reactions), transient neuro-motor anomalies.

In case of suspecting a neurologic damage with consequences of motor impairment, a repeated quality clinical assessment is necessary in order to label a cerebral palsy.

Delays in the psychomotor development are not sufficient for CP diagnosis. Three assessment methods may be used to define the anomalies:

I. Examination of the spontaneous motor function,
II. Clinical assessment of innate motor skills,
III. Passive mobilization of limbs.

I. EXAMINATION OF THE SPONTANEOUS MOTOR FUNCTION

The spontaneous motor function involves the movements executed by the full-term newborn infant. (1,4,7). The following aspects are to be observed:

— The duration, stability and postural symmetry of the inferior limbs, when the movements cease and the pelvic girdle is in median position. The quality of the anti-gravitation maintenance of the limbs.
— The synchronization of thigh, shin and feet movements – pedalling or triple extensions followed by triple flexion in harmonious movements.
— Selectivity: there are individual movements of fingers and toes, of fist, elbow, shoulder, ankle and hip articulations. There are also isolated movements of a limb with respect to the other homologous one. The global movements of the upper limbs (UL) are limited in amplitude. Initially, they develop in a preferential manner, only to become more and more varied and ample later.

According to Prechtl, the quantity of limb movement varies in a newborn according to his physiologic condition (8). He describes 5 stages:

Stage 1: eyes, regular breathing, calm sleep, without rapid eye movements, episodic, impulsive movements of the limbs.
Stage 2: eyes closed, irregular breathing, paradoxical sleep, rapid movements of the eyeballs under eyelids; it is the stage of the perinatal period.
Stage 3: eyes open, minimal movements, communication may take place.
Stage 4: eyes open, important, rapid movements with intense reaction to stimuli – agitated waking activity.
Stage 5: eyes open or closed, anxiety, violent cry.

Towen, one of Prechtl’s students, described also a 6th stage, namely a physiologic condition, transitorily altered by an intercurrent disorder.
— In the normal infant, Stage 3 is easily reached after 3–4 weeks of life.
— Lethargic infant: Stages 1 and 2 predominate.
— Hyper excitable infant: Stages 4 and 5 predominate.

During examination, the physiologic stage of the infant should be recorded from the very beginning.

II. CLINICAL ASSESSMENT OF INNATE MOTOR SKILLS

The focus in the clinical evaluation of the innate motor skills is on the motor reactions elicited by the evaluator. In 1952, prof. Andre Thomas described the innate motor skills as being “primary motor function”, i.e. one that will disappear during the development of the little child. (Asymmetrical Tonic Neck Reflex -ATNR, Symmetrical Tonic Neck Reflex -STNR, Moro Reaction, automated stepping, grasping, Galant reflex, etc.). In the ‘80s, Michel le Metayer described
those innate motor skills that would never disappear (6).

The innate motor skills are automated motor reactions (not reflex ones). They are predictable in any healthy child. The examiner is to evidence them by means of definite manoeuvres in order to evaluate the response quality on the postural level.

The automated reactions have a definite character, completed by:

— the amplitude of the motor response or by
— the speed of the response.

These ontogenetic adjustments improve during the first year of life. There are 14 elicited motor reactions and one may select 6-7 from them in order to assess motor anomalies at first glance.

1. Ventral suspension: The child is in ventral suspension on the examiner’s hand:

— during the first 6-7 weeks, the head falls under the level of the ventral support point.
— after 2 months, the head is in the axis of the trunk.
— after 4-5 months, the head rises above the horizontal plane, while the individualised movements of the limbs become visible.
— after 10 months, the extension of the lower limbs is complete, the ULs may be used for prehension (Figure 1)

![Fig. 1. Ventral suspension – normal reaction](image1)

Pathological aspects: In ventral suspension, one may note the discrepancy between the insufficient straightening of the trunk and the rigidity of the lower limbs (LLs), the flexion of the ULs with closed fists (Figure 2).

![Fig. 2. Ventral suspension – pathological reaction](image2)

2. Lateral suspension: the child is positioned in lateral support, on the examiner’s hand: the superior thigh abducts simultaneously (this test is valid starting with the age of 4 weeks old, when there is some head control) (Figure 3).

![Fig. 3. Lateral suspension – normal reaction.](image3)

— after 6 months, the infant arches his back with the concavity upwards, the lower limbs abduction is neat, the LL from the inferior side tends to adopt a vertical position.

Pathological aspects: The LL from the superior side does not abduct (even after a scratch on the inner side of the thigh), there is axial hypotonia, and the individualized movements of the limbs are absent (Figure 4).

![Fig. 4.](image4)
3. **Asymmetric crawling pattern:** The child is in ventral decubitus. The evaluator rotates the infant’s head laterally. An asymmetric postural pattern develops by curving the trunk, followed by a rotation and a triple flexion of the LL situated on the side of the face, support on the forearm situated on the side of the neck (Figure 5).

![Fig. 4. Lateral suspension – pathological reaction.](image)

![Fig. 5. Asymmetric crawling pattern – normal reaction.](image)

![Fig. 6. Asymmetric crawling pattern – pathological reaction.](image)

4. **Crouched posture:** The infant is held in “crouched” posture, with asymmetric support on the LLs; he is capable of maintaining his weight firmly. At the pressures exercised by the examiner from down upward, the infant resists, having even an anti-gravity reaction (Figure 7). The infant will also react to the lateral movements inflicted by the examiner at the level of the pelvis, the LLs orienting into synchronous inversion and eversion. When antero-posterior movements are enforced in this crouched posture, the toes flex and, respectively, extend.

![Fig. 7. Crouched posture – normal reaction.](image)

**Pathological aspects:** the infant is unable to sustain his own weight (Figure 8), the response of the toes is asymmetrical (Figure 9), the support of the legs is in equine posture (Figure 10).

![Fig. 8. Crouched posture – pathological reaction: the infant does not sustain his weight.](image)
5. Rolling over from dorsal (DD) to ventral (VD) decubitus, with stimulation of the LLs (LL): While the infant is in dorsal decubitus, the examiner elicits the simultaneous flexion of one LL and the extension of the other one, enforcing, at the same time, a rotation on the side of the extended LL. The following are observed:

a. the rotation of the head and its detachment from the plane of the table, as well as an attempt to roll back with support on the shoulder (Figure 11), and

b. the rolling back support is changed from shoulder to the forearm, while the free UL will take support on the forearm and on the hand situated on the table; thus the infant arrives in ventral decubitus (Figure 12).

Pathological aspects: insufficient response, exaggeration of the axis extension, asynchronous movements of the limbs, insufficient control of the head in rolling back (Figure 13).

6. Lateral rolling back with elbow support: The infant is in DD. With her right hand, the examiner takes the infant’s right thigh and she introduces her left thumb in the right palm of the infant. The examiner will perform an internal rotation of the right
thigh, which will induce an automated response of rotation of the child’s trunk axis. Then, the child will start to roll on the right shoulder, and then on the elbow. Meanwhile, the right thigh is abducted and the leg is oriented in eversion.

The examiner will not induce any traction at the level of the right hand, but she will only support it. Starting with the age of 8 weeks, the infant’s attempt to roll back ends with his right hand open on the table.

This manoeuvre shall be performed for both sides (Figure 14).

7. Sitting on a buttock (the swing response): From a maintained “crouched” position, with the examiner holding him by the hands, the infant is inclined laterally, and concomitantly a contortion is executed on the supporting buttock. The opposed LL will orient itself in abduction and the extension of the knee increases with the age (180° in 12 months) (Figure 16).

Fig. 16. The swing response: – normal reaction

Pathological aspects: LLs do not actively rise from the flat surface, are adducted and in triple flexion, the individualised movements of the feet and toes are absent (Figure 17).

Fig. 17. The swing response: – pathological reaction

The Lateral Abduction Reaction (LAR) (1,7) is a postural reaction that was described by professor Grenier, and it generates a series of contractions of a hemibody from head to foot, which result in a clear abduction of the thigh. Once this reaction appears, it will last the whole life.

The child is in lateral decubitus on the table. The LL beneath will be maintained in triple flexion, possible by someone else. The cranial LL is in extension. The upper part of the trunk is placed outside the table. One of the examiner’s hands will be placed at the iliac...
wing level and with the other hand, she will support
the child's head, provoking him lateral redresses. These
redresses will determine chain reactions from the level
of the neck to the pelvic girdle, the cranial LL extends,
is abducted, the foot is flexed dorsally, the hallux being
oriented to the examiner (Figures 18, 19, 20).

This manoeuvre shall be performed for both sides.

ATTENTION! The flexion of the thigh on the
pelvis is not permitted, because in this case, the
adducting muscles do not react and we obtain a false
abduction. At an unsatisfactory reaction, the extension
of the hemibody is not achieved, the cranial LL is not
abducted and remains adducted, rotated interiorly, the
feet in plantar extension. It must be mentioned that,
besides a neurological disorder, a hip dysplasia might
prevent the abduction of the tight, too.

LRA is very precious, because, from the author's
thirty-year experience, CP children did not achieve a
correct reaction even since their neonatal period. From
the moment it appears during a child's development
path, this reaction is an indicator of a favourable
prognosis. It is a complimentary exam, drawing
immediate attention in the case of a newborn with
neurologic risk, with tonus or motor anomalies.

Many years before, I have examined 261 infants
aged 0 to 6 months who were born with neurologic
risk, and 22 had negative LRA. They have been
monitored until the age of 1 year and 6 months with
the following results:
  — 12 had CP,
  — 3 had hip dysplasia,
  — 7 had a normal evolution,
  — The rest of 239 cases with positive LRA,
    although premature and with various degrees of
    suffering at birth, with tonus anomalies or poor
    spontaneous motor function, had a normal ulterior
    psychomotor evolution.

III. PASSIVE MOBILIZATION OF LIMBS

The passive mobilization of limbs represents the
manoeuvres used in order to evaluate the resistance
opposed by the muscles during passive mobilization.

The muscle should be extended at slow speed,
then, the amplitude obtained is measured. In case
of spastic CP, the possibility of elongating certain
muscles is diminished (adductors, biceps, triceps surae,
pronators of the UL, etc.). At least 2 angles will be
measured:
  — One angle measured by elongating the muscle
    slowly, without special precaution,
  — One angle also measured at slow speed, this
time after relaxation.
  — Another angle may be measured, with fast
    speed, in order to evidence a pathologic miotatic re-
    flex (after former relaxation).
TRANSITORY MOTOR ANOMALIES (6, 7, 10)

The transitory motor anomalies are disorders that may be noticed in the first weeks of life, and are rather relatively frequent, although they cannot be included in the neurologic pathology.

1. Posterolateral plagiocephaly
   - the child’s head is rotated to the same side as the cranial flattening.
   - there is a postural asymmetry of the body’s axis with a curvature oriented in the same direction as the face.
   - there is also an asymmetry of the hip muscle contractions, which produce a perceptible functional shortening of the LL opposed to the plagiocephaly.
   - if the extended LLs are abducted from DD to the side opposed to the plagiocephaly, the angle obtained is smaller. This asymmetry disappears after some relaxation manoeuvres.
   - for some weeks, the preferred rotation of the head may generate an adaptation of the Sternocleidomastoid from the opposite side, which loses partially its possibility of elongation. As a consequence, it is necessary to place the head on a sponge cushion, cut according to the shape of the neck and of the occipital zone, so that, in DD, the head could be slightly flexed and the child could look forwardly and laterally.

2. Global “Hipertony”
   - generally, the muscles of an excitable, frequently crying child might be more contracted, especially when he hears noises (Stage 5 according to Prechtl). Sometimes, the Achilles reflex presents exhausting clonus.
   - at the elongation of the triceps surae, one may find a higher contracting force, the angle stops at 90°.

3. “Ballet dancer” Syndrome
   - might be found in hyper excited infants, who, in vertical suspension, touch the flat surface digitigradely, and after 10-20 seconds, their heels lower. Some of these children keep this habit when they start walking, but, when they are placed on a slope, they step normally. Newman has defined this manifestation “child’s transitory dystonia”. It disappears around the age of 2 years.

4. Global Essential Hipotony
   - in these cases, in Stage 5 Prechtl, the motor reactions are perfectly normal. In more prolonged forms of hypotonia, moulded orthopaedic prostheses for the feet may be prescribed. When the child starts to walk, in order to avoid a ligament distension and developing a flat foot as a consequence.

5. Exaggerated Extension of the Body Axis
   - In ventral decubitus (VD), an extension of the spine is found, the thighs and the upper trunk come off from the plane of the table (transitory hipertonia) (1, 4). This hypertonia is supposed to be due to an intrauterine malposition of the extensor muscles of the neck and trunk.

6. Feet Inversion or Eversion
   - It may be symmetrical or asymmetrical, uni- or bilateral. This position is corrected spontaneously during the rolling movements from VD to DD, or when we place the child in VD and make him to get support on one forearm first, then on the other. The response will be automatic, with asymmetric postures.

7. Relatively Closed Adducted Thumb and Fist
   - This posture is not constant, it does not accentuate in effort. The correction is done provoking the lateral redress reaction from DD, with propping on forearm and hand.

8. Tongue Protrusion
   - Sometimes it generates difficulties in sucking; the orofacial motor automatisms are normal. The child will be stimulated by introducing a finger in his mouth for 1 – 2 weeks.
   - In an attentive clinical examination, these transitory motor anomalies present neither abnormal aspects at passive mobilization nor other pathological elements. The imagistic examinations do not reveal deviations from the normal, either.
   - Still, these children benefit from some sessions of Kinesiotherapy, which will soon prove the normal motor condition of the child. (1, 5).
   - For safety reasons, it is recommended that the children with transient motor anomalies should be monitored psychologically, in order to make sure that their development is clearly normal.
   - In conclusion, an attentive examination of the newborn, especially of those with a higher risk factor, offers the possibility to begin a rehabilitation programme in the first 3 months of life, with better results as compared to the ones obtained after the age of 8 – 10 months.
BIBLIOGRAPHY


