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THE ROLE OF PHYSIOTHERAPY IN ACONDROPLAZIA

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Abstract: *Like any other child, the child with acondroplasia has the natural need for movement. However, the development of its motor behavior is subject to specific disturbances. Despite this, these children use the potential they possess and develop a modified form of motor behavior. Specialty studies have highlighted that lack of movement is likely to negatively influence some innate functions. Driving education is of particular importance, as motricity is one of the means that contributes to the development of the nervous system.The aim of this study is to find physiotherapist methods and means, applied as early as possible, adapted to the characteristics of the child's development process with acondroplasia, but also its low adaptation capacity, in order to help it acquire the most speed and to evolve as quickly as possible in the psycho-motor plane.*

Key words: *physiotherapy, acondroplasia*

1. Introduction

Chondroplasty causes most types of dwarfism. It is part of the group of conditions called generic chondrodistrophies. Chondroplasty is characterized by abnormal bone growth and small stature determination with disproportionate short arms and legs, large head with frontal bulging, collared chest, high weight and characteristic facial features.

The child has decreased muscle tone (hypotonia). Due to the large head, especially compared to the rest of the body, but also to the low muscle tone, the child with acondroplasia will experience "delays" in reaching the motor goals in the development stages [5]. The primary defect described in acondroplasia is abnormal endochondral ossification. Periosteal and intramembranous ossification are normal.

The tubular bones are short and thick, reflecting normal periosteal development. The apophyses of the iliac crest are normal. Endochondral cartilage is abnormal. The extreme affectation of the upper extremities is rhizomelic with the proximal segments more involved than the distal ones. The shoulders appear large due to the normal development of the collarbone and the musculature. The short arms contribute to the formation of muscle masses and the apparent developed scapular muscles [2]. Total

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elbow extension is lost. The lower limb is rhizomelic with contractures in flexion of the thighs, ligamentous laxity and external rotation with the genus recurvatum before walking. The tibia is arched, causing genus varum. The most important complication in people with chondroplasia is the neurological one associated with spinal canal stenosis [3]. The most common problems are:

- small, disproportionate waist, with consequences on self-confidence and social integration;
- gripping difficulties, related to the short upper limbs, trident-shaped hands;
- difficulties to move (the height of the sidewalk, stairs, important elevations);
- fatigue related to long trips;
- dorsal and/or cervical pain, often spontaneous or related to an extended uncomfortable position;
- muscle weakness, cramps in the lower limbs. These signs can be call signs for serious problems such as spinal cord compression (neurological complications) [6].

2. Materials and Methods

The kinetotherapeutic treatment was carried out in the kinetotherapy room of the Ghiocelul Bacau Social Services Center, between June and November, 2019. On a child diagnosed with acondroplasia, aged 6 years. Analyzing the literature, we started the study with the following assumptions: dacă se intervine printr-un program de kinetoterapie cât mai precoce cu continuitate și regularitate se pot obține rezultate favorabile la nivelul controlului postural și asupra comportamentului motor la copiii cu acondroplazie.

2.1. Evaluation methods:

Somatoscopic *evaluation* considered the following elements: waist (qualitative assessment); nutrition status; the degree of development and distribution of subcutaneous cellular tissue; the degree and harmony of the development of the musculature; the attitude of the body; the position of the head and neck; chest conformation; position of the shoulders; the position of the shoulder blades; conformation of the spine (frontal and antero-posterior); waist triangles; abdomen conformation; position of the pelvis (frontal and sagittal); sub-file envelopes; position of the knees; the position of the feet; plantar arch, teguments and peripheral circulation [1].

The anthropometric evaluation completes the somatoscopic examination. The measured parameters were: weight, height (stature or waist), perimeters (chest in deep breath and forced expiration, abdominal in orthostatism and in dorsal decubitus), measurement of the distance between the knees.

2.2. Research objectives:

- toning the muscles of the whole body,
- development of chest elasticity;
- correction of deficiencies in the scapular belt and spine that may accompany the clogged chest;
- prevention of the development of flexion of the elbow specific to the acondroplasty;
- increased joint stability in the lower limbs;
- correction of the varum genus;
- formation of the ability to walk properly.

Depending on the purpose and the objectives pursued in the prevention and

correction of the physical deficiencies specific to the chondroplasty, we used the general toning massage and the following methods, means, techniques and exercises of corrective medical gymnastics:

1. Anakinetic techniques, in which postures (positions) were used, to correct or avoid the installation of static deviations and vicious positions or to facilitate a physiological process [2]. The positioning was achieved without causing any pain which could, in turn, generate new contracts.
2. Dynamic kinetic techniques, which are based on motion in all its forms. In this paper, the active active mobilization in the form of dynamic corrective exercise was used within these techniques.

In the use of dynamic corrective exercises, we aimed to increase either the muscular force or the joint mobilization, respecting a slow, rhythmic execution, based on stable starting positions, on the principle of progressivity (from easy, hard and simple to complex) [4].

Free corrective exercises:

- breathing exercises - have been used to ensure oxygenation of the body due to increased needs, determined by physical exertion, and on the other hand, to help increase the thoracic elasticity;
- corrective exercises with an applicative character - being exercises with a complex structure, they were used for the formation or restoration of the basic motor skills, involving almost all the body segments in movement.
- fixed exercises on fixed devices - they were used because they secured a better fixation of the body segments and created conditions in which the subject had to fight with external forces, which would increase the peripheral resistance of the corrective movements. The devices were used: parallel bars, fixed stairs, gym bench, stepper.

3. Results

Due to chondroplasty, the patient had generalized hypotonia during initial somatoscopic testing, chest clogged, upper and lower limbs shorter in comparison to the trunk, and a prominent abdomen and pelvis in the anteversion. In the lower limbs it had bilateral varum genus.

Following the application of the recovery program, the problems caused by hypotonia have diminished, thus the position of the head and neck, of the shoulder blades, is normal, the tone of the abdomen has improved, and the muscles of the lower and upper limbs have been highlighted. During the recovery period, the child weighed only one kilogram, which is a good thing because usually with hypotonia, children with acondroplasia can become obese, and the position of the genus varum can be increased even more. Chest elasticity increased from 3 to 4, and the index of abdominal tonicity dropped from 4 to 3. As muscle tone increased, stability in the knee joint also increased, so the distance between the knees decreased from 2.5 cm to 1 cm. The patient increased in height by 4 cm, and the length of the lower limbs increased by 1 cm. The initial and final anthropometric examinations presented in table 1.

Evolution of anthropometrically analyzed elements Table 1

Anthropometric examination	**Initial**	**Final**
Weight (G)	15 kg	16 kg.
Waist	90 cm	94 cm
bust	60 cm	61 cm
Cranial perimeter	54 cm	54 cm
Chest perimeter at rest	56 cm	57 cm
Chest perimeter in deep inspiration	59 cm	60 cm
Chest perimeter in forced expiration	56 cm	56 cm
Chest elasticity	3cm	4 cm
Abdominal perimeter in orthostatism	53cm	52 cm
Abdominal perimeter in dorsal decubitus	49 cm	49 cm
Abdominal tonicity index	4 cm	3 cm
The distance between the knees	2,5cm	1cm
Thigh circumference at 2 cm. suprarotulian right	27cm	28 cm
Thigh circumference at 2 cm. suprarotulian left	27cm	28 cm
Circumference of the leg at 2 cm. subrotulian right	21cm	23 cm
Circumference of the leg at 2 cm. subrotulian left	21cm	23 cm
Length M.I. right	34cm	35cm
Length M.I. left	34 cm	35 cm

4. Interpretation of Results

Following the application of the recovery program centered on the harmonious development of the whole body and on its toning, it was observed that the patient did not gain more than one kilogram in weight during the research, increased in height by 4 cm. And the cranial perimeter did not increase. This can be seen in chart no.1.

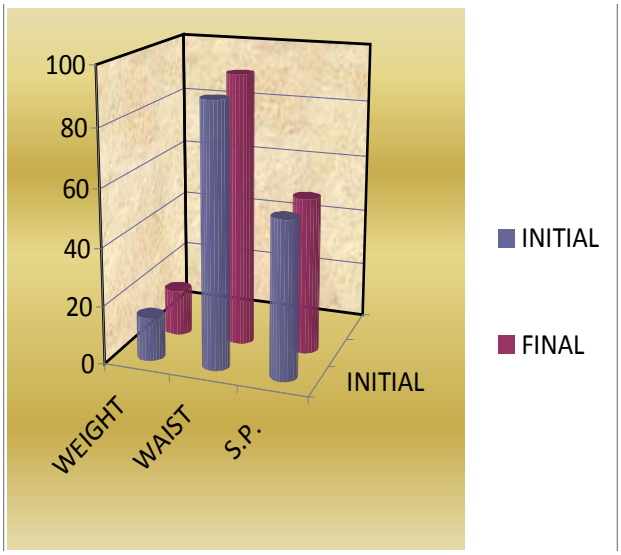

Chart 1. *Dynamics of values regarding weight, waist and skull perimeter*

Following the application of the massage, the corrective postures, the dynamic corrective exercises, the breathing exercises, the corrective exercises with an applicative character (eg, dragging, balancing, walking, running, grasping), the thoracic elasticity improved from 3 to 4 , the abdominal tonicity index decreased from 4 to 3, and the distance between the knees decreased from 2.5 cm to 1 cm. This can be seen in the chart no.2 presented below.

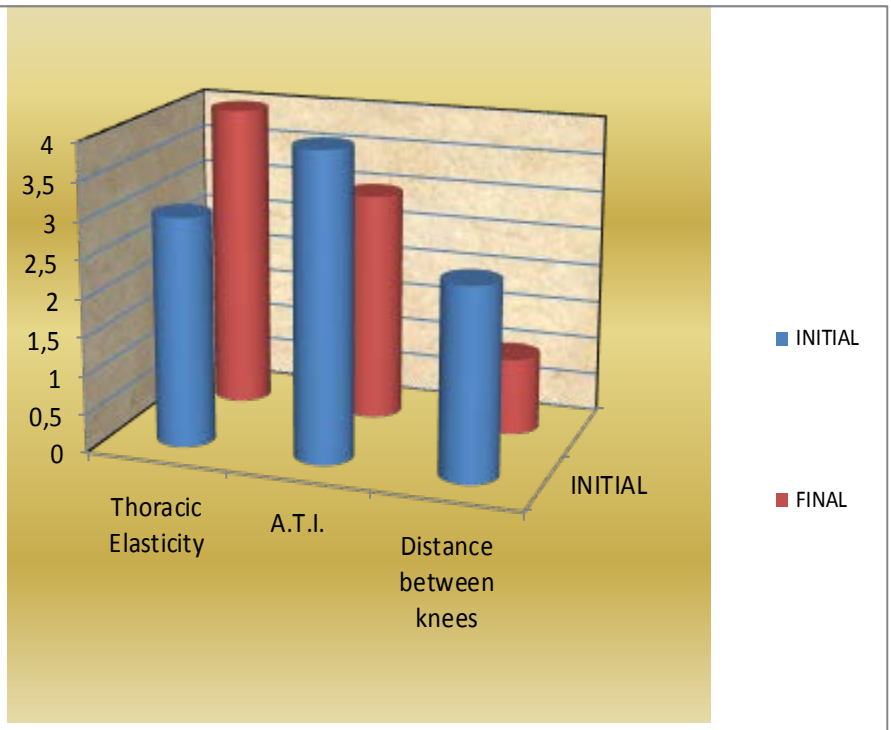

Chart 2. *Dynamics of values regarding thoracic elasticity, abdominal tonicity index and distance between knees*

Following the application of the measurements it was observed that the length of the lower limbs increased by one centimeter, which can be seen in graph no. 3.

5. Conclusions

Following the research conducted and the results obtained, we can say that the hypothesis initially established was confirmed.

Because the motor development of children with chondroplasia is negatively influenced by muscle hypotonia and laxity in the joints, it is important that the recovery program is focused on solving them.

It is important to know those moments of motor development in which the child relies on postural and movement patterns to overcome gravitational force and assume verticality.

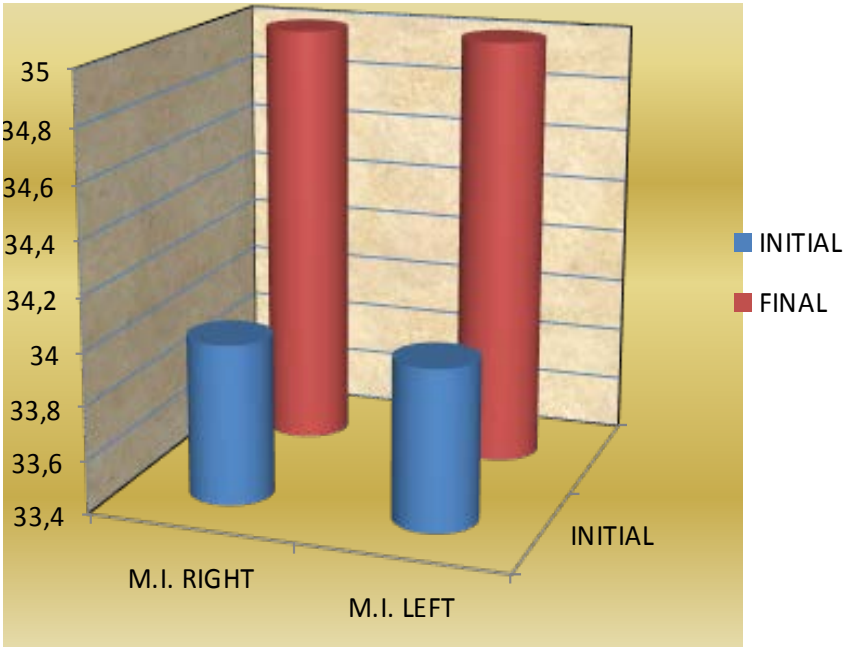

Chart 3. *The dynamics of growth of the lower limbs in initial and final length*

The parent is the key element in identifying the functional limitations, from the first days of birth, but also in the subsequent intervention, becoming a member of the working team, together with the doctor and the kinetotherapist.

The recovery program should focus on improving stability around the joints in each phase of motor development, resulting in the child's ability to take posture.

Early intervention by kinetotherapy increased the child's postural tone by reinforcing his correct postural and movement patterns from both ventral decubitus, dorsal decubitus, and sitting, quadruped and orthostatism.

The persistence, consistency, dedication and involvement of the team led to the shortening of the recovery period and to obtain remarkable results regarding the patient's evolution in the psycho-motor plane.

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