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THE IMPORTANCE OF PHYSICAL THERAPY IN THE TREATMENT OF LEGG-CALVE-PERTHES DISEASE

Silviu Gabriel CIOROIU[1]

Abstract: *The article is based on the importance of applying the means and methods specific to physical therapy in the improvement of Perthes disease. The condition is known as Perthes, Legg-Perthes or Legg-Calve-Perthes disease. Perthes disease is an avascular osteonecrosis of the epiphysis of the femoral head. It is assumed that through a kinetotherapeutic program appropriate to the patient's particularities, the mobility of the coxofemoral joint will remain within normal parameters, the femoral head will acquire a rounded shape, the stability of the joint will increase, walking will improve, and surgical intervention will be avoided or at least delayed.*

Key words: *physical therapy, Perthes disease, kinetic program*

1. Introduction

The coxo-femoral joint is a spheroidal synovial joint that connects the femoral head to the coxal bone. The spherical surface of the bone (femur) adapts to a concave and deep cavity of the other bone (iliac).

The acetabulum is the cavity bounded by the ilium, ischium and pubis and is where the rounded head of the femur articulates. The acetabulum limits the range of motion, through its depth, while providing strength and stability to the joint. On the anterior side, the acetabular notch forms an opening (foramen) that represents the passage for nerves and blood vessels [1].

2. Definition. Etiology

Perthes is a rare disease, also known as osteochondritis of the femoral head, is a particular form of arthritis in children. The femoral head loses blood supply and, as a result, necrosis of the proximal femoral epiphysis occurs.

For most children with Perthes disease, only one hip is affected. In the case of 10-12% of children with this disease, the damage is bilateral, but usually not simultaneous.

Boys are affected 3-5 times more often than girls, and the incidence increases in poor socio-economic groups and in children with low birth weight.

Perthes disease is degenerative and causes the loss of growing bone masses,

[1] Department of Physical education and special motor skills, *Transilvania* University of Braşov.

the collapse of the hip joint, the deformation of the femoral head and the acetabular surface that contains it [8].

Perthes has been associated with thrombosis, an abnormal "pattern" of bone growth, repeated minor trauma, mechanical overload, due to hyperactivity of the child, or below average birth weight and/or height. Some studies suggest smoking during pregnancy and other risk factors [6].

3. Material and Methods

In general, the condition includes four phases of evolution:

Phase 1 – Necrosis

Blood supply to the femoral head is interrupted; the hip becomes inflamed and swelling sets in. Portions of the bone become dead tissue. The femoral head no longer appears so round on radiographs. This phase can last from several months to 1 year.

Phase 2 – Fragmentation

The body "cleans" dead bone cells. The joint is still irritated and painful. This phase can last from 1 to 3 years.

Phase 3 – Reossification

The osteoblastic phenomenon begins, and the femoral epiphysis regains its balance. This phase lasts 1-3 years.

Phase 4 – Remodelling

The new femoral head may have a flat or thickened appearance, as it reshapes as it grows. Patients who respond to treatment may show favourable developments in 2-4 years [3].

3.1. The clinical picture

The clinical picture is varied, with an insidious onset, rarely sudden or related to a trauma. Most of the time, the child is brought to the consultation because of a limping, painless walk that appears after fatigue and disappears at rest. Children complain of vague pain in the thigh and knee. Accusations must be considered important even when we find no objective sign.

Signs and symptoms:

- lame - due to weakening of the psoas muscle. The limp is more noticeable after physical activity and improves after rest. It becomes more apparent at the end of the day, after a long period of walking;
- pain in the knee, thigh or hip. The child complains of pain during acute periods. It is usually stronger at the end of the day, after more demanding physical activity. Night-time pains are also common;
- decreased mobility of the hip;
- increased energy level - a good
- percentage shows hyperactivity and ADD;
- flaccid lower limb, lack of history of
- trauma;
- painful support in the leg;
- inequality of the lower limbs;
- atrophy of the thigh muscles;
- small stature [9].

Rotation test - with the patient lying down, the affected thigh is rotated externally and internally, the test demonstrates spasms and defense especially in internal rotation.

Physical examination may reveal:

- a decrease in internal rotation and abduction of the hip;
- pain during rotation, felt in the knee or thigh, antero-medial region;
- atrophy of the thigh and gluteal muscles;
- discrepancy between the length of the lower limbs.

a) Imaging studies. Plain radiography of the hip (figure 1) is extremely helpful in establishing the diagnosis. Fragmentation and flattening of the femoral head is observed. The affected thigh has a "frog's leg" appearance. Widening of the joint space is observed, and the decrease in bone density inside and outside the joint is noted after a few weeks [5].

Initial radiographs may appear normal; size changes can be observed at the level of the epiphysis and the widening of the joint space. Later there is flattening of the femoral head, signs of fragmentation, low bone density, bone marrow changes.

Fig. 1 *The plain radiograph of the hip*

Treatment consists of protecting the joint by allowing bone formation and regaining the sphericity of the femoral head. It is desired to prevent irregular contour, mushroom flattening of the head, shortening and/or thickening of the neck and flattening of the vertical walls of the acetabulum.

The development of any of these conditions causes osteoarthritis at an early age.

Exercise is important to prevent muscle contracture and atrophy. Swimming is recommended, because it allows the thigh muscles to work with minimal pressure, part of the body weight being taken over by the water, the joints are not very stressed. Water exercises increase the mobility and flexibility of the joints, reduce the pain caused by arthritis, and the resistance of the water increases the strength and toning of the muscles.

As an orthopedic method, the doctor can resort to unloading the hip joint and prolonged immobilization of the patient in bed, combined with traction. Obviously, depending on the specifics of the case, the doctor may also recommend immobilization in a plaster cast or with the help of orthoses, figure 2, [2].

Fig. 2 *Prolonged immobilization of the patient in bed*

The recovery program was applied to a patient diagnosed with Perthes disease. The intervention plan is customized to the conditions of the research subject. The treatment was performed at the patient's home. The kinetic program was carried out 5 days a week, both under supervision and individually. The approximate duration of a recovery session is 60 minutes. Sedative massage and passive mobilizations were performed before the medical gymnastics program, and stretching exercises at the end of the physical therapy session.

3.2. Physical therapy program

The exercises used in the recovery program are structured in three stages, depending on the evolution of the condition, the doctor's advice and the patient's movement possibilities. The increase in the number of repetitions or sets was done gradually, as well as the introduction of new exercises alongside those already learned in the previous stages. Depending on the patient's mood and degree of adaptation to the effort made during the program, the exercises were performed once a day, with a lower or higher number of repetitions as well as short distance walking exercises, cycling, exercise in water.

In the first part of the recovery program, the emphasis was on relaxing the muscles, reducing muscle contractions and regaining joint mobility. The program started with a sedative or mild decontracting massage, with the aim of warming the joint and coxofemoral muscles, to facilitate passive mobilization manoeuvres, also helping to increase the range of execution of active exercises and preventing injuries. At the end of the program, stretching exercises were performed, having a role in stretching the muscles, relaxation and preventing the formation of muscle contractions.

The second part of the recovery program used exercises aimed at increasing joint mobility, passive-active exercises and active exercises. The exercises are simple, easy to understand, without difficulty and are performed in short series so as not to cause excessive fatigue and to allow the patient to easily get used to the effort during recovery.

In the third part of the program, the exercises for strengthening the muscles were diversified and the number of repetitions or series was adapted. The strengthening of the muscles is especially aimed at the pelvic girdle, which will result in greater control over movements in the hip joint, correct positioning of the femoral head in the acetabular cavity and its maintenance, ease of walking, reduction of pain and fatigue. The exercises are performed slowly, keeping the correct form, with the necessary breaks, without being forced or jerky.

4. Results and Discussions

After carrying out the specialist medical consultation and confirming the diagnosis of Perthes, the advantages of following a kinetotherapeutic program were presented to the patient. Thus, the exercises used in the recovery program are structured according to the evolution of the condition, the doctor's advice and the patient's movement possibilities. Increasing the number of repetitions or sets, as well as diversifying the types of exercises, was done gradually.

Table 1

The degree of mobility of the coxofemoral joint, in the case of external rotation and abduction

Parameters	Initial testing	Intermediate testing	Final testing
External rotation	8°	12°	15°
Abduction	20°	25°	30°

Lower limb length discrepancy Table 2

Parameters	Initial testing	Intermediate testing	Final testing
Knee height difference	1cm	1,5cm	2cm

The rotation test, table 1, revealed on initial testing knee and hip pain, spasms, jerky movements, patient defensiveness, lack of confidence in movement, and a reduced range of motion. The final testing reveals a decrease in the degree of pain, an increase in the range of motion and its suppleness. Spasms are reduced; the patient no longer has a defensive, twitching reaction caused by fear of pain during movement.

Atrophy of the thigh and gluteal muscles is visible. On palpation, there is stiffness in the tendons, strengthening and slight shortening of the thigh muscles, especially the medial muscle, which tends to bring the lower limb into internal rotation, causing the femoral head to push out of the joint. The exit of the head of the femur from the joint occurs without pain felt by the patient, he only notices stiffness at the level of the coxofemoral joint during certain movements.

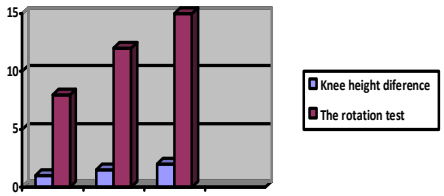

Fig.3. *Graphical of the discrepancy plot between lower limb length and rotation test*

The discrepancy between the length of the lower limbs can be measured from the supine position, with the knees bent, noting the unequal height of the knees (figure 3). The right limb is more affected because the condition first started in it, with the left limb being affected later. A difference in the height of the knees of 1.5 cm is observed, this increases with the evolution of the condition, the continuation of the fragmentation of the femoral head and its collapse inside the joint.

And within the range of motion of external rotation and abduction there is a considerable difference, even from the initial testing at 8° to 15°.

The initial amplitude of the external rotation was 8°, which reached 15° following the kinetotherapeutic program.

The range of motion of abduction also shows considerable progress, regression and favourable evolution, as well as a similar difference in the degree of increased mobility in the left lower limb than in the right (Figure 4).

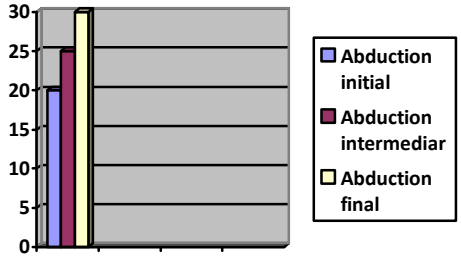

Fig. 4. *Graphical representation of the number of abduction*

Progress is notable in Intermediate I testing, with the degree of range of motion increasing by 5°/10°, reaching close to normal maximum range, from 20° to 30°.

5. Conclusions

Perthes is a rare disease, also known as osteochondritis of the femoral head, being a particular form of arthritis in children. The femoral head loses blood supply and, as a result, necrosis of the proximal femoral epiphysis occurs [4].

The present research demonstrates that through a kinetotherapeutic program appropriate to the patient's particularities, the mobility of the coxofemoral joint remains within normal parameters, as long as it is carried out continuously, the stability of the joint will increase by toning the muscles, and walking will improve. A reduction in symptoms is also observed, represented by the reduction of limping and the reduction of pain in the knee, thigh, and hip.

In conclusion, physical therapy exercises are effective as long as they are performed regularly, evenly, still insisting on exercises aimed at improving joint mobility, increasing muscle tone and strength, and reducing pain [5].

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