

Conservative Treatment for Patients with Legg-Calve-Perthes Disease: Seven Years of Follow-up

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Abstract

Objective: The purpose of the present study was to clinically and radiographically evaluate possible effects from the proposed physiotherapy, in comparison with observation, among patients with Legg-Calve-Perthes disease over a seven-year follow-up.

Method: A prospective seven-year follow-up study was conducted among 17 patients with unilateral Legg-Calvé-Perthes disease, divided into two groups: Group A (observational) and Group B (physiotherapeutic). In order to evaluate the outcomes from the treatment protocols used, the following clinical and radiographic parameters were assessed.

Results: There were no significant differences between the mean scores for joint dysfunction, in group A ($P = 0.082$). In group B, the mean before treatment was greater than the mean after treatment ($P=0.036$) and greater than the mean seven years after treatment ($P=0.028$).

Conclusion: The results suggest that physiotherapeutic treatment for patients with Legg-Calve-Perthes disease was effective, in comparison with observation, even after seven years had elapsed since the intervention.

Keywords: Physical therapy techniques; Legg-Perthes disease; Hip; Evaluation; Exercise therapy; Legg-Calve-Perthes

Introduction

Legg-Calve-Perthes disease (LCPD) is a syndrome in which an avascular event affects the capital femoral epiphysis [1]. The main objective of treatment is to maintain the hip joint morphology in its best possible condition in order to prevent early degeneration, while preserving joint mobility with pain relief [2,3].

It is unclear what the possible benefits from physiotherapy for LCPD would be or when it should be used. Some studies have mentioned physiotherapy as a pre and/or postoperative resource [4-7], while others have considered it to be a form of conservative treatment associated with other treatments [3,8-11].

According to Herring et al., the previous studies in the literature include one randomized study and a few controlled studies, but most studies have not had control groups [12,13].

Wild et al. [14] suggested that a study should be conducted among patients with LCPD scored as I or II in the Catterall radiographic classification with three to four months of physiotherapeutic treatment, with clinical and radiographic control evaluations.

In a previous study, we evaluated the effect of physiotherapeutic treatment for 12 weeks among patients with LCPD [15]. However, the long-term effects among these patients who underwent physiotherapy sessions, i.e. after reaching skeletal maturity, remained unknown.

The hypothesis to be tested in the present study was that physiotherapy exercises for LCPD provide significant functional improvement, compared with observation alone, over a long period of follow-up.

The purpose of the present study was to clinically and radiographically evaluate possible effects from the proposed physiotherapy, in comparison with observational follow-up among patients with LCPD.

Methods

This was a prospective, parallel-group controlled study on individuals with unilateral LCPD who were seen at the XXXX. The study was approved by the institution's Ethics Committee (0623/11). Patients presenting with an indication for conservative treatment were divided into two groups: A (control group) and B (physiotherapy group).

Between November 2003 and September 2005, 20 patients were treated and divided between the groups. On that occasion, the patients were included in this study in accordance with the following criteria: radiographic classifications (Catterall Type I, II or III and Herring Type A or B) other associated lesion or surgery in the hip, unilateral involvement, indication for conservative treatment and no neurological disturbance. The patients in Group B needed to be available to attend the IOT twice a week to participate in physiotherapy sessions. The patients excluded from the study were those who ceased treatment, who were not available for reevaluation, who needed to undergo a surgical procedure, or who failed to attend treatment on more than two consecutive occasions. Two patients were excluded from Group B (one was absent on more than two consecutive occasions and the other underwent a surgical procedure) and one patient who was not available for reevaluation was excluded from Group A. Therefore, 17 patients completed the study out of the 20 who were initially included.

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All the 17 patients who completed the initial study were invited to return to the IOT seven years after they had completed their treatment, or attempts were made to contact them, so that new physical and radiographic evaluations could be made. However, patients would be excluded from the present study if they had undergone any surgical procedure on the hip during this follow-up period, or if it was impossible to contact them or if they were unable to come for these evaluations. Out of the 17 patients initially studied, eight were reevaluated seven years after the treatment, four from each group. Among the nine patients who could not be reevaluated, five were excluded because they had undergone hip surgery (two in group A and three in B), one because he moved to another state (group B) and three because it was impossible to contact them (two in group A and one in B).

Intervention

Seven years ago, Group A underwent a 12-week observational follow-up with no therapeutic intervention. At the same time, Group B received physiotherapeutic treatment twice a week for 12 weeks. The treatment proposed included passive exercises to stretch the musculature of the hip involved and straight leg raise exercises for the hip muscles. The balance training started during the fifth session, initially on stable terrain and later on unstable terrain [15].

Clinical evaluation

The clinical evaluation consisted of performing the special Trendelenburg and Thomas tests. In addition, the anthropometric data relating to body mass, height and body mass index were quantified. It was ascertained whether any trunk deformities were present, specifically scoliosis, and whether the Adams test was positive. The presence and location of pain were assessed using a body diagram [16].

Hip range of motion was evaluated through measurements of passive movements of the hip, using a manual goniometer. Muscle strength was evaluated using a 0 to 5 scale [17]. The findings were compared with those of the unaffected contralateral hip. In order to evaluate the muscle strength level, a muscle function test for hip joint movements was applied.

These two clinical evaluations, i.e. hip range of motion e hip muscle strength, were done in order to be able to use a scale that was derived from Sposito et al. [18], so as to evaluate the level of joint dysfunction that was observed in this study. In this, one point was assigned for every five degrees of discrepancy in relation to the normal pattern of the unaffected hip, and one point for each level of muscle strength discrepancy in the groups tested, always comparing the result with the unaffected side. The scores obtained, before and after treatment, were summed to compare the groups.

Radiographic evaluation

The examinations were performed by experiences and trained technicians. Two views of the hip were produced: anteroposterior and frog-leg position. The Stulberg et al. classification [19] was used to categorize the results from the proposed treatment. In addition, scanometry was performed with the children standing upright without shoes on, with their arms hanging alongside the body, in order to evaluate any discrepancy of the lower limbs.

Statistical analysis

Descriptive analysis was performed. The mean levels of dysfunction were compared between the two groups and within the groups on three occasions. This was done using the analysis of variance technique with repeated measurements. The assumptions for applying the technique

were evaluated by constructing a normal probability plot for residuals and using Box's test for equality of variance-covariance matrices and Mauchly's sphericity test. When necessary, Bonferroni's procedure was applied to localize the differences between the means.

A significance level of $P < 0.05$ was used throughout the analysis. The analysis was performed using the Minitab® statistical software, Release 14.

Results

The data characterizing the groups seven years after the intervention period are presented in Table 1.

The descriptive statistical values for the dysfunction, per group, are presented in Table 2.

It could be seen that the mean score in group A was smaller than the mean in group B before the treatment. After the treatment and seven years after the treatment, the mean in A was greater than the mean in B.

Figure 1 presents the individual dysfunction profiles for groups A and B. It should be noted that the individuals in group B presented a marked decrease in score after the treatment, in relation to before the treatment, as shown in Figure 1.

Analysis of variance with repeated measurements showed that there was an interaction between the occasion of measurement and the group ($p < 0.001$). Thus, the difference between the groups depended on the occasion and the difference between the occasions depended on the group. The analysis sought to localize the differences between the occasions in each group, and between the groups on each occasion.

In comparing the occasions within the groups, the following was found:

- There was no significant difference between the mean scores on the three occasions in group A ($p = 0.082$);
- In group B, the mean before treatment was greater than the

	Group	
	A	B
Age (years)	12.8 (1.3)	11.5 (1.3)
Height (m)	1.6 (0.06)	1.45 (0.09)
Body weight (kg)	59.2 (18.78)	50.18 (19.60)
BMI (kg/m)	23.43 (8.51)	23.5 (7.11)
Sex (male)	4	4
Trendelenburg sign (positive)	2	2
Thomas test (positive)	2	1
Complaint of hip pain (positive)	3	1
Clinical scoliosis (positive Adam test)	4	3

Table 1: Characterization of the groups seven years after the time of the intervention.

Occasion	Group	N	Mean	Standard deviation	Minimum	Median	Maximum
Before treatment	A	4	3.0	2.3	1	3	5
	B	4	10.8	4.0	6	11	15
After treatment	A	4	6.3	1.7	4	6.5	8
	B	4	2.0	1.4	0	2.5	3
Seven years after treatment	A	4	4.3	2.9	0	5.5	6
	B	4	0.5	1.0	0	0	2

Table 2: Descriptive statistical values for dysfunction according to group.

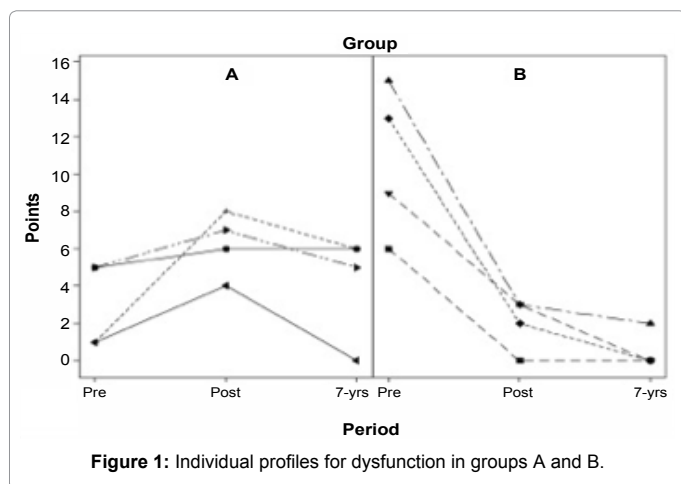


Figure 1: Individual profiles for dysfunction in groups A and B.

mean after treatment ($p=0.036$) and was greater than the mean seven years after treatment ($p=0.028$). There was no significant difference in mean score between after the treatment and seven years after the treatment ($p=0.308$).

In comparing the means for the groups on each of the three occasions, the following was found:

- Before the treatment, the mean in group A was smaller than in group B ($p=0.001$);
- After the treatment, the mean in group A was greater than in group B ($p=0.046$);
- There was no significant difference between the means for the two groups on the occasion of seven years after the treatment ($p=0.077$).

Table 3 presents the marginal and combined Stulberg distributions after the treatment and seven years after the treatment in each group. This table makes it possible to evaluate the changes in conditions from after the treatment to seven years after the treatment.

Scanometry on the lower limbs showed that the mean difference between the affected and unaffected sides was 1.98 (1.82) cm for group A and 3 (0.81) cm for group B.

Figure 2 shows the radiography of a 12-year-old boy with LCPD of the right hip after 7 years of an physiotherapeutic treatment.

Discussion

In the evaluation performed seven years after the intervention, it could be seen that the joint dysfunction of the patients in group A remained the same at all times, while group B showed an improvement after the treatment, which was maintained seven years after the intervention. Regarding the radiographic condition, one patient in group A presented worsening and one in group B presented improvement. The discrepancy between the lower limbs was an average of 2 cm in group A and 3 cm in group B.

The ages of the groups were statistically equal at the beginning of this study, with a mean age of 5.6 years in group A and 5.7 years in group B [15].

One of the early symptoms of LCPD is pain and/or claudication. Pain may be located in the hip, although it is normally reported in the medial region of the thigh or in the knee [20,21]. Even after treatment during the active phase of the disease and after skeletal maturity

has been reached, the disease may still be present. Out of the eight patients who were reevaluated, four presented hip pain, and three of these patients were in group A. The etiology of hip pain in young adults with a history of LCPD is unclear. The pain generators that have been proposed among these patients include femoroacetabular impingement, instability, labral disease and early osteoarthritis [22].

During clinical examination, patients with LCPD may also present positive signs in the Trendelenburg test [23]. Even seven years after the intervention, four patients (50%; of whom three were in group A) presented a positive Trendelenburg test, thus demonstrating weakness of the gluteus medius. Moreover, three patients (two in group A) presented a positive Thomas test, thus demonstrating shortening of the iliopsoas muscle.

In addition, out of the eight patients reevaluated, seven presented scoliosis, with a positive Adams test. The only patient who did not present this was in group B. We believe that two factors were responsible for the presence of scoliosis: the pain, which led to use of a posture that avoided pain; and the leg-length discrepancy.

The reduction in the hip range of motion, mainly in abduction, flexion and medial rotation, may lead to hypotrophy or atrophy of the thigh due to lack of use of the limb [22]; failure of the abductor muscles due to increased growth of the greater trochanter [9]; and hip contracture due to reduced flexion and abduction [24]. Therefore, it is important to measure the range of motion and the level of hip muscle strength [20,23-25], because the results from treatment are directly related to the hip range of motion; a good outcome is when the patient has no symptoms and total hip range of motion [26]. Thus, a reduction in hip range of motion may be one of the first signs of subluxation [27,28].

In the present study, we quantified the joint range of motion and muscle strength of the hip movements in order to determine the degree of joint dysfunction. This remained the same at all times among the patients in group A. However, in group B, which received a physiotherapeutic intervention, an improvement in the degree of joint dysfunction was seen after the treatment, and this improvement was maintained seven years after the intervention. These findings demonstrate that the exercises proposed were effective in improving the joint range of motion and hip muscle strength, compared with patients who did not do these exercises. According to Larson [22], pain, arthritis and ongoing hip dysfunction are common in patients with LCPD that was treated nonoperatively.

There are many forms of conservative treatment, and the earlier the treatment is started, the better the prognosis will be [29]. However, few studies have had the purpose of evaluating the benefits of physiotherapy

Group	After treatment	Seven years after treatment			
		1	2	3	4
A	2	1			
		25.0%			
	3			2	1
				50.0%	25.0%
B	1	1			
		25.0%			
	2	1	1		
		25.0%	25.0%		
	3			1	
				25.0%	

Table 3: Marginal and combined Stulberg distributions after treatment and seven years after treatment in each group.

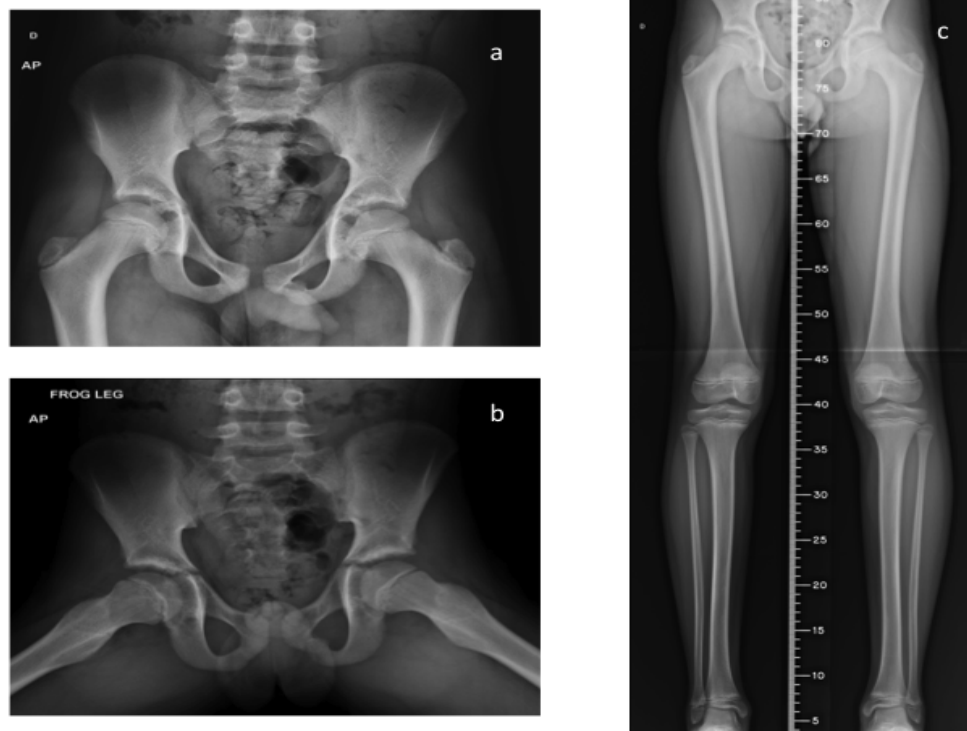


Figure 2: a) AP pelvis radiograph of a 12-year-old boy with Legg-Calve-Perthes disease (LCPD) of the right hip after 7 years of an physiotherapeutic treatment. b) AP pelvis radiograph with hip abduction (Frog-Leg position). c) Scanometry from the lower limbs.

for LCPD. Most have used physiotherapy as a resource in association with other treatments, although they did not directly evaluate its benefits [13].

Only a few published studies have reported values for joint range of motion, and the reported values usually relate to patients who underwent reevaluations many years after treatment, mostly on the occasion of surgical treatment. Some reports have stressed the importance of physiotherapy for LCPD, with exercises to maintain or provide gains in hip range of motion, and to reduce muscle spasms [12]. These reports have described physiotherapy exercises and resources that can be used by patients with LCPD, although they did not evaluate them [20]. Some case reports have shown how physiotherapy works in cases of LCPD and have evaluated it, but only among patients who used physiotherapy as a resource associated with surgery or with other conservative treatment [30].

With regard to radiographic condition, it was found that there was a discrepancy between the lower limbs, i.e. between the affected and unaffected limb, as shown by scanometry. The discrepancy was a mean of 2 cm in group A and 3 cm in group B. According to the Stulberg classification, one patient in group A presented worsening and on in group B presented an improvement. Thus, radiographically, there were no important differences in comparing between the groups.

The most important finding in this study was that the exercises proposed for group B were effective for improving both the joint range of motion and the degree of muscle strength of the affected hip, in comparison with Group A after the treatment, and that this was maintained for seven years after the intervention. The physiotherapeutic treatment used in group B was effective for patients with LCPD who presented with an indication for conservative treatment.

The present study has important limitations, among which the main one is the small sample size. Some of the p values obtained in the tests were between 0.05 and 0.10 and the lack of statistical power in these cases may be attributable to the small sample size. Moreover, the method for evaluating the degree of joint dysfunction is examiner-dependent, and this is the reason why the same evaluator performed the examinations on all occasions.

The results suggest that the physiotherapeutic treatment for patients with LCPD was effective, in comparison with observation, even after seven years had elapsed since the intervention.

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