INTERNATIONAL SEVEN JOURNAL
OF HEALTH RESEARCH
ISSN: 2764-9415

Influence of physiotherapy treatment for developmental dysplasia of the hip after use of the Pavlik Suspension

Influência do tratamento fisioterápico da displasia do desenvolvimento do quadril após o uso do Suspensório de Pavlik

DOI: 10.56238/isevjhv2n5-001
Receiving the originals: 10/08/2023
Acceptance for publication: 31/08/2023

Bruna Vieira Tavares
Physiotherapy Student – UNEC
E-mail: bruna_bvt@hotmail.com

Patricia Brandão Amorim
Coordinator of the Physiotherapy course – UNEC
E-mail: brandaoamorim@hotmail.com

Livia Vicente Lopes
Physiotherapy Student – UNEC
E-mail: lyviavicente123@gmail.com

Maria Julia Pereira Sena
Physiotherapy Student – UNEC
E-mail: majusena901@gmail.com

João Victor Soares de Aguilar
Physiotherapy Student – UNEC
E-mail: joaovictoraguilar19@gmail.com

ABSTRACT

Developmental dysplasia of the hip (DDH) consists of abnormalities that affect the hip of the newborn, and may present in various forms, such as abnormal acetabular, and may or may not be associated with a subluxation or dislocation of the femoral head. This article aims to analyze the possible influence of physical therapy treatment on the rehabilitation of a patient diagnosed with hip dysplasia using a pavlik suspender from the theoretical survey on the subject, to understand the functioning of the pavlik suspender and to list the kinesiotherapeutic activities in patients who use the pavlik suspender for the treatment of this comorbidity. The present study will be a case study evaluated in the city of Ponto Belo - ES, where the importance of physical therapy in the treatment of hip developmental dysplasia was explored. The research was carried out primarily through pediatric evaluation, observing the evolution and influence of physical therapy after the use of the pavlik suspender. Based on articles of secondary form, directed to DDH, these show diverse subjects on anatomy, definitions, pathophysiology, epidemiology, diagnoses and treatment. It can be concluded that treatment with the pavlik suspender has been shown to be effective in patients diagnosed with DDH.

Keywords: Physical therapy, Developmental dysplasia of the hip, Pavlik's suspender.

1 INTRODUCTION

Developmental Hip Dysplasia (DDH) encompasses all changes in the newborn's hip, from unstable to dislocated hips. It is a complex hip pathology that affects the pediatric age group and has several clinical presentations. Regarding studies on the theme of DDH, there is a lack of studies and scientific evidence available to guide clinical practice within this comorbidity. There is no consensus regarding the diagnosis and classification of this pathology, the studies published so far have small samples, are retrospective and bring uncorrected data regarding the type of DDH.

Concomitantly, there is a knowledge gap on the part of health professionals, especially pediatricians and residents in Brazilian pediatrics, which ends in a late direction of patients for the correct treatment of this comorbidity. The Ortolani maneuver is used as an initial screening for DDH, evaluating whether there is instability or dislocation of the hip, followed by imaging tests to diagnose this pathology.

For the treatment of DDH, the Pavlik suspender is used, which aims at simultaneous flexion and abduction of the coxofemoral joint supported by the strips of this orthosis, which is able to reduce the need for surgical reduction in patients with this pathology.

This article will deal with a case study of an infant from the city of Ponto Belo - ES, who was submitted to the use of Pavlik's suspender and physiotherapeutic treatment in hip developmental dysplasia, bringing the evolution and influence of physiotherapy concomitant to the use of the orthosis in question. In addition, this study lists relevant information directed to DDH, such as definition, anatomy, pathophysiology, epidemiology, diagnosis, and treatment of the same.

2 DEVELOPMENTAL DYSPLASIA OF THE HIP

Developmental Hip Dysplasia (DDH) is one of the most common pediatric pathologies and encompasses a vast arsenal of anomalies, with anatomical variations ranging from instability, dysplasia itself, subluxation and dislocation of the femoral head in relation to the acetabulum (PAVONE *et al.,* 2021; ZOMAR *et al.*, 2021).

DDH can be characterized by the abnormal relationship between the femoral head and the acetabulum, ranging from milder to more severe cases, where situations of transient hip instability, such as acetabular dysplasia and open dislocations with a primitive acetabulum and/or new formation of the acetabulum can be observed in orthopedics (GOIANO *et al.*, 2020).

Given this variable scenario, it is possible to find numerous studies that differ as to the definition of the disease, bringing with it a questionable history related to the terminology of DDH.

These inconsistencies, in their great majority, can be explained because of the forms and diagnostic criteria previously accepted, being included, erroneously, several other diseases of the coxofemoral joint (ZOMAR *et al.*, 2021).

In Brazil we can find a lack of knowledge of health professionals regarding DDH, which generates a late direction of patients for the correct treatment. In addition to this factor, it is added that the information that is available in the databases comes mostly from retrospective studies or carried out in a single health center, which makes it even more difficult to really know this disease, especially with regard to the epidemiological factor of it (SOUZA *et al.*, 2021).

2.1 EPIDEMIOLOGY

Developmental dysplasia of the hip most frequently affects female neonates, with a proportion of 4 to 10 times when compared to males. Unilateral injury is more common than bilateral lesion, accounting for approximately 65% of cases (GKIATAS *et al.*, 2019).

Its incidence can vary between 2% and 30% of neonates, depending on the parameters adopted for recognition and definition. Some studies suggest that the sonographic incidence can reach about 69.5 cases per 1,000 births, and most of them have spontaneous resolution in about 2 months. After the aforementioned period, just over 4 cases per 1,000 births will require some type of therapeutic intervention (NANDHAGOPAL; DE CICCO, 2021).

2.2 PATHOPHYSIOLOGY

Congenital hip dislocations may originate from dysfunctions in the hip development process still in the intrauterine period, after the seventh week of gestation. It is known that the extreme hip positions adopted by the fetus during the gestational period can cause significant damage to the articular cartilage, since the hip joint cannot form a fixed rotation support around which movements can be performed, so that the acetabulum may not fully develop and the head of the femur may adopt a non-spherical shape (HERRING, 2014).

Thus, these congenital changes include multiple etiological factors, such as poor positioning and mechanical conditions in the uterus, ligamentous laxity that can be induced by hormones, genetic or maternal-environmental factors. In addition, it is likely that intrauterine compression, fetal malposition or all of these environmental factors, culminate in dislocation in individuals who already have a genetic predisposition to this pathology (VAQUERO-PICADO *et al.*, 2019).

2.3 CLINICAL PICTURE

DDH is a complex pediatric hip disease that can present clinically in different ways. It begins still in the intrauterine period, where the extreme positions of the hip during the development of the fetus can cause important lesions in its articular cartilage (DIAS *et al.*, 2022).

Thus, the first signs of the disease can be observed at the beginning of the neonatal period or later, around the first trimester of life. This condition resolves spontaneously in the first month in 80% of the cases, evolving to subluxation or dislocation in the other 20% affected by this condition (DAYS *et al.*, 2022).

In this pathology, some children may present without apparent changes at birth, acquiring pathological aspects of DDH later. When not previously treated, or treated inappropriately, this dysplasia causes permanent functional and physical maladjustment for the patient (DIAS *et al.*, 2022).

2.4 DIAGNOSIS

Like any clinical picture, a detailed anamnesis and a complete physical examination are necessary in patients with suspicion of this pathology. Information about the gestational and postnatal period of this individual is of similar importance, encompassing aspects of the musculoskeletal and neurological system of the child. As components of the physical examination, inspection, palpation, measurement of range of motion and gait, for children who already walk, these are indispensable for a complete evaluation (GONÇALVES *et al.,* 2020).

Imaging tests are extremely useful to make the diagnosis of this pathology, and ultrasound is an indispensable exam when it comes to patients within their first semester of life, since the nucleus of the femoral head is not yet fully ossified in this period, which allows the visualization of the femoral head in this complementary examination.

It is possible to visualize the anatomy of the child's acetabulum, while it is possible to investigate the patient's coxofemoral joint stability. In cases where the ossification of the femoral head nucleus is already established, we can make use of pelvic radiography, which is chosen as the method of choice in the examination of hip growth and development within the age range of four to six months of age (VAQUERO-PICADO *et al.*, 2019; HARPER *et al.*, 2021)

3 TREATMENT OF DYSPLASIA

The treatment of DDH is still a challenging issue, both for the orthopedist and the physiotherapist. This has as main objectives the early diagnosis and immediate initiation of

treatment within the different age groups. Diagnosis at neonatal age leads 96% of cases to the initiation of correct and effective therapy.

The success rate in the treatment of this pathology is high, explained by the conservation of the anatomy of the hip of newborns. The early resolution of DDH cases ends in a physiological development of the joints (BARBOSA; Albernaz, 2019).

When performed late or undiagnosed, DDH causes an early degeneration of the joint, leading 86% of these patients to surgical intervention in cases diagnosed up to 10 months of age, such as total hip arthroplasty (YAZAR, *et al.*, 2019).

In cases of late diagnosis, acetabular or femoral osteotomy should be performed to prevent osteoarthritis and other diseases, maintaining a high prevalence of some degree of arthrosis in adulthood (BARBOSA; Albernaz, 2019).

3.1 PHYSIOTHERAPEUTIC TREATMENT

In DDH, the physiotherapeutic treatment aims to reestablish and improve the quality of life of patients with this pathology. The treatment to be adopted has as a determinant of choice the age at which the diagnosis of DDH was made, knowing that the earlier the diagnosis, the better the prognosis and evolution of this comorbidity (PAVLIK, 1992).

Currently, the most used orthosis is the Pavlik suspender, whose principle is the simultaneous flexion and abduction of the hip joint supported by the straps that join with relative ease. This orthosis is able to significantly reduce the risk of the need for surgical intervention (PAVLIK, 1992).

Another therapeutic option is the plaster fixation device, which performs the isometry of the muscles of the lower limbs within the plaster itself, and work the trunk with flexion, extension, and lateralization. After the end of the use of this fixation device, progress should be made to active mobilization, working on exercises to reinforce and re-educate the gait as soon as the child is able to maintain the orthostatic position (LIMA; FARIA, 2001).

When a surgical intervention is necessary, the physiotherapist plays an important role in the postoperative period, especially in the adoption of activities capable of preventing contractures, such as proper positioning and specific stretching for this condition, in search of increasing the range of motion of the shortened muscles. The gain in mobility enables the patient with DDH to improve balance and synchrony when performing routine activities (LIMA; FARIA, 2001).

3.2 PAVLIK SUSPENDER

As the treatment method chosen, the Pavlik suspender, an orthopedic appliance widely used in the treatment performed by physiotherapists, this has as a mechanism the reduction of the femoral head in the acetabular cavity and its maintenance until total joint stability, based on the principle of reduction in flexion, preventing the position of forced abduction of the coxofemoral joint (PAVLIK, 1992).

The use of the Pavlik suspender can reduce the need for surgical interventions, especially in patients up to 6 months of age, being able to maintain an appropriate stimulus for the physiological development of this joint (PAVLIK, 1992). Studies indicate that 89% of hip dislocation cases in the pediatric age group up to 6 months were successfully reversed, following with a normal development after the use of the Pavlik suspender (KALAMCHI; MACEWEN, 1980).

This orthosis has a low risk of complications, which are less than 1%. The main one is avascular necrosis of the epiphysis of the femur. It is also important to mention femoral nerve palsy. These complications present a good resolvability when there is suspension of the established treatment (BARBOSA; Albernaz, 2019).

4 METHODOLOGICAL PROCEDURES

The present study will be a case study evaluated in the city of Ponto Belo - ES, where the importance of physical therapy in the treatment of hip developmental dysplasia was explored. The research was carried out primarily through pediatric evaluation, observing the evolution and influence of physical therapy after the use of Pavlik's suspender. Based on articles of secondary form, directed to DDH, these show diverse subjects on anatomy, definitions, pathophysiology, epidemiology, diagnoses, and treatment.

The clinical case study aims to analyze the possible influence of physical therapy treatment on the rehabilitation of a patient diagnosed with hip dysplasia after the use of Pavlik's suspender. Through the analysis and interpretation of the medical records, presenting the evolution according to what was described in the day-to-day application of the rehabilitation protocols.

Initially, the physiotherapeutic evaluation was performed before the treatment was arranged, it was composed of questions related to the disease, such as the main complaint, birth history, family history, sensory and motor development, frontal, lateral and posterior inspection, measurement of joint range of motion of the bilateral hip, bilateral knee and right bilateral ankle, strength test in all muscle chains of the lower limbs and postural evaluation. At the end of the

sessions, a new evaluation was performed on the child so that with the data obtained it would be possible to perform a comparative analysis of the results.

To achieve the proposed objective, a bibliographic research was carried out as an instrument to collect information through books, documents and scientific articles available online, in the electronic databases Google Scholar, Scientific Electronic Library Online (SCIELO), US National Library of Medicine National Institutes of Health (PUBMED), all the collection of articles was carried out between the months of January to April 2023, through articles already published.

5 RESULTS AND DISCUSSION

This is L. T. R., a female patient, born at term, weighing 3115kg and 49 cm long, who received a possible diagnosis of hip dislocation shortly after birth, where bilateral positivity of the Ortolani test was observed by the pediatrician.

Next, a hip ultrasound was requested by the pediatrician at the Hospital e Maternidade Nossa Senhora Aparecida in the city of Montanha-ES. The follow-up of the patient was carried out at the Hospital Estadual Infantil e Maternidade Alzir Bernadino Alves, in the city of Vila Velha – ES, by a specialist in the area.

As therapy, the use of the Pavlik suspender was indicated initially for 3 months, being this the most used method for correction of such alteration in neonates, aiming at reduction and maintenance of the femoral head in the acetabulum until stabilization of the joint.

The condition continued to be monitored by the responsible physicians and after reduction and stabilization, the monthly return for outpatient evaluation was advised, knowing that the non-response to the initial approach could require the adoption of other therapeutic measures.

After 90 days of the use of the Pavlik suspender, the patient was reassessed and already demonstrated progression of her clinical condition, being advised to use the suspender only during nocturnal sleep for a period of 30 consecutive days.

Ultrasound evaluation is recommended until the 6th month of life, followed by radiographic evaluation, considering the progress of the ossification process. After the removal of the Pavlik suspender with 90 days of treatment, the physiotherapeutic evaluation was performed, where the physiotherapy sections were initiated, with the achievement of excellent results, followed by the total removal of the suspender and closure of the case with total clinical and imaging improvement of the condition.

Physical therapy treatment was initiated on March 13, 2023, with a total duration of 90 days. In the first evaluation of the patient, with a chronological age of 5 months and 14 days of life, she had a motor age of 3 months, with cervical control, following movements performed, with discovery of the hands taking them to the mouth, holding objects with her hands, in full development of body awareness.

Regarding joint mobility, the infant presented great stiffness in the coxofemoral, patellofemoral, tibiofibular and talocrural joints, which was completely reduced after the removal of the suspender. Regarding muscle strength, it presented notorious muscle weakness, with a degree of muscle strength evaluated in 3, showing little muscle contraction overcoming gravity.

At the end of the physiotherapy treatment, when reassessed, it was possible to observe that the patient was already completely within the normal range, with the chronological age compatible with the motor age, presenting joint mobility without stiffness and muscle strength reaching a degree of strength evaluated in 5, with muscle contraction, overcoming gravity and imposed resistance.

6 CONCLUSION

Developmental dysplasia of the hip is a complex pathology involving several etiopathogenic factors. DDH causes changes and disorders to the developing hip, affecting the coxofemoral joint. This disease presents a relevant number of annual cases in the country and impairs the quality of life of these patients, besides causing great financial impact for the public health system. The early institution of treatment is of fundamental importance in improving quality of life and reducing the risk of possible complications and surgical interventions. However, we still face the scarcity of studies and scientific evidence about this disease, which should be more covered in the academic and scientific field.

REFERENCES

BARBOSA, R. O.; ALBERNAZ, E. P. Perfil dos pacientes diagnosticados comdisplasia do desenvolvimento do quadril. Rev Bras Ortop, 2019; 54(5): 497–502.

GKIATAS, Ioannis; BOPTSI, Anastasia; TSERGA, Dimitra; GELALIS, Ioannis; KOSMAS, Dimitrios; PAKOS, Emilios. Developmental dysplasia of the hip: a systematic literature review of the genes related with its occurrence. EFORT Open Reviews, v. 4, n. 10, p. 595– 601, out. 2019.

GOIANO, Ellen de Oliveira; AKKARI, Miguel, PUPIN, Juliana Pietrobom; SANTILI, Cláudio. Epidemiologia da displasia do desenvolvimento do quadril no sexo masculino. Acta Ortop Bras, 2020; 28(1): 26-30.

GONÇALVES, Kamila Caixeta; ASSIS, Igor Henrique Nunes; OLIVEIRA, Everton Henrique Santos; CARDOSO, Geisa Peixoto; SPAZIANI, Amanda Oliva; FROTA, Raissa Silva; JACOMINI, Raphaela de Paula; LEITE, Mélany Alves; SANTOS, Matheus Vinicius Fernandes; AZERÊDO, Ludwig; DOS SANTOS, Flávio Henrique Nuevo Benez. Principais patologias ortopédicas pediátricas do quadril: uma revisão de literatura. Brazilian Journal of health Review, 2020; 3(2): 3218-3230.

GUILLE JT; PIZZUTILLO, Peter; MacEwen GD. Development dysplasia of the hip from birth to six months. Journal of the American Academy of Orthopaedic Surgeons. 2000; 8(4) 232-42.

HARPER, Philip; GANGADHARAN, hilip; GANGADHARAN, Rohit; POKU, Daryl; AARVOLD, Alexander. Cost Analysis of Screening Programmes for Developmental Dysplasia of the Hip: A Systematic Review. Indian Journal of Orthopaedics, v. 55, n. 6, p. 1402–1409, 6 set. 2021.

HERRING JA. Tachdjian's pediatric orthopaedics: from the Texas Scottish Rite Hospital for children. 5th ed. Philadelphia: Elsevier; 2014. p. 483–579.

KALAMCHI, A.; MACEWEN, G. D. Avascular Necrosis Following treatment of congenital dislocation of the hip. Journal of Bone and Joint Surgery. 1980; 62 (6): 401-11.

KONIN, G. Jeff. Cinesiologia pratica para fisioterapeutas. Rio de Janeiro: Guanabara, 2006.

LIMA, C. L. A.; FARIA, R. G. C. O quadril instável na paralisia cerebral espástica. In: Clínica Ortopédica: O quadril da Criança e do Adolescente. São Paulo: Medsi; 2001. p. 225-37.

NANDHAGOPAL, Thiagarajan; DE CICCO, Franco Luis. Developmental Dysplasia Of The Hip. StatPearls. Treasure Island, 09 oct. 2021.

PAVLIK, A. The functional method of treatment using a harness with stirrups as the primary method of conservative therapy for infants with congenital dislocation of the hip. 1957. Clin Orthop Relat Res. 1992;(281):4-10. 19.

PAVONE, Vito; DE CRISTO, Cláudia; VESCIO, ANDREA; LUCENTI, Ludovico; SAPIENZA, Marco; SESSA, Giuseppe; PAVONE, Piero; TESTA, Gianluca. Dynamic and Static Splinting for Treatment of Developmental Dysplasia of the Hip: A Systematic Review. Children, v. 8, n. 2, p. 104, 4 fev. 2021.

RAMSEY PL, LASSER S, MACEWEN GD. Congenital dislocation of the hip. Use of the Pavlik harness in the child during the first six months of life. J Bone Joint Surg Am. 1976;58(7):1000-4.

SHEPHERD, Roberta B. Fisioterapia em Pediatria. 3ª ed. Livraria Santos: 1998, São Paulo.

SOUZA, Bruno Gonçalves Schroder; VASCONCELOS, Bruno Marinho Coelho; PUJONI, Higor Pereira; NOGUEIRA, Mário Círio; DE OLIVEIRA, Valdeci Manoel; CHAOUBAH, Alfredo. Epidemiologia e custos do tratamento cirúrgico da displasia do desenvolvimento do quadril no Sistema Único de Saúde em uma década. Einstein (São Paulo), 2021; 19: 1-11.

TECKLIN, Jan Stephen. Fisioterapia pediátrica. 3. ed. Porto Alegre: Artmed, 2002.

VAQUERO-PICADO, Alfonso; GONZÁLEZ–MORÁN, Gaspar; GARAY, Enrique Gil; MORALEDA, Luis. Developmental dysplasia of the hip: update of management. EFORT Open Reviews, v. 4, n. 9, p. 548–556, set. 2019.

WYNNE-DAVIES, Ruth. Acetabular dysplasia and familial joint laxity: two etiological factors in congenital dislocation of the hip. Bone & Joint Journal, v. 52, n. 4, p. 704-716, 1970.

YAZAR, E, A; *et al*. Efeito das posições dos enxertos na estabilidade da artroplastia total de quadril com diferentes tipos de encurtamento subtrocantérico. Rev Bras Ortop, 2019; 54(4):465–470.

ZOMAR, Bryn O.; MULPURI, Kishore; SCHAEFFER, Emily K. Examining the Short-Term Natural History of Developmental Dysplasia of the Hip in Infancy: A Systematic Review. Indian Journal of Orthopaedics, v. 55, n. 6, p. 1372–1387, 13 set. 2021.