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Hip joint degeneration- not only an issue of the elderly

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Summary.

This study explores Legg-Calvé-Perthes Disease (LCPD), a condition in children characterized by ischemia of the femoral head, leading to hip pain and limping. It delves into the potential causes of LCPD, which remain unclear but are thought to be multifactorial. The study discusses the diagnostic process, emphasizing the importance of radiological imaging in identifying the disease's stages. The treatment strategies highlighted in the study focus on improving hip mobility and joint function through physiotherapy, activity restriction, and when necessary, surgical interventions. Risk factors and environmental influences are considered, along with prognosis indicators. Additionally, the study examines the clinical outcomes of LCPD treatment, and focuses on mental health impact of activity restrictions. The long-term outcomes often involve total hip arthroplasty, with many adults reporting high satisfaction post-surgery.

Keywords: Legg Calve Perthes Disease; Musculoskeletal Disease; Femur Head Necrosis; Osteoarthritis

Highlights.

- The cause of LCPD is multifactorial, with theories including repetitive microtrauma, skeletal retardation, and vascular insufficiency. Hyperactive children are more prone due to microtrauma.
- Initial symptoms are limping and hip pain during physical activity, with limited hip mobility. Diagnosis is based on radiological fingings, using classification systems like Waldenström, Catterall, and Herring to assess disease progression.

- The primary goals are enhancing mobility, minimizing mechanical strain, and maintaining joint congruence. Treatment includes physiotherapy, activity restriction, and surgical options like Salter's innominate osteotomy and femoral varus osteotomy.
- Prognosis is influenced by hip congruence at the end of growth, with factors such as age of diagnosis and extent of femoral head necrosis being critical.
- Most treatments yield satisfactory results. Impact of reduced physical activity on mental health is more significant in younger children (5-7 years), highlighting the need for tailored approaches to disease management.

Abstract.

Introduction: Legg-Calve-Perthes Disease (LCPD) is a condition characterized by ischemia of the proximal femoral epiphysis, leading to pain, limping, and potential hip joint deformities in children. Its etiology remains unclear, with theories implicating repetitive microtrauma, skeletal retardation, and vascular insufficiency. Diagnosis involves radiological assessment and classification systems to monitor disease progression, influencing treatment decisions and long-term outcomes.

Material and methods: This study summarizes existing literature and clinical data on LCPD, focusing on etiological theories, diagnostic methods, treatment strategies, risk factors, and prognostic indicators. Information was gathered from medical databases, peer-reviewed journals, and case studies to compile a comprehensive overview of the disease.

Aim of study: The aim was to gather current knowledge on LCPD, emphasizing diagnostic approaches, treatment modalities, and factors influencing clinical outcomes. Special attention was given to discussing the efficacy of various treatment options and identifying prognostic factors that impact the disease trajectory.

Conclusion: Effective management of LCPD hinges on early diagnosis, appropriate treatment selection, and careful monitoring of disease progression. Prognosis is influenced by factors such as age at diagnosis, extent of femoral head involvement, and maintenance of hip joint congruence. Further research is needed to refine treatment protocols and improve long-term outcomes for affected children.

The overview.

Legg-Calve-Perthes Disease (LCPD) is characterized by proximal femoral epiphysis ischemia, which causes limping on the leg and pain located in the thigh or knee, usually occurring after physical activity, as well as Trendelenburg's gait in advanced stages[1]. The cause of ischemia is

still unclear and is suspected to be multifactorial. The most postulated theory suggests a repetitive mechanical trauma that disrupts the blood supply to the femoral head. The incidence rate is varying between 0.4/100000 to 29.0/100000 in children below 15 years of age, with peak in children aged between 4 years and 8 years. It is more common in males with ratio of 5:1.[2, 3, 4, 5]

The etiology.

The etiology of LCPD is still unknown, and several theories have been concluded. Three of the most common are: repetitive microtrauma, skeletal retardation and vascular insufficiency.

Repetitive microtrauma leads to small fractures within the delicate structure of developing, immature femoral head, which is related to the fact that LCPD occurs more often in hyperactive children. The theory suggesting a vascular etiology indicates that the blood vessels supplying the femoral head are particularly vulnerable in the age group of patients with LCPD. Issues related to blood coagulation and abnormalities in blood supply may lead to necrosis of the femoral head. Most children with Perthes disease also exhibit delayed skeletal development.[6] In Perthes disease, persistent synovitis leads to edema of the cartilage, deterioration of its mechanical properties, hypermetabolism and hypertrophy.[7]

The diagnosis.

The first symptom that patients usually complain of is limping accompanied with pain in hip joint present during physical activity. In physical examination the mobility of the hip is limited in abduction and internal rotation, additionally there may be adduction contracture and collapsed epiphysis which can cause a difference in leg length.[3, 8]

Diagnosis is based on X-ray examination of the pelvis and hip in two planes, followed by classification according to the Waldenström scale, which includes four stages. Other scales have also been proposed to determine the degree of disease progression, such as Catterall's which assesses the extent of necrotic area, and Herring's which emphasizes height of the lateral pillar.[9] Contrast MRI without subtraction is sufficient to evaluate femoral head perfusion.[10] Arthrogram can be performed in order to plan treatment and decide whether patient needs surgery, it also reduces need for additional diagnostic tests.[11]

During initial/necrosis phase the femoral head becomes highly susceptible to external forces, because of blood supply deficiency and bone necrosis. During this phase the earliest radiological sign can be found, the Waldenstrom sign, which is characterized by increased joint space due to a subchondral fracture. Next comes a fragmentation phase initiated by osteoclastic

resorption of necrotic bone. The dense bone islets can be observed in radiological findings. In reossification stage osteoblasts deposit new bone along the outer perimeter towards center of the femoral head. Enlarged femoral head can be identified in x-ray scan. The final phase is when the necrotic bone is completely replaced. Newly formed bone adapts morphologically to the required shape; however the process can be disrupted and result in a deformed femoral head.[3, 4, 12]

One study shows that high platelet to lymphocyte ratio has diagnostic value in necrosis and fragmentation stage[13]

The treatment.

The primary treatment objectives involve enhancing mobility through physiotherapeutic exercise, minimizing mechanical strain, and maintaining proper joint congruence.[9] There is strong recommendation that in all stages patients should perform stretching exercises.[14] Therapeutic approach is determined based on the disease's radiological stage. Patients experiencing hip pain or stiffness are advised to rest for 5 to 7 days, and nonsteroidal anti-inflammatory drugs can help alleviate symptoms. If there's no improvement, bilateral skin traction with progressive adduction may be considered.[15]

Activity restriction and weighbearing is recommended to patients in initial stages of the disease, especially in losing hip motion, increasing pain, progression of hip deformity.[16]

Surgical approaches can target either the femoral or acetabular side, or both, but consensus on the most effective method remains uncertain.[17] In cases where mobility isn't restored and there is significant damage to the femoral head, alternative therapeutic options should be explored, such as surgical treatment. Most performed surgical procedures include Salter's innominate osteotomy and femoral varus osteotomy.[18, 19]The primary goal is to maintain congruence between the femoral head and pelvis. In children older than 8 years, shelf arthroplasty is recommended. Additionally, hip abduction-extension osteotomy is the main procedure for patients with active disease and painful hip abduction.[3, 6, 20]

Risk factors and prognosis.

One of the factors corresponding with the disease is ethnicity, with Caucasian having the higher risk.[21] The evidence suggests strong connection with environmental factors, in particular maternal smoking. [2, 22] It is suspected that large dosage of glucocorticoids may be a risk factor in developing LCPD, but further research is needed.[22] The long-term prognosis is determined by the congruence of the hip at the end of growth, affecting the likelihood of degenerative

changes and osteoarthritis in adulthood. Prognostic factors assessed during childhood focus on the shape of the femoral head and hip congruence, typically classified according to Stulberg's five stages, which predict the hip's long-term outcome. Mose's classification at 16 years old is also used, based on the femoral head's shape, with spherical heads having a good prognosis, spherical but crescent-shaped heads having a fair prognosis, and non-spherical heads having a poor prognosis.[1] There is a strong association of the following risk factors with radiographic outcomes: age over 6 at diagnosis, complete femoral head necrosis, low lateral pillar height, and femoral head cover under 80%. More risk factors lead to worse outcomes.[23]

The clinical outcome.

In most cases, treatment yields satisfactory results, and osteoarthritis rarely occurs before the age of 50.[19]

Surgical outcomes vary based on age and specific procedures. While Herring B and B/C hips show excellent results, Herring C hips have poorer outcomes. Patients aged 6 to 8 years tend to fare slightly better. Early intervention, disease severity, and preoperative range of motion are key factors in treatment effectiveness.[18]

The impact of reduced physical activity and weightbearing on mental health of patients has been discussed. In patients older than 8 years, no associations with depressive symptoms, anxiety or peer relationship have been identified.[16, 24] However in children aged 5 to 7 it was found that moderate restriction was linked with worse depressive symptoms and anxiety than the control group.[25, 26] Another crucial aspect is that children and their families reported positive experiences when actively participating in the decision-making process to select the most suitable treatment options.[27, 28]

According to a survey conducted on adult patients with a history of Perthes disease in childhood, total hip arthroplasty was the most used surgical treatment (reported by 22.1% of respondents), and approximately 48.6% of respondents anticipated future surgical intervention.[29]

Perthes disease is the second most common reason for total hip arthroplasty in young adults (<50 years old). Patients maintain high satisfaction level and function after surgery and Oxford Hip Scale is helpful in predicting these indicators.[30, 31]

Conclusions.

The exact cause of Legg-Calve-Perthes Disease (LCPD) remains unclear, with repetitive microtrauma, skeletal retardation, and vascular insufficiency being leading theories. Early

diagnosis, prompted by symptoms like limping and hip pain, is crucial and relies on radiological assessments such as X-rays and MRI, using classification systems like Waldenström and Herring. Ongoing research is needed to better understand the etiology, improve diagnostic methods, and refine treatments to enhance long-term outcomes for children with LCPD. This study highlights the importance of early diagnosis and tailored treatment, emphasizing the need for further research to optimize patient care and outcomes.

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