

# A POST-TREATMENT RETROSPECTIVE EVALUATION OF SLIPPED CAPITAL FEMORAL EPIPHYSIS

## AVALIAÇÃO PÓS-TRATAMENTO DE EPIFISIÓLISE PROXIMAL DO FÊMUR: ESTUDO RETROSPECTIVO

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### ABSTRACT

**Objective:** To analyze the cases of slipped capital femoral epiphysis (SCFE) submitted to surgery at the Pediatric Orthopedics Surgery service of the Hospital Risoleta Tolentino Neves (HRTN), Belo Horizonte/MG, between 2016 and 2019. **Methods:** Patients treated for SCFE at the HRTN between January/2016 and January/2019 participated in this study. The following data were collected: gender, age, affected side, procedure performed, and postoperative complications. **Results:** Twenty-one patients were treated at HRTN during the specified period. Among these, most were female (57%) with mean age of 12 years. At the initial diagnosis, about 80% of the patients presented with chronic/acute-on-chronic epiphysis. The left hip was slightly more affected than the right (6:5), with a bilateral rate of 47%, and avascular necrosis was the most frequent complication, occurring in 33% of cases. **Conclusion:** Slipped femoral capital epiphysis is associated with high morbidity; thus, early diagnosis, endocrine disorder investigation, and appropriate surgical treatment are key for improving these patients' clinical and functional outcome. **Level of Evidence II, Retrospective study.**

**Keywords:** Slipped Capital Femoral Epiphysis. Hip. Child.

### RESUMO

**Objetivo:** Analisar os casos de epifisiólise do fêmur proximal operados pelo serviço de Ortopedia Pediátrica do Hospital Risoleta Tolentino Neves (HRTN), Belo Horizonte/MG, entre os anos de 2016 e 2019. **Métodos:** Foram analisados retrospectivamente os pacientes submetidos a tratamento cirúrgico de epifisiólise no Hospital Risoleta Tolentino Neves entre janeiro/2016 a janeiro/2019. Os dados coletados para análise foram: sexo, idade, lado acometido, cirurgia realizada, complicações pós-operatórias. **Resultados:** De janeiro de 2016 a janeiro de 2019, foram tratados 21 pacientes no HRTN. Houve predomínio do sexo feminino (57%), com média de idade de 12 anos. Cerca de 80% dos pacientes apresentaram quadro de epifisiólise crônica/ crônica-agudizada no primodiagnóstico. O lado esquerdo foi ligeiramente mais acometido em relação ao direito (6:5), com bilateralidade de 47%. A necrose avascular foi a complicação mais frequente, em 33% dos casos. **Conclusão:** Trata-se de quadro de alta morbidade associada, devendo haver um diagnóstico precoce, investigação de distúrbios endócrinos e tratamento cirúrgico adequado, visando uma melhora do prognóstico clínico e funcional do paciente. **Nível de Evidência II, Estudo retrospectivo.**

**Descritores:** Escorregamento das Epífises Proximais do Fêmur. Quadril. Criança.

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### INTRODUCTION

Proximal femoral epiphysis, or slipped capital femoral epiphysis (SCFE), is an important disorder of adolescence and the most common cause of hip pain and dysfunction in this period of life. SCFE often develops during pubertal growth, being a topic of great interest in pediatric orthopedics. Among the several genetic, endocrine, and biomechanical risk factors for SCFE described in the literature, obesity and decrease in femoral anteversion are considered the most relevant.<sup>1</sup>

Proximal femoral epiphysis comprises a change in the normal anatomical relationship between the femoral head and neck, whereby the femoral neck deviates anterosuperiorly in relation to the femoral head at the level of the growth plate (physis). According to the literature,<sup>2</sup> SCFE affects mostly male patients (2:1 - 3:2) and the left hip. Bilaterality occurs in 20% to 40% of the cases, 50% of which presents symptoms and contralateral changes at the time of diagnosis. The incidence of SCFE in Brazil is 0.7-3.41 cases per 100,000 individuals, peaking among individuals aged from 11-15 years.<sup>3</sup>

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The study was conducted at Hospital Risoleta Tolentino Neves.

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Surgical treatment of SCFE seeks to stabilize the proximal femoral epiphysis in the femoral neck, preventing further slippage, reducing deformity, or even promoting physeal closure.<sup>2</sup>

Premature physeal closure, chondrolysis, avascular necrosis of the femoral head, femoroacetabular impingement, hip deformity, and premature coxarthrosis are the most common complications associated with the condition and its treatment.<sup>4</sup>

This study aims to analyze SCFE cases submitted to surgery at the Pediatric Orthopedics Surgery service of the Hospital Risoleta Tolentino Neves between 2016 and 2019 based on initial examination, surgical procedure, and clinical outcome.

## MATERIALS AND METHODS

This is a retrospective study conducted with patients treated for slipped capital femoral epiphysis at the Hospital Risoleta Tolentino Neves between January/2016 and January/2019. Data were collected from medical records, pre and postoperative radiographs, and hospital records on Orthotics, Prosthetics, and Special Materials (OPMEs). The following data were analyzed: gender, age at diagnosis, affected side, surgical procedure performed, postoperative complications, and functionality after one year.

## RESULTS

Twenty-one patients were treated for slipped capital femoral epiphysis (SCFE) at the Hospital Risoleta Tolentino Neves (HRTN) between January, 2016 and January, 2019. Among these, most were female (57%), 12 years as the mean age, and 80% presented with chronic/acute-on-chronic epiphysis at the initial diagnosis. The left hip was slightly more affected than the right (6:5), with a bilateral rate of 47% (Tables 1 and 2; Figure 1).

**Table 1.** Characteristics of patients who underwent surgical treatment (N; %).

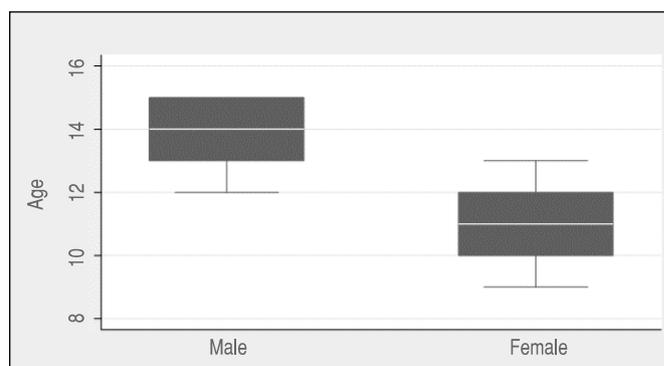
Variable	N	%
<b>Gender</b>		
Male	9	42.9
Female	12	57.1
<b>Age</b>		
9 years old	1	4.8
10 years old	3	14.3
11 years old	3	14.3
12 years old	6	28.6
13 years old	3	14.3
14 years old	2	9.5
15 years old	3	14.3
<b>Mean age</b>	12	
<b>Laterality</b>		
Right side	5	23.8
Left side	6	28.6
Bilateral	10	47.6
<b>Clinical classification</b>		
Acute	3	14.3
Chronic	12	57.1
Acute-on-chronic	6	28.5
<b>Interventions</b>		
Cannulated screw fixation	15	71.4
Contralateral prophylactic fixation	4	19.0
Modified Dunn procedure	7	33.3
<b>Outcome</b>		
Avascular necrosis of the femoral head	7	33.3
Femoral neck fracture	1	4.8
Cam-type femoroacetabular impingement	1	4.8

**Table 2.** Patient's age by gender and for the general population.

Statistics	Male	Female	General
Mean (SD)	13.7 (1.2)	11.1 (1.2)	12.2 (1.7)
Median (IQR)	14 (2)	11 (2)	12 (2)
Min; Max	12; 15	9; 13	9; 15

Note: significant age differences between genders (mean and median).  $p < 0.001$ ; SD: standard deviation; IQR: interquartile range.

One year after surgery, patients presented a slight decrease in internal rotation (less than 10 degrees in relation to the contralateral limb), but without functional impairment, being able to return to daily recreational activities.



**Figure 1.** Boxplot representing age distribution by gender.

Avascular necrosis of the femoral head (ANFH) was the most common complication, occurring in 33% of the cases, followed by femoroacetabular impingement and femoral neck fracture. One patient evolved with ANFH and substantial limitations in hip flexion and internal rotation, thus being a potential candidate for total hip arthroplasty in the future.

## DISCUSSION

The clinical presentation of epiphysis is often nonspecific, but patients affected by the condition often present claudication and poorly localized pain in the hip, thigh, and knee. In total, 15% of cases include knee pain.<sup>5</sup> Slipped capital femoral epiphysis (SCFE) is classified using the Loder classification, which assesses stability and functional status based on patients' weight-bearing tolerance with or without the aid of crutches. Fahey and O'Brien propose yet another classification system, whereby SCFE is classified according with symptoms onset and duration: when symptoms started less than three weeks prior to diagnosis, the condition is considered acute; when symptoms appeared and persisted for more than 3 weeks, it is considered chronic; and when chronic symptoms get worse, it is considered acute-on-chronic.<sup>6</sup>

About 85% of the analyzed patients presented with a chronic or acute-on-chronic condition at the time of surgery, which may be associated with delay in diagnosis and referral to a specialized service. The mean age was higher among male patients (12 years) than among female patients (11.2 years), which is consistent with literature data. Approximately 25% of the cases showed bilaterality, ranging from 8 to 50%.<sup>7</sup>

Surgical treatment options included *in situ* cannulated screw fixation, proximal femoral osteotomies (subcapital, base of the femoral neck, or intertrochanteric), and prophylactic fixation.

Whereas *in situ* fixation is indicated for mild and stable slips, more severe epiphyseal slips require osteotomies to restore hip anatomy and reduce the risk of avascular necrosis of the femoral head.

Subcapital osteotomies (modified Dunn) have been shown to provide good clinical and radiographic outcomes for treating severe and unstable slips when compared to *in situ* fixation.<sup>8</sup>

In turn, prophylactic fixation of a clinical and radiographically normal hip is indicated for patients who are underage, obese, presenting with endocrinopathies, and for those whose follow-up is considered difficult. The ongoing debate on routine prophylactic contralateral fixation has pointed to tendencies for increasing this practice, as the morbidity and complication rates associated with the procedure are lower in relation to the development of contralateral disease.<sup>9</sup>

In a long-term study conducted by Hägglund, 25% of the patients who did not undergo prophylactic fixation developed contralateral hip osteoarthritis.<sup>10</sup> In our study, 19% of the patients underwent prophylactic fixation, showing good postoperative clinical evolution after one year. Avascular necrosis was the most common complication found in our study sample, which may be explained by the late diagnosis,

especially when considering the significant relationship between epiphyseal slips severity and delay in diagnosis delay.<sup>2</sup>

## CONCLUSION

Our results show that epiphysis is a common hip pathology in children and adolescents, and late diagnosis may impact the treatment, morbidity, and prognosis of these patients. Thus, health professionals, especially those in primary care, must be attentive to children and adolescents with hip or knee pain, promptly referring them for a pediatric orthopedist for an appropriate surgical treatment. Due to being a condition that implies high morbidity, epiphyseal slips must be surgically stabilized in patients presenting clinical and laboratory conditions for the procedure.

Physicians, pediatricians, and orthopedists must also be aware of possible associated endocrine disorders such as hypothyroidism and renal failure, investigating them at the time of diagnosis, especially in patients with early involvement.

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