

MANAGEMENT OF SLIPPED CAPITAL FEMORAL EPIPHYSIS: ROLE OF IN-SITU PINNING USING CANCELLOUS SCREW IN A TERTIARY CARE CENTRE IN SOUTHERN INDIA

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Received : 25/08/2023
Received in revised form : 22/09/2023
Accepted : 04/10/2023

Keywords:

Slipped capital femoral epiphysis, pinning in-situ, surgical hip dislocation, cancellous screw.

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DOI: 10.47009/jamp.2023.5.5.211

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (5); 1084-1087



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Abstract

Background: Slipped capital femoral epiphysis (SCFE) is among the most common hip pathologies observed in in pre-teenagers and adolescents. The main objective in the management of SCFE is to stop additional slippage. **Materials and Methods:** This study was conducted in Department of Orthopaedics, Government Villupuram medical college, from May 2019 to April 2022. During this period 18 cases of Slipped capital femoral epiphysis were studied. Clinical outcome assessment was done by Merle d' Aubigne - Postel score. **Results:** We observed were adolescent males, the mean age at presentation was 13.1 ± 1.2 years. Majority of the children had increased body mass index. Chondrolysis was observed in 1 patient. After 1 year follow up no patient had developed SCFE on opposite side. Majority of the patients had excellent and good results. **Conclusion:** The findings from the present study indicate that in situ pinning of slipped capital femoral epiphysis with partly threaded cancellous screw is a feasible and safe technique with few peroperative and postoperative complications.

INTRODUCTION

Slipped capital femoral epiphysis (SCFE) is among the most common hip pathologies observed in in pre-teenagers and adolescents (approximately 10.8/100,000). It happens when there is an aberrant posterior and inferior displacement of the femoral epiphysis in relation to the femoral head and neck. The majority of SCFE cases are idiopathic. The common associated causes include history of trauma, endocrine disorders like hypothyroidism, hyperthyroidism, pan hypopituitarism, and growth hormone deficiency. Other conditions like renal disorders, and Down syndrome have also been reported to be associated with the incidence of SCFE. Obesity is the single biggest risk factor for SCFE. Male gender, periods of rapid growth, past radiation therapy to the hip, retroversion of the acetabulum or femoral head, which all enhance mechanical shear stresses across the physis, are additional risk factors.^[1-4]

The main objective in the management of SCFE is to stop additional slippage. The possibility of iatrogenic avascular necrosis should be considered in every situation. In situ fixation is the gold standard for treating moderate forms, whether they are stable or

unstable. One of the primary methods for the treatment of SCFE is in-situ screw fixation.^[5-8] We present clinical and radiographic results of an in-situ fixation of the femoral head with partially threaded cancellous screw in order to facilitate further growth of the femoral neck. The criteria for successful in-situ screw fixation are that the screw should be placed in the center of the epiphysis, preferably perpendicular to the physis without penetrating the joint.

MATERIALS AND METHODS

This study was conducted in Department of Orthopaedics, Government Villupuram medical college, from May 2019 to April 2022. During this period 18 cases of Slipped capital femoral epiphysis were studied. The AP and frog-leg lateral radiographs of 18 consecutive hips which underwent either in-situ fixation for the slip (18 hips) or prophylactic screw fixation of the contralateral hip (6 hips) were taken for this study. We analysed the post-operative radiographs of 18 hips for the accuracy after six weeks of placement of screws by this technique. Clinical outcome assessment was done by Merle d' Aubigne - Postel score.^[9] Radiological evidence of AVN was recorded if there was collapse or sclerosis

of the femoral head. Chondrolysis was diagnosed if there was loss of 50% of the joint space or the joint space was less than 3 mm in patients with bilateral SCFE.^[10-11]

Initial assessment – Pre-op

After obtaining informed consent and assent, a detailed history about socio-demographic characteristics, mode of injury and initial treatment was obtained from parents and children.

Intra-op

The severity of slip was evaluated using the frog-leg lateral and anterior-posterior (AP) perspectives. Based on the degree of slip, the starting point and trajectory of the screw in the AP and frog-leg lateral views are chosen. On the radiolucent table, the patient was lying flat. To obtain an AP image of the hip joint, the image intensifier was fixed on the opposing side.

The preferred entry point is 0.5 to 1 cm below the trochanteric apophysis on the AP projection. The entry on the lateral projection was based on the severity of the slip. Entry was made with 4.5 mm solid drill in the AP plane under image intensifier. The correct length 6.5 mm cannulated cancellous screw was advanced over the guide wire upon achieving the desired trajectory.^[12]

Post-op

The participants were mobilized with crutches and partially weight-bearing for 4–6 weeks. After the aforementioned post-op duration there were no restrictions. Six of the children had prophylactic pinning of the contralateral hip.

Outcome Assessment

The long term outcomes were assessed based on the clinical and radiographic findings after physal closure. The radiographic examination at the final follow-up included 2 supine views namely, Antero-posterior (AP) and Frog-leg view

Radiographic outcomes were Slip progression of more than 10° (Southwick's lateral epiphyseal-shaft angle), Signs of avascular necrosis, Leg length discrepancy (superior margins of the greater trochanter to the superior margins of the femoral head), Longitudinal growth of the femoral neck and presence for evidence of a chondrolysis.^[13]

RESULTS

During the period from May 2019 to April 2022 a total of 24 radiographs of hips were studied. The study included 18 participants among whom prophylactic screw fixation of the contralateral hip (6 hips) were taken up for this study. We observed that 10 children were male (55.5%) while 8 (44.5%) children were female. The mean age at presentation among male children was 13.1± 1.2 years while the mean age of presentation among female children was 11.5±0.5years. Among the study participants 1 child was underweight (<18.5 kg/m²), while 6 children were normal (18.5-24.99 kg/m²). We observed that 9 children were overweight (25-29.99 kg/m²) and 2 children were obese (30-34.99 kg/m²).

Majority of the cases were right sided 11 (61.1%) and 7 were left sided (38.9%). Eighteen patients underwent in situ pinning, six of these patients also underwent prophylactic pinning of the opposite hip. The indications for prophylactic pinning was obesity and decreased age.

Among the study participants the SCFE was acute in 5 patients, while it was acute on chronic among 8 patients. In 5 patients the presentation was chronic. For 10 subjects who had unilateral surgery without any signs or suggestions of contralateral involvement, movement in the operated hip was compared to that in the normal hip. A mean reduction of 5° (SD = 11) in internal rotation and a mean increase of 9° (SD = 9) in external rotation was found for the operated hip. These were not statistically significant. The mean difference in ATD between the operated hip and the contralateral hip for subjects operated unilaterally was 7.3 (0–17) mm. Chondrolysis was observed in 1 patient. After 1 year follow up no patient had developed SCFE on opposite side. Based on Merle d' Aubigne- Postel score, 3 patient had excellent, 10 had good results. Among the study participants fair and poor outcomes were observed in 4 and 1 participants respectively.



Photograph Template 1 - Unilateral Fixation



**Photograph Template 2 – Unilateral slip
Bilateral Fixation**

Table 1: Characteristics of the study population

Variable	Mean	SD
Age at presentation(in years)		
Male	13.1	1.2
Female	11.5	0.5
Variable	Frequency (n=18)	Percentage
Gender		
Male	10	55.5
Female	8	44.5
Side		
Right side	11	61.1
Left side	7	38.9
Body Mass Index		
Underweight	1	5.6
Normal	6	33.3
Overweight	9	50
Obesity	2	11.1
Complications		
Chondrolysis	1	5.5

Table 2: Duration for fracture union and fixator removal

Variable	Male (n=10)	Female (n=8)
Type of slip		
Acute	3	2
Acute on chronic	5	3
Chronic	2	3
Pinning done		
Type of slip	Same side	Contralateral
Acute	5	5
Acute on chronic	8	0
Chronic	5	0

Table 3: Functional outcome of the study participants

Variable	In situ pinning (n=18)
Excellent	3
Good	10
Fair	4
Poor	1

DISCUSSION

The present study was undertaken to assess the role of In-situ pinning using cancellous screw in the management of slipped capital femoral epiphysis. There is a wide range of appearances and symptoms among SCFE patients. Most commonly it is observed among obese, hypogonadal child in the adolescent

age group. In most cases the endocrinopathies are not present.^[14]

In our study we observed that majority of the patients were male and the mean age at presentation was 13.1 ± 1.2 years. Arora et al,^[15] in their study have also reported similar findings. Studies conducted by Loder et al,^[16] and Mulgrew et al,^[17] have also reported that SCFE was more common among the adolescent age group. We also observed an increased

male predominance in the incidence of SCFE, similar findings were reported in various studies, and the increased male predominance has been attributed to the increased active nature of the male child.

In the present study we have reported that majority of the children had increased body mass index. A similar significant association between obesity and slippage of capital femoral epiphysis has been reported by Arora et al.^[15] They have reported that more than 50% of the study participants in their study were overweight. In a study conducted by Murray et al,¹⁸ documented that the increasing body mass index was found to be significantly associated with increasing in incidence of SCFE.

Studies conducted by Carney et al,^[19] Aronson et al,^[20] Denton et al,^[21] have reported that the incidence of Slip progression was high among patients treated with single screw. Segal et al,^[22] had documented that double screw fixation is provided torsional stability in non-reduced slips than a single screw in artificially created slips in bovine femurs. Seller et al,^[23] in their study had assessed the role of multiple Kirchner wires to fixate the femoral head. Carney et al,^[24] have reported that 20% suffered a slip progression of 10° or more when operated with a single cannulated screw.

Avascular necrosis (AVN) of the femoral head is a severe surgical complication. Carey et al,^[25] in two different studies have documented that avascular necrosis was more prevalent among patients with severe slips. They also found a positive association between AVN and penetration of a pin into the joint. No case of AVN found in our study. Chondrolysis or cartilage necrosis can develop in slips that are left untreated, but they are frequently accompanied by immobilisation in a spica cast or penetration of the internal fixation screws into the joint area. Arora et al,^[15] in their reported that the incidence of chondrolysis was less than 4%, in our study we observed chondrolysis in one patient. In the present study the outcome of the patient's condition was assessed using Merle d' Aubigne- Postel score. We found that majority of the patients had excellent and good results. Arora et al,^[15] in their study have also reported similar findings.

CONCLUSION

The findings from the present study indicate that in situ pinning of slipped capital femoral epiphysis with partly threaded cancellous screw is a feasible and safe technique with few perioperative and postoperative complications, and with good clinical and radiographic long-term outcome. None of the operated hips had a slip progression of more than 10°.

Conflict of interest: None declared

Source of funding: None.

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