

CASE REPORT

Management of Slipped Capital Femoral Epiphysis (SCFE) on Top of Fixed Fracture Neck of Femur (Case Report)

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Abstract

The incidence of Slipped capital femoral epiphysis (SCFE) after management of femoral neck fracture in pediatrics is very rare. In this case report, a nine-year-old female child sustained left sided femur neck fracture after a motor car accident. The fracture was fixed by two cannulated screws and healing with mild varus occurred after six weeks. However, progressive slippage of femoral epiphysis was observed. This was treated by subtrochanteric valgus osteotomy and fixed by tension band and Wagner technique. Better radiological and functional outcomes were obtained at the short term follow up.

Level of evidence: V

Keywords: Coxa vara, Fracture neck of femur, SCFE, Slipped capital femoral epiphysis, Valgus osteotomy, Wagner technique

Introduction

Pediatric femoral neck fracture is a relatively rare injury which is usually resulted from high energy trauma. Complication rate is high in spite of proper diagnosis and management.¹ The complications include avascular necrosis (AVN), nonunion, coxa vara and premature physeal closure. Slipped capital femoral epiphysis (SCFE) is considered one of the rarest complications after fracture management.² Perfect anatomical reduction and stable fixation of the fracture helps to decrease the risk of SCFE. Delayed diagnosis leads to more slippage, deformity and worse prognosis.³ This case report shows how to deal with SCFE to achieve a good result.

Case Presentation

A nine-year-old female child presented with left sided femur neck fracture after a motorbike accident. The fracture was type III Delbet classification. Open reduction and internal fixation with 4.5 mm cannulated screws was done without hip spica. The fracture healed in mild varus after six weeks. She was allowed to do partial weight bearing. Three months postoperative, she started to complain of pain and

limping in the operated hip. Examination revealed decreased hip movements with an external rotation deformity. The radiographs showed progressive femoral epiphysis slippage (SCFE). At four months, the hip developed moderate Southwick slip angle and grade II slippage percentage. Lab investigations including complete blood count (CBC), erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) were done to exclude infection with normal parameters obtained. Also, hormonal profile and vitamin D level were normal. Screws removal and subtrochanteric valgus osteotomy were done to convert shearing force at slippage site into compression force. Fixation was done by Wagner technique where three two mm-thick smooth k wires were crossing femoral head physis for good purchase and the least possible violation to it. Tension band combination was added to hold greater trochanter (GT) to medial femoral shaft below osteotomy site. No hip spica was applied and weight bearing was allowed after six weeks with physiotherapy to strengthen hip muscles for one month.

After two years of follow up, the patient showed good union of osteotomy, correction of SCFE, no avascular necrosis (AVN), excellent hip function according to modified

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McKay's criteria and hip range of motion at last visit was as the following: extension 15°, flexion 120°, Abduction 50°, adduction 30°, external rotation 40° and internal rotation 40°. No obvious limb length discrepancy nor limping were noticed. Only mild discomfort from k wires underlying the skin was encountered. Final wires had not been removed yet. See [Figure 1-5].



Figure 1. Preoperative X rays anteroposterior and lateral views showing Left sided Delbet type III fracture NOF



Figure 2. Six weeks after two 4.5 mm cannulated screws fixation showing varus partial union of NOF fracture



Figure 3. Three months postoperative anteroposterior and lateral views showing union of NOF fracture in varus position with slippage of femoral physis

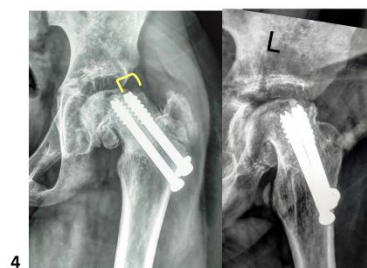


Figure 4. Four months postoperative anteroposterior and lateral views showing progression of slippage of femoral physis into moderate Southwick slip angle and grade II slippage percentage



Figure 5. Two years follow up anteroposterior and lateral views after subtrochanteric valgus osteotomy and fixation of femoral physis by Wagner technique & GT by tension band. Notice correction of SCFE, horizontal femoral physis, good union of subtrochanteric osteotomy, GT descent distally and no signs of avascular necrosis (AVN)

Discussion

Neck of femur fracture (NOF) in children is an uncommon injury which usually occurs from high energy trauma. Many complications could happen after surgical management of this fracture. One of the rarely reported complications in literature is SCFE. Sometimes, the diagnosis is delayed which leads to progressive slippage and further deformity. Suggested risk factors includes implant irritation, early return to weight bearing, delayed union or nonunion, coxa vara, and avascular necrosis.^{2,4-6}

Jung et al. 2012⁷ reported a child boy presented with femoral neck fracture, which managed with open reduction and internal fixation with cannulated screw (CS). Fifteen months postoperative, coxa vara developed and epiphyseal slippage was noted. Varus correction was corrected by subtrochanteric valgus osteotomy and fixed by condylar blade plate. SCFE was fixed by (CS).

Gopinathan et al. 2012⁸ had a rare case of ten years old male with bilateral femoral neck fractures due to fall from height. Bilateral percutaneous cannulated screws were inserted. While the right side had fully united at end of three months, the left side had nonunion and SCFE five months after surgery. Graft by non-vascularized fibula and a single physis-

crossing screw was inserted for SCFE. Finally, the patient reached good union and function after 18 months.

Chinoy MA et al. 2020³ reported a five-year-old male who developed severe SCFE and coxa vara seven months after closed reduction of NOF. They did in situ pinning with one screw. However, in their case the SCFE slippage is not fully corrected with a broken guide wire during trial of screw pinning.

As infection and hormonal parameters in this case were normal, so mechanical instability and shearing forces at the physis are suggested to be the cause of SCFE. The fracture was fixed by two cannulated screws in varus position. The primary surgeon did not cross the physis for sake of growth preservation but the short working distance of screws could not withstand the stresses at both fracture site and femoral physis. Not applying hip spica and early weight bearing may also contributed to slippage.

The method used in this case report by Wagner technique and tension band combination after subtrochanteric valgus osteotomy reverses the shearing force into compressive force to prevent slippage of femoral physis. It also lowers down greater trochanter where hip abductors are inserted which improves the trendelenburg gait. Crossing the femoral physis by k wires and the tension band fixing the greater trochanter ensure stable fixation to withstand stresses till valgus osteotomy union. Using smooth k wires helps to decrease physeal violation to a minimum. Using long k wires and wrapping them to femoral shaft by two cerclages gives good implant stability and a cumbersome hip spica is not

necessary.

Further study with more cases recruitment is suggested to use Wagner technique in treatment not only in cases of SCFE after fracture neck femur fixation but also in primary fixation of fracture neck of femur.

Conclusion

Slipped capital femoral epiphysis (SCFE) after treatment of femoral neck fracture in children is a rare sequela that needs to be early recognized and treated. The onset of SCFE may show inadequate reduction or fixation of the fracture. Anatomic reduction and stable internal fixation for femoral neck fracture with sufficient and stable method of fixation provides best outcomes. Postoperative care and delayed weight bearing are also equally important to avoid complications. Wagner technique contributes to better results in cases of SCFE after neck of femur fracture.

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References

1. Yerli M, Ocak O, Yüce A, et al. Retrospective analysis of 35 pediatric femoral neck fractures. *Eur J Orthop Surg Traumatol.* 2022; 32(7):1385-1390. doi: 10.1007/s00590-021-03126-6.
2. Li H, Zhao L, Huang L, Kuo KN. Delayed slipped capital femoral epiphysis after treatment of femoral neck fracture in children. *Clin Orthop Relat Res.* 2015; 473:2712-2717. doi: 10.1007/s11999-014-4067-y.
3. Chinoy MA, Pal S, Khan MA. Slipped capital femoral epiphysis after treatment of femoral neck fracture. *Pak J Med Sci.* 2020; 36(1):S94-s97. doi:10.12669/pjms.36.ICON-Suppl.1725.
4. Xin P, Li Z, Pei S, Shi Q, Xiao L. The incidence and risk factors for femoral head necrosis after femoral neck fracture in pediatric patients: a systematic review and meta-analysis. *J Orthop Surg Res.* 2023; 18(1):22. doi: 10.1186/s13018-023-03502-4.
5. Chaudhary S, Garg V, Mishra D, et al. Risk Factors for Avascular Necrosis of the Femoral Head in Pediatric Femoral Neck Fractures. *Cureus.* 2021; 13(7):e16776. doi:10.7759/cureus.16776.
6. Dai ZZ, Zhang ZQ, Ding J, et al. Analysis of risk factors for complications after femoral neck fracture in pediatric patients. *J Orthop Surg Res.* 2020; 15(1):58. doi: 10.1186/s13018-020-01587-9.
7. Jung ST, Park GH. Slipped capital femoral epiphysis following fracture of the femoral neck: a case report. *J Pediatr Orthop B.* 2012; 21(6):579-82. doi:10.1097/BPB.0b013e328354afcf.
8. Gopinathan NR, Chouhan D, Akkina N, Behera P. Case report: Bilateral femoral neck fractures in a child and a rare complication of slipped capital epiphysis after internal fixation. *Clin Orthop Relat Res.* 2012; 470(10):2941-5. doi: 10.1007/s11999-012-2458-5.