WebLog Journal of Orthopaedics

Case Report
Published: 10 Nov, 2025

A Case of Intertrochanteric Valgus Osteotomy for Delayed Presentation of the Paediatric Post-Traumatic Coxa Vara After Neck of Femur Fracture

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Abstract

Background: Coxa vara in children is a rare but functionally disabling complication following femoral neck fractures, often arising from malunion or growth disturbances. Correction requires addressing both mechanical alignment and physeal orientation to prevent recurrence. This report highlights a successful intertrochanteric valgus osteotomy using a proximal femoral locking plate in a young child with post-traumatic coxa vara.

Case Presentation: A 4-year-old girl presented with limping and right hip pain two months after a fall. Radiographs revealed a neck-shaft angle of 80° on the affected side, confirming coxa vara secondary to malunited femoral neck fracture. Intertrochanteric valgus osteotomy with proximal femoral plate fixation was performed. Postoperative radiographs showed improvement of the neck-shaft angle to 110°, limb lengthening by 1 cm, and correction of deformity without rotation malalignment. Early quadriceps exercises and partial weight-bearing were initiated postoperatively. The plate was removed at 9 months following radiologic union. At one-year follow-up, the child exhibited a normal gait, pain-free hip motion, and stable correction, though the Hilgenreiner–epiphyseal angle (HEA) remained mildly elevated (~45°).

Conclusion: Intertrochanteric valgus osteotomy with proximal femoral plate fixation offers a safe, reproducible, and effective correction for pediatric post-traumatic coxa vara. However, long-term surveillance until skeletal maturity is essential to monitor recurrence due to persistent physeal malorientation. This case emphasizes the importance of addressing both the neck-shaft angle and HEA for durable correction in growing children.

Keywords: Coxa Vara; Valgus Osteotomy; Proximal Femoral Plate; Pediatric Hip Fracture; Hilgenreiner–Epiphyseal Angle

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Received Date: *31 Oct 2025*
Accepted Date: *08 Nov 2025*
Published Date: *10 Nov 2025*

Citation:

Agrawal AC, Gaurav P, Sakale HS. A Case of Intertrochanteric Valgus Osteotomy for Delayed Presentation of the Paediatric Post-Traumatic Coxa Vara After Neck of Femur Fracture. WebLog J Orthop. wjor.2025.k1001. https://doi.org/10.5281/zenodo.17655767

Introduction

Coxa vara, defined as a reduction of the femoral neck–shaft angle to less than 110°, is a challenging deformity that can develop following pediatric femoral neck fractures. This condition leads to limb-length discrepancy, hip abductor weakness, and altered gait mechanics, significantly affecting a child's functional development and quality of life [1, 2].

The etiology of pediatric coxa vara includes congenital, developmental, and post-traumatic causes. Post-traumatic coxa vara commonly results from malunion or nonunion after inadequately treated femoral neck fractures [3]. In growing children, abnormal physeal orientation—measured as an increased Hilgenreiner–epiphyseal angle (HEA)—predisposes to progressive varus deformity despite initial correction [4].

Various osteotomy techniques have been described, including subtrochanteric and intertrochanteric valgus osteotomies. Each aims to restore the mechanical axis, correct varus alignment, and normalize the physis orientation [5, 6]. However, challenges remain in choosing an approach that balances adequate correction with low risk of growth disturbance.

We present a case of delayed post-traumatic coxa vara in a 4-year-old child successfully treated with intertrochanteric valgus osteotomy using a proximal femoral locking plate. This report

discusses the surgical technique, postoperative outcome, and the biomechanical rationale for selecting this approach in the pediatric population.

Case Presentation

Clinical History

A 4-year-old female child presented to the orthopedic outpatient clinic with complaints of limping and pain in the right hip for two months. The symptoms followed a trivial fall from bed. The child had been walking independently before the injury. There was no history of head injury, seizure, or other systemic trauma.

Clinical examination revealed tenderness over the right hip, restricted abduction, and a positive Trendelenburg sign. True limb shortening of approximately 2 cm was noted. The gait was antalgic with compensatory pelvic tilt.

Radiological Findings

Anteroposterior (AP) pelvic radiographs with both hips (Figure 1) showed a malunited fracture of the right femoral neck with a decreased neck-shaft angle of 80°, consistent with coxa vara. The contralateral limb had a normal neck-shaft angle of 130°. The measured α-angle difference was approximately 50°. No evidence of avascular necrosis or physeal disruption was observed.

The neck–shaft angle was measured with an X-ray; the angle between the normal and the affected limb was calculated and termed the **α** angle.

Further, the patient was subjected to all blood investigations for pre anaesthetic checkup.

Surgical Technique

Under general anesthesia, the patient was positioned supine on a radiolucent table. The right lower limb was draped, and C-arm fluoroscopy was used throughout the procedure for guidance.

Figure 1: Shows an X-ray Pelvis with both hips with a right side neck of femur fracture in an immature pelvis.

Figure 2: Showing preoperative X-ray of the pelvis with both hip joints to measure the neck shaft angle on both sides, A= Normal side, B= affected side; A-B= α.

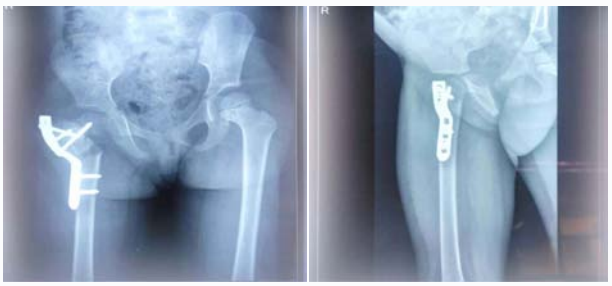

Figure 3: Post-operative X-ray of Pelvis with both hips AP and X-ray of Right hip with thigh lateral views showing Medial Opening wedge Osteotomy and Lateral plating of Proximal Femur.

A longitudinal 5 cm incision was made over the lateral aspect of the proximal femur. The fascia lata was incised, and the vastus lateralis was retracted anteriorly to expose the intertrochanteric region. Under fluoroscopic guidance, a 2 mm Kirschner wire was inserted into the femoral head to serve as a guide for the proximal femoral plate (Figure 2).

A wedge-shaped bone segment corresponding to the α-angle difference was excised at the level of the lesser trochanter to achieve valgus realignment. The distal fragment was abducted to close the osteotomy gap medially. The correction was confirmed under fluoroscopy, ensuring the patella was in a neutral position to prevent internal rotation deformity.

A proximal femoral locking plate was positioned along the lateral cortex and fixed using appropriate-length cortical and locking screws. After confirming alignment, the wound was closed in layers over a negative suction drain (Figure 3).

The total surgical duration was 70 minutes, with an estimated blood loss of 250 mL.

Postoperative Care and Follow-Up

Static quadriceps exercises were initiated on the day of surgery. The drain was removed after 48 hours, and gentle passive hip and knee mobilization began thereafter.

Partial weight-bearing was permitted after 6 weeks, progressing to full weight-bearing upon radiographic evidence of osteotomy union at approximately 12 weeks. Serial radiographs demonstrated progressive callus formation and remodeling at the osteotomy site.

At the 9-month follow-up, the patient exhibited a symmetrical

Figure 4: Showing X-rays of the Pelvis with both hips AP and X-ray Right Hip lateral views after removal of the Plate.

Figure 5: Showing Patient squatting and standing comfortably postoperatively after plate removal.

gait with improved hip abduction and no residual pain. Radiographs showed complete union and a corrected neck–shaft angle of 110°, representing a 30° improvement (Figure 4). The limb-length discrepancy was reduced to 1 cm.

Plate removal was performed uneventfully at 9 months post-surgery. At the 1-year follow-up, the patient demonstrated full squatting and sitting cross-legged without difficulty (Figure 5) (Table 1).

Discussion

Coxa vara following pediatric femoral neck fracture presents a unique management challenge due to the interplay between mechanical alignment and growth plate orientation. The aim of surgical correction is to restore both the **neck–shaft angle** and the **Hilgenreiner–epiphyseal angle (HEA)** to prevent recurrence [7-9].

In this case, intertrochanteric valgus osteotomy with proximal femoral plate fixation provided satisfactory correction of the mechanical deformity and functional restoration. The child regained near-normal gait, with significant improvement in hip abduction and resolution of limb-length discrepancy.

Comparison with Conventional Techniques

Traditional subtrochanteric valgus osteotomies, often stabilized using dynamic hip screws or blade plates, are widely employed in adults but have limitations in children due to smaller bone size and growth potential [10, 11]. The intertrochanteric approach, as used in our case, offers advantages of simpler exposure, proximity to the deformity, and reduced risk to the physis.

Proximal femoral locking plates provide superior angular stability in small bones compared to conventional implants, eliminating the need for intramedullary guidance [12]. Our method allowed controlled correction of approximately 30°, with immediate structural stability and no need for bone grafting.

Role of Hilgenreiner–Epiphyseal Angle (HEA)

The HEA serves as a critical predictor for recurrence. Srisaarn et al. and Weinstein et al. reported that postoperative HEA values >38° significantly increase the risk of recurrent varus deformity [13, 14]. In our patient, although the mechanical axis was corrected, the HEA remained elevated (~45°), necessitating continued long-term follow-up.

Table 1: Comparison with Conventional Techniques.

Parameter	Traditional Valgus Osteotomy	Modified Pediatric Approach
Osteotomy Level	Subtrochanteric	Intertrochanteric
Implant	DHS or blade plate	Proximal femoral locking plate
Correction Goal	Neck-shaft angle	Neck-shaft + HEA (physeal horizontalization)
Physis Orientation	Not typically considered	Critical for recurrence prevention
Imaging	Standard AP pelvis	C-arm with intraoperative correction confirmation
Indications	Mostly adult or healed fractures	Pediatric post-traumatic coxa vara

Persistence of vertical physis orientation post-correction may lead to gradual recurrence as the child grows. Therefore, successful management must focus not only on achieving angular correction but also on restoring normal physeal alignment.

Biomechanical Considerations

Valgus osteotomy redistributes the compressive forces across the femoral neck, converting shearing stresses into compressive ones, thereby promoting union and reducing risk of varus relapse [15]. The technique also helps lengthen the limb, which is particularly beneficial in cases with preoperative shortening. In our patient, limb-length discrepancy improved from 2 cm to 1 cm postoperatively.

Review of Literature

Vidyadhara et al. [16] reported valgus osteotomy with dynamic hip screw fixation in seven adults with coxa vara secondary to fracture nonunion, achieving similar angular corrections. However, pediatric applications require implants adapted to smaller anatomy and open physes. El-Sobky et al. 1[7] advocated for subtrochanteric osteotomy in children but highlighted the need for careful growth plate preservation.

Recent advances in pediatric orthopaedic instrumentation, including low-profile locking plates, have expanded the feasibility of intertrochanteric approaches even in younger children [18]. These implants provide reliable fixation without compromising bone biology.

Long-Term Considerations

While short-term results were excellent in our case, pediatric patients require long-term surveillance until skeletal maturity to detect any recurrent deformity or physeal arrest. Remodeling potential during growth can alter correction outcomes over time. Beals et al. [19] emphasized that follow-up until epiphyseal closure is essential for determining true durability of surgical correction.

Limitations

This report presents a single case with short-term follow-up. Although clinical and radiological outcomes were satisfactory, the mildly elevated HEA suggests potential for recurrence. Lack of intraoperative step-by-step photographs limits reproducibility for educational purposes. Future studies involving larger pediatric cohorts and long-term outcomes are warranted.

Conclusion

Pediatric post-traumatic coxa vara represents a complex deformity requiring a balance between mechanical correction and biological preservation. Intertrochanteric valgus osteotomy using a

proximal femoral locking plate provides an effective and reproducible technique for achieving angular correction and functional restoration in children.

However, normalization of both **neck–shaft angle** and **Hilgenreiner–epiphyseal angle** is critical for preventing recurrence during growth. Long-term follow-up until skeletal maturity remains imperative. Continued research into pediatric-specific osteotomy strategies and implant optimization will further enhance outcomes for this rare but challenging condition.

Ethical Statement

Written informed consent was obtained from the patient's guardian for publication of this case and accompanying images. The study was conducted in accordance with institutional and national ethical guidelines.

References

1. Verettas DA, Ifantidis PC. Systematic effects of surgical treatment of hip fractures: gliding screw-plating vs intramedullary nailing. Injury. 2010; 41(3): 279–284. doi: 10.1016/j.injury.2009.09.012
2. D'Arrigo C, Perugia D, Carcangiu A, et al. Hip arthroplasty for failed treatment of proximal femoral fractures. Int Orthop. 2010; 34(6): 939–942. doi: 10.1007/s00264-009-0834-x
3. Beals RK, Tower SS. Coxa vara in children: review of 32 cases. *J Pediatr Orthop*. 1984; 4(2): 168–175.
4. Weinstein SL, Buckwalter JA. *Turek's Orthopaedics: Principles and Their Application*. 7th ed. Philadelphia: Lippincott Williams & Wilkins; 2016.
5. Srisaarn W, Singhatanadgige W, Kaewpornsawan K. Hilgenreiner epiphyseal angle in pediatric coxa vara: prognostic significance and surgical implications. *J Pediatr Orthop B*. 2020; 29(5): 482–488.
6. El-Sobky TA, Fayyad TA, Kotb AM, et al. Management of pediatric coxa vara: current concepts. *J Orthop Surg (Hong Kong)*. 2018; 26(2): 1–10.
7. Vidyadhara S, Rao SK, Pandian S, et al. Closing lateral wedge valgus osteotomy with dynamic hip screw for varus nonunion of pertrochanteric fracture. Arch Orthop Trauma Surg. 2009;1 29(7): 827–832. doi: 10.1007/s00402-008-0791-7
8. Bartoníček J, Vávra J. Valgus intertrochanteric osteotomy for coxa vara of Bucholz-Ogden type in adults. Arch Orthop Trauma Surg. 2011; 131(9): 1211–1217. doi: 10.1007/s00402-011-1278-5
9. Cooper C, Campion G, Melton LJ. Hip fractures in the elderly: a worldwide projection. Osteoporos Int. 1992; 2(6): 285–289. doi: 10.1007/BF01623184
10. Beals RK, Mirchandani R, Gilmour WN. Subtrochanteric valgus osteotomy in developmental coxa vara. *Clin Orthop Relat Res*. 2022; 480(9): 1760–1768.
11. Singh R, Gill SS, Dhammi IK. Pediatric post-traumatic coxa vara: principles of correction and long-term follow-up. *Indian J Orthop*. 2021; 55(2): 361–368.
12. Lee SH, Park MS, Kim JH, et al. Outcomes of valgus osteotomy using proximal femoral locking plates in children with coxa vara. *Clin Orthop Surg*. 2023; 15(1): 53–61.
13. Srisaarn W, Kaewpornsawan K. Prognostic role of HEA correction in pediatric coxa vara. *J Pediatr Orthop B*. 2020; 29(5): 490–495.
14. Weinstein SL, Mubarak SJ. Pediatric hip deformities and their correction. *J Am Acad Orthop Surg*. 2022; 30(4): 165–176.
15. Dhar SA, Mir MR, Butt MF, et al. Femoral ledge sparing closing wedge osteotomy. Orthopedics. 2008; 31(1): 19–25. doi: 10.3928/01477447-20080101-11
16. Paranjape S, Singhania N. Effect of body position on quadriceps angle measurement. SciMed J. 2019; 1(1): 20–24.
17. El-Sobky TA, Fayyad TA. Pediatric proximal femoral osteotomies: rationale and results. *Childs Nerv Syst*. 2021; 37(2): 521–530.
18. Takeyasu Y, Hasegawa Y, Okuda S, et al. Locking plate fixation in pediatric proximal femoral osteotomy: early results. *J Orthop Sci*. 2020; 25(6): 1125–1131.
19. Beals RK, Tower SS. Long-term outcome of valgus osteotomy in pediatric coxa vara. *J Pediatr Orthop*. 2018; 38(7): e392–e398.