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Valgus Subtrochanteric Osteotomy as A Salvage Procedure for Varus Hip Malunion After Internal Fixation in Adolescent: A Case Report

Hendy[1], Agus Eka Wiradiputra[2]

[1]General Practitioner, Bhayangkara Hospital, Denpasar, Indonesia
[2]Hip and Knee Clinical Fellowship, Orthopedic Department, Bhayangkara Hospital, Denpasar, Indonesia

Corresponding Author: Hendy

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ABSTRACT

Introduction: Varus malunion of the proximal femur following internal fixation may result in persistent hip pain, limb length discrepancy, gait disturbance, and functional limitation. Valgus subtrochanteric osteotomy is a recognized corrective procedure that restores the neck–shaft angle, improves biomechanics of the hip joint, and relieves symptoms. This case highlights the role of valgus subtrochanteric osteotomy as a salvage procedure for symptomatic varus hip malunion after internal fixation in adolescent.

Case Presentation: A 17-year-old female presented with persistent hip pain and a noticeable deformity of the left hip six months after undergoing open reduction and internal fixation in early 2025. The patient complained that the operated hip felt bent and different compared to the contralateral side. Clinical examination demonstrated varus deformity of the proximal femur associated with functional limitation. Radiographic evaluation confirmed varus malunion. The patient subsequently underwent valgus subtrochanteric osteotomy to correct the deformity.

Following surgical correction, the patient experienced significant functional improvement. At follow-up, the patient was able to walk long distances with only mild discomfort in the left knee. Limb length was equal bilaterally. The patient was able to climb stairs and sit for prolonged periods without significant limitation, although maximal squatting remained restricted. Overall, hip alignment and functional capacity improved compared with the preoperative condition.

Conclusion: Valgus subtrochanteric osteotomy can effectively correct deformity and improve functional outcomes in adolescents with symptomatic varus hip malunion following internal fixation. This case highlights the role of corrective osteotomy in restoring hip alignment and functional mobility in young patients

Keywords: Valgus osteotomy; Proximal femur; Hip malunion; Varus deformity; Salvage surgery.

INTRODUCTION

Malunion of the proximal femur following internal fixation is a recognized complication that can lead to significant functional impairment.[1] Varus malunion in particular alters the femoral neck–shaft angle, resulting in abnormal hip biomechanics, limb length discrepancy, gait disturbance, and persistent hip pain. These biomechanical changes increase the load across the hip joint and surrounding structures, potentially leading to reduced

mobility and long-term joint degeneration if left untreated. Such complications are especially concerning in young patients, as they may significantly affect daily activities and quality of life.[2]

Several surgical strategies have been described to address proximal femoral deformities after failed or complicated fixation.[3] Among these, valgus subtrochanteric osteotomy is commonly used as a corrective procedure to restore the femoral neck–shaft angle and realign the mechanical axis of the lower limb. By converting the varus deformity into a valgus alignment, this procedure can improve hip biomechanics, redistribute load across the femoral head and neck, and enhance functional outcomes.[4]

This case report describes a 17-year-old female who developed symptomatic varus malunion of the proximal femur following internal fixation. The patient presented with persistent hip pain and functional limitations six months after the initial surgery. She subsequently underwent valgus subtrochanteric osteotomy as a salvage procedure to correct the deformity and restore hip alignment. This case is unique as it reports the clinical outcome and functional improvement following corrective osteotomy in a young patient with post-traumatic varus hip deformity.

CASE PRESENTATION

A 17-year-old female presented to the orthopedic clinic with persistent pain in the left hip and a sensation that her left hip appeared “bent” and different compared with the right side. The patient reported difficulty with certain daily activities, particularly prolonged walking and squatting. The symptoms had persisted for approximately six months after she underwent open reduction and internal fixation (ORIF) of the proximal femur at another hospital in early 2025 following a traumatic injury. Despite the initial surgery, the patient continued to experience discomfort and functional limitation.

The patient had no significant past medical history, no known genetic disorders, and no relevant family history of musculoskeletal diseases. She was otherwise healthy and active prior to the injury. Psychosocial history revealed that she was a high school student whose daily activities were limited by the hip pain and deformity. There was no history of smoking, alcohol consumption, or other risk factors that might affect bone healing.

On physical examination, the patient demonstrated an antalgic gait and mild discomfort during weight-bearing on the left lower limb. Inspection revealed mild deformity of the left hip region. Range of motion of the left hip was relatively preserved but associated with pain at the extremes of motion. Limb length discrepancy was suspected clinically due to the varus alignment of the proximal femur. The patient was unable to perform maximal squatting comfortably. The Harris Hip Score (HHS) was 74.

Radiographic evaluation with plain X-ray of the pelvis and femur demonstrated varus malunion of the proximal femur, characterized by a decreased femoral neck–shaft angle consistent with varus deformity after internal fixation. No signs of infection or implant failure were identified. The primary diagnostic challenge was determining the optimal management strategy for symptomatic varus malunion in a young patient while preserving hip joint function.

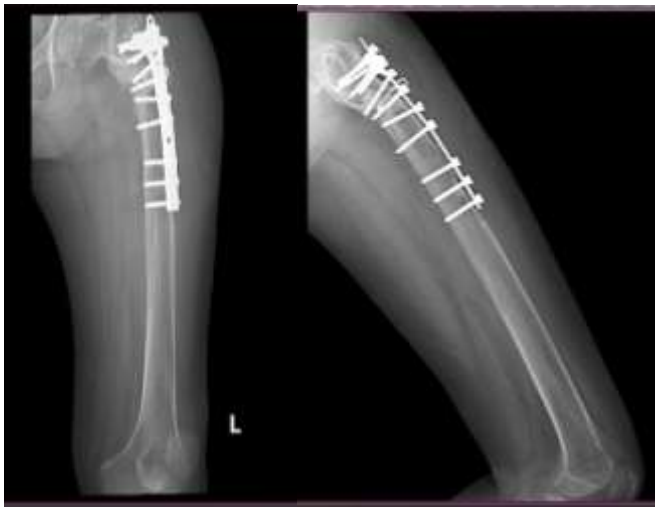

Figure 1. Anteroposterior and lateral radiographs of the left femur six months after the initial ORIF, showing plate-and-screw fixation of the proximal femur prior to corrective osteotomy.

Based on clinical and radiographic findings, the patient was diagnosed with varus malunion of the proximal femur following internal fixation. Differential diagnoses considered included delayed union, implant-related complications, and early degenerative hip changes. However, these were excluded through imaging and clinical evaluation.

Given the persistent symptoms and mechanical deformity, the patient underwent valgus subtrochanteric osteotomy as a corrective surgical procedure to restore the femoral neck–shaft angle and improve hip biomechanics. Internal fixation was used to stabilize the osteotomy site.

At follow-up evaluation, the patient reported significant improvement in symptoms. She was able to walk long distances with only mild discomfort in the left knee. Limb length was clinically equal between both lower extremities. The patient was able to climb stairs and sit for prolonged periods without significant limitation. However, maximal squatting remained restricted. No postoperative complications or adverse events were observed. The HHS improved from 74 preoperatively to 90 postoperatively. The patient adhered well to postoperative rehabilitation and tolerated the intervention without difficulty.

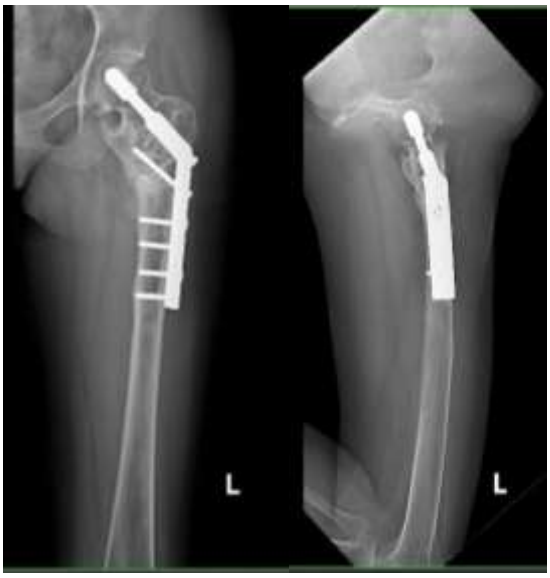

Figure 2. Anteroposterior and lateral radiographs of the left proximal femur after valgus subtrochanteric osteotomy, showing correction of the varus deformity and stabilization with plate-and-screw fixation.

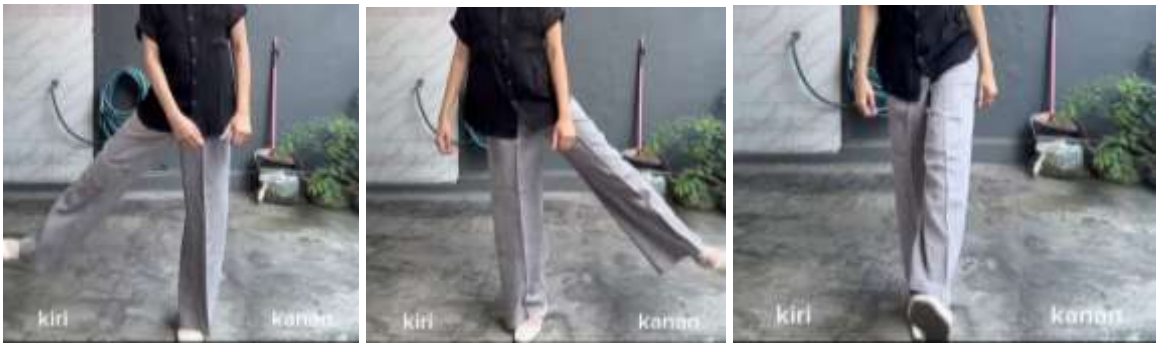

Figure 3. Postoperative clinical assessment after valgus subtrochanteric osteotomy showing improved hip abduction and flexion

Figure 4. Postoperative gait assessment after valgus subtrochanteric osteotomy. Sequential images (A–F) demonstrate the patient's ability to ambulate independently with a stable gait pattern.

DISCUSSION

This case illustrates the clinical value of valgus subtrochanteric osteotomy as a joint-preserving salvage procedure for symptomatic varus malunion after internal fixation in a young patient. The main strength of our approach was that treatment addressed the underlying mechanical problem rather than only the symptom of pain. The patient's persistent postoperative complaints, visible deformity, and functional limitation were consistent with proximal femoral malalignment, and corrective osteotomy was chosen to restore the neck–shaft angle, improve abductor mechanics, and equalize limb length. The postoperative course supported this strategy, as the patient achieved improved alignment, equal leg length, better walking tolerance, and recovery of several daily activities such as stair climbing and prolonged sitting. The residual inability to squat maximally and the presence of mild ipsilateral knee pain suggest that functional recovery was substantial but not complete.

The literature supports corrective valgus osteotomy for post-traumatic proximal femoral deformity, particularly when varus malunion is associated with pain, limp, shortening, or abductor insufficiency. In a retrospective series by Bartoníček et al., valgus intertrochanteric osteotomy for trochanteric varus malunion or nonunion produced reliable healing and improved hip function, with Harris hip scores increasing from a mean of 73 preoperatively to 92 postoperatively. Their study also showed correction of shortening, with an average lengthening of 2 cm, which is relevant to the present case because postoperative limb length equality was achieved.[5]

Our case also aligns with broader contemporary literature emphasizing that valgus-producing proximal femoral osteotomy remains an important option despite the increasing use of arthroplasty in failed proximal femur fixation. A 2026

review noted that post-traumatic proximal femoral complications often occur in combination, including varus malunion, limb shortening, pain, and secondary symptoms in the knee or lumbar spine, and concluded that valgus intertrochanteric osteotomy still has an important role in selected cases.[6] This is particularly relevant in adolescents and young adults, in whom preservation of the native hip is usually preferred over replacement. Pediatric and adolescent orthopedic reviews describe intertrochanteric or proximal femoral osteotomy as a method to restore alignment, improve joint congruity, reduce pain, and optimize limb function in the growing or young hip.[7]

Another strength of this case is the age of the patient. At 17 years old, she is at an age where joint-preserving reconstruction is especially meaningful. Prior literature on valgus osteotomy in young patients with proximal femoral pathology has emphasized preservation of bone stock and delay or avoidance of arthroplasty.[8] Reviews and case-based reports on femoral neck nonunion and other proximal femoral deformities have highlighted improved biomechanics, high union rates, and restoration of function after valgus osteotomy in younger populations.[9,10] Although our patient had malunion rather than nonunion, the same biomechanical principle applies: converting a pathologic varus alignment into valgus can reduce abnormal loading and improve function while preserving the femoral head.

The limitations of our approach should also be acknowledged. First, this is a single-case report, so the findings cannot be generalized to all patients with post-ORIF varus malunion. Second, detailed radiographic parameters such as preoperative and postoperative neck–shaft angle, limb length discrepancy measurements, and standardized functional scores were not included in this report; therefore, the magnitude of correction could not be quantified as precisely as in larger series. Third, follow-up was focused mainly on clinical recovery, so longer observation is still needed to determine whether the correction will remain durable and whether late complications such as secondary osteoarthritis, hardware-related symptoms, or persistent knee discomfort will occur. Finally, because maximal squatting remained limited, the outcome should be interpreted as marked functional improvement rather than full return to preinjury status.

CONCLUSION

This case demonstrates that valgus subtrochanteric osteotomy can be an effective joint-preserving salvage procedure for symptomatic varus malunion of the proximal femur following internal fixation in a young patient. This case emphasizes that corrective valgus osteotomy can provide functional recovery and improved quality of life in adolescents with post-ORIF proximal femoral deformity.

Declaration by Authors

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