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Case Report

Orthopaedics Section

A Multistage Surgical Approach to a Compound Grade 2 Supracondylar Femur and Patella Fracture: A Case Report

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ABSTRACT

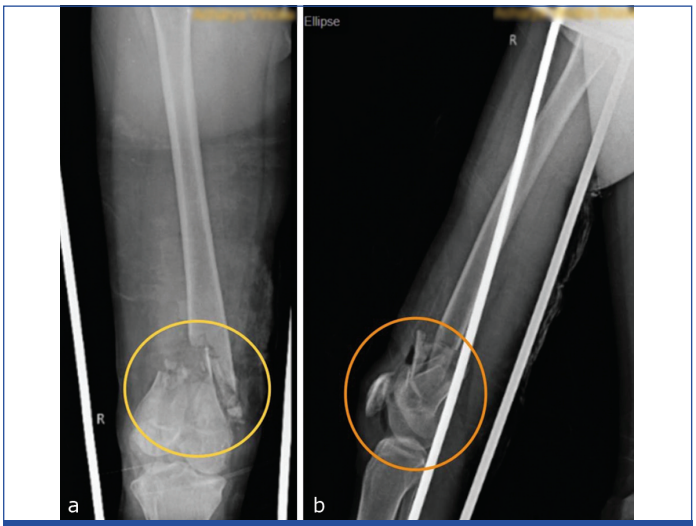
Supracondylar femur and patella fractures compromise knee stability and function. Compound injuries with bone loss are best managed in stages. The authors present a case of a 22-year-old female with a Gustilo-Anderson Grade 2 open supracondylar femur fracture and an associated patella fracture following a road traffic accident. Initial management included thorough wound debridement, temporary external fixation of the distal femur, and Kirschner wiring (K-wiring) of the patella. On the eighth day after confirming satisfactory wound status and the absence of clinical signs of infection, definitive Open Reduction and Internal Fixation (ORIF) with a distal femur locking plate was performed, along with the placement of antibiotic-impregnated cement beads. At six weeks postoperatively, autologous iliac crest (5×2 cm corticocancellous block) and fibular grafts were inserted to address the residual metaphyseal defect. The patient was then managed with structured rehabilitation and achieved union with a final knee range of motion of 0-90° at the most recent follow-up (38 months from injury), after elective implant removal. This case underscores the rationale for staged fixation and delayed grafting in open distal femur fractures with bone loss.

Keywords: Antibiotic beads, Autologous bone graft, Distal femur fracture, External fixation, Staged surgery

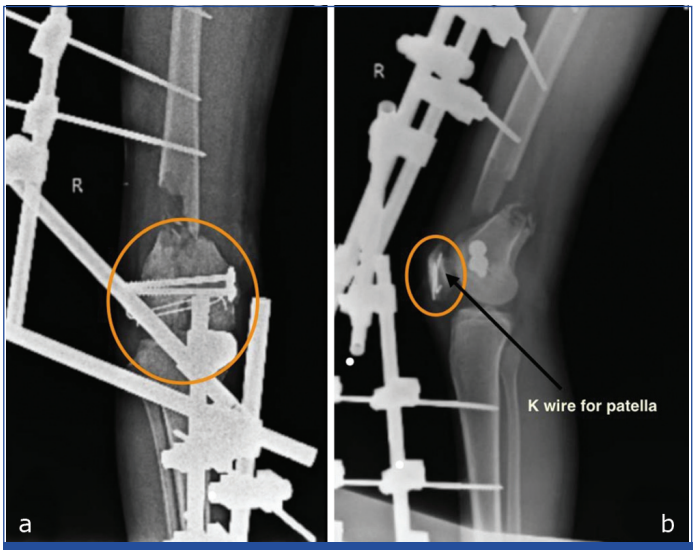
CASE REPORT

A 22-year-old female presented to the Emergency Department immediately after a two-wheeler accident, with an open injury around the right knee. Examination and radiographs demonstrated a compound (Gustilo-Anderson Grade 2) [1] supracondylar femur fracture with an associated patella fracture [Table/Fig-1a,b]. After copious wound washing with Betadine, hydrogen peroxide, and normal saline, two cancellous screws with washers were inserted across the intercondylar area from medial to lateral to aid in reduction.

For external fixation, three Schanz pins were placed proximal to the fracture in the femur and connected via two rods using six Arbeitsgemeinschaft für Osteosynthesefragen (AO) clamps. Distally, three Schanz pins were inserted in the anterolateral tibia and connected similarly. The femoral and tibial frames were linked using two connecting rods with four rod-to-rod clamps to create a stable construct. The patella was reduced through traction and manipulation, and stabilised using two K-wires [Table/Fig-2a,b].



[Table/Fig-1]: a,b) Preoperative radiographs of the right distal femur and knee {Anteroposterior (AP) and lateral} showing a supracondylar femur fracture with an associated patella fracture.



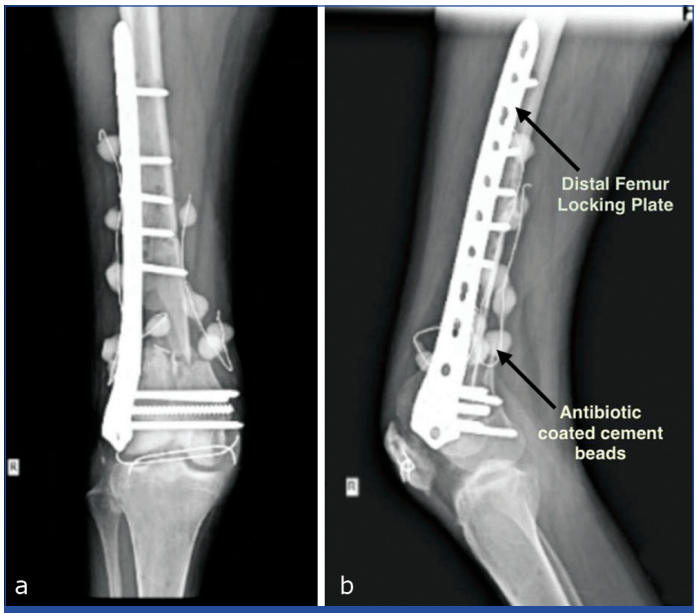
[Table/Fig-2]: a,b) Immediate postprocedural images after initial management: linked femoro-tibial external fixation construct and patella K-wiring with two K-wires.

Definitive fixation (day 8): With satisfactory wound condition and no clinical signs of infection, the external fixator was removed, and open reduction internal fixation of the distal femur was undertaken. Through a 15 cm lateral approach (from the lateral epicondyle proximally along the posterior femoral shaft), the fracture site and metaphyseal defect were exposed and debrided. A nine-hole distal femur locking plate was applied with four distal locking screws and five proximal locking screws, achieving satisfactory alignment and fixation. Antibiotic-impregnated cement beads with vancomycin were placed: four on the medial and six on the lateral aspect [Table/Fig-3a,b]. Physiotherapy commenced postoperatively, and the patient was discharged after ten days.

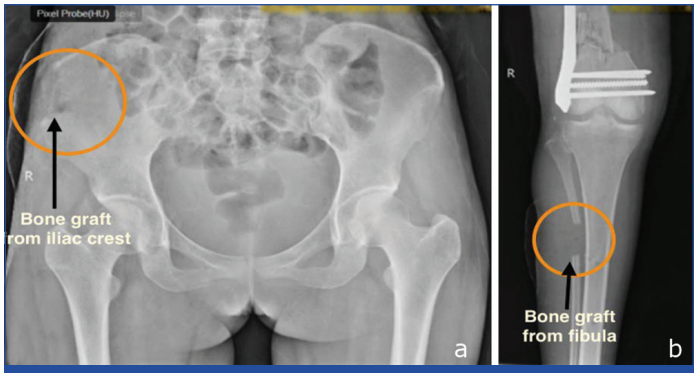
Bone grafting (6 weeks): The patient was readmitted for the removal of antibiotic beads, which had been placed as a temporary measure to deliver a high concentration of antibiotics while maintaining a spacer effect in the defect until the infection was controlled.

For further augmentation with autologous bone graft, a 5×2 cm corticocancellous block was harvested from the iliac crest. A 4 cm

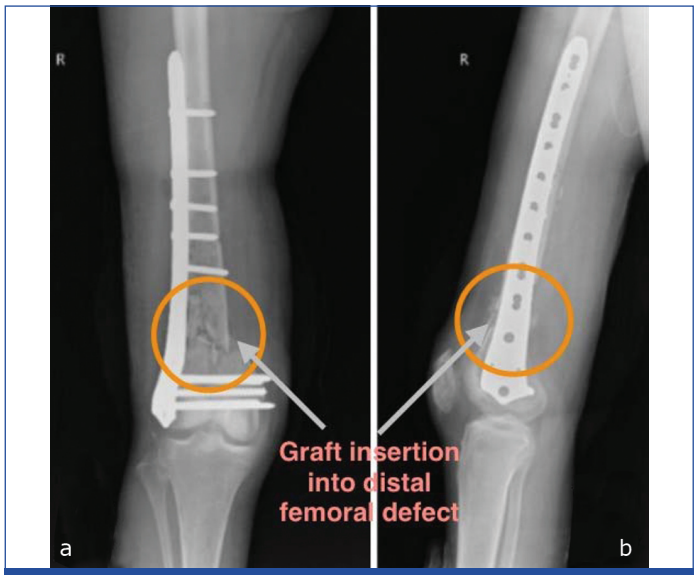
incision was made over the lateral aspect of the right leg, 8 cm below the fibular head to harvest the fibular graft, and the site was closed with appropriate sutures. The distal femur was re-exposed via approximately 7 cm lateral and 3 cm medial mini-approaches. Six lateral and four medial antibiotic beads were removed, fibrous tissue was excised, and the defect edges were curetted. The prepared grafts were shaped and firmly impacted into the metaphyseal defect [Table/Fig-4a,b,5a,b].



[Table/Fig-3]: a,b) Postoperative radiographs following definitive open reduction internal fixation (Day 8): nine hole distal femur locking plate with four distal and five proximal locking screws; medial and lateral antibiotic-impregnated cement beads in situ.

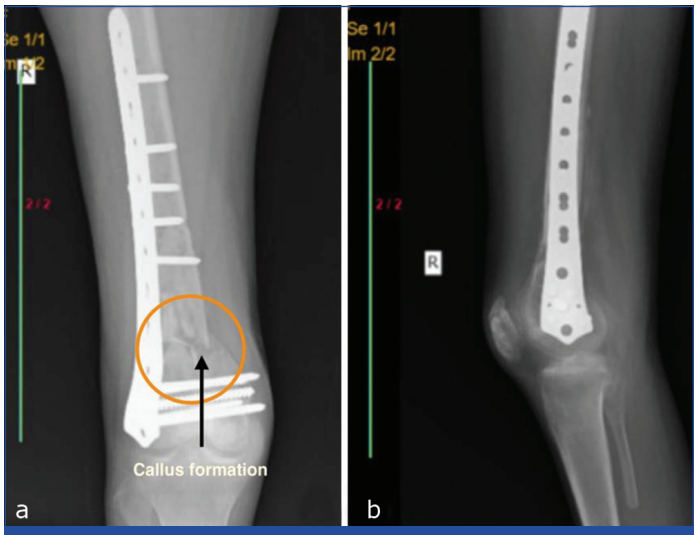


[Table/Fig-4]: a,b) Postoperative radiographs after iliac crest and fibular graft harvest demonstrating donor sites (pelvis AP; right knee-leg AP).

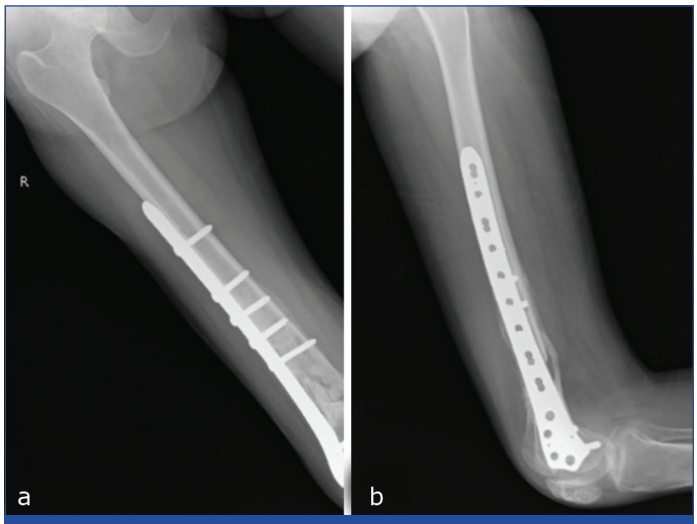


[Table/Fig-5]: a,b) Postoperative radiographs after graft insertion into the distal femoral defect; white arrow shows the graft placement and defect fill.

Follow-up and outcomes: At 4.5 months postoperatively, progressive callus formation was noted [Table/Fig-6a,b]. At nine months [Table/Fig-7a,b] and 16 months [Table/Fig-8a,b], further consolidation with improving function was recorded. At 20 months and 32 months [Table/Fig-9a-d], the patient was fully weight-bearing with near-complete range of movement. At 38 months postoperatively, the patient had achieved near-normal knee range of motion with full weight-bearing and was admitted for elective implant removal [Table/Fig-10a,b].

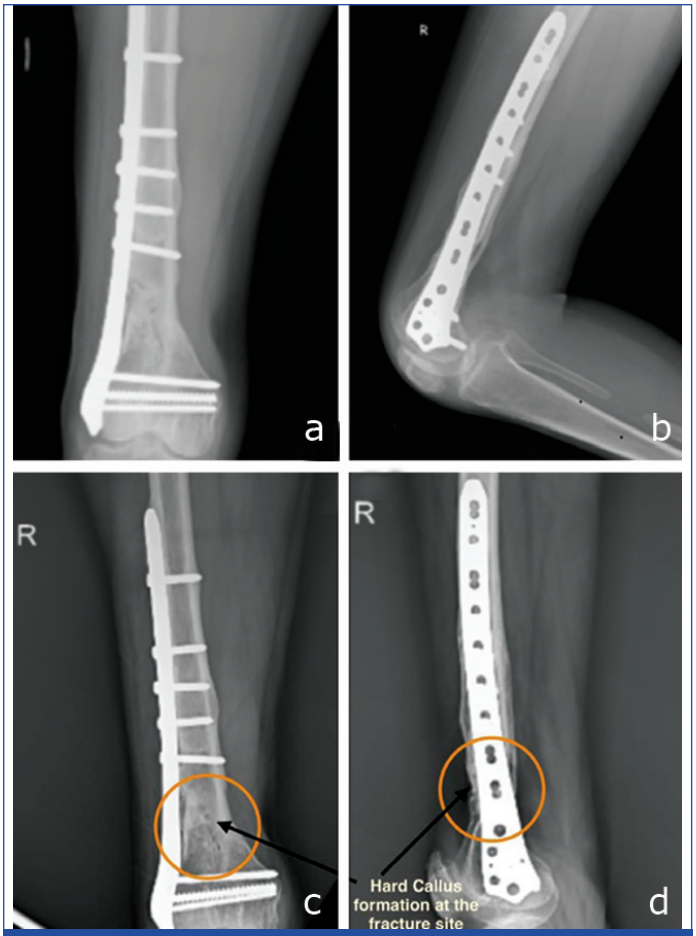


[Table/Fig-6]: a,b) Postoperative radiographs of right thigh with knee at 4.5 months suggestive of progressive callus formation.

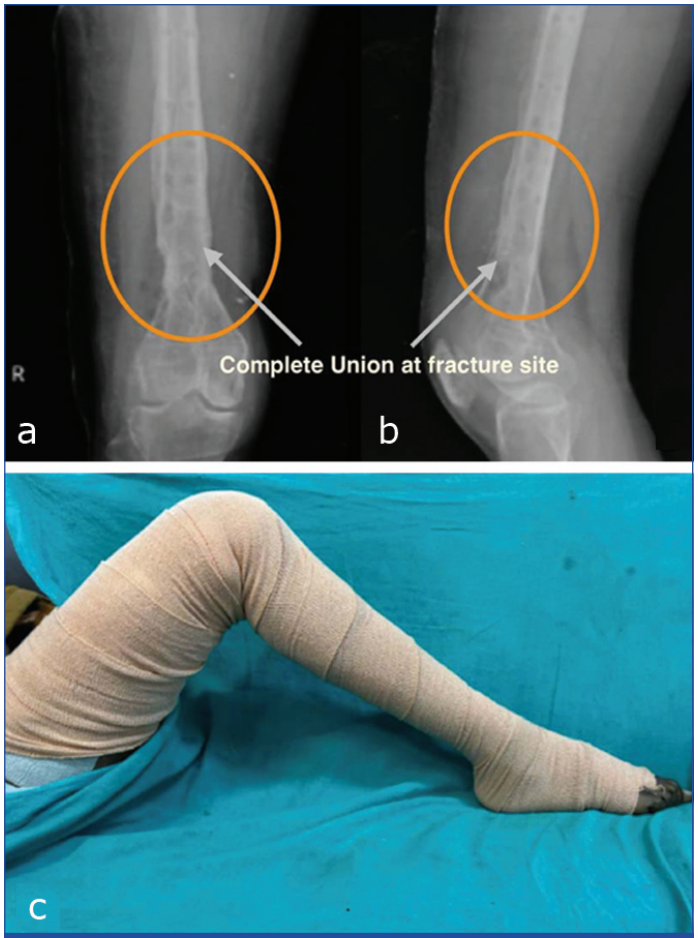


[Table/Fig-7]: a,b) Postoperative radiographs of right thigh with knee at nine months shows further consolidation of distal femur site.

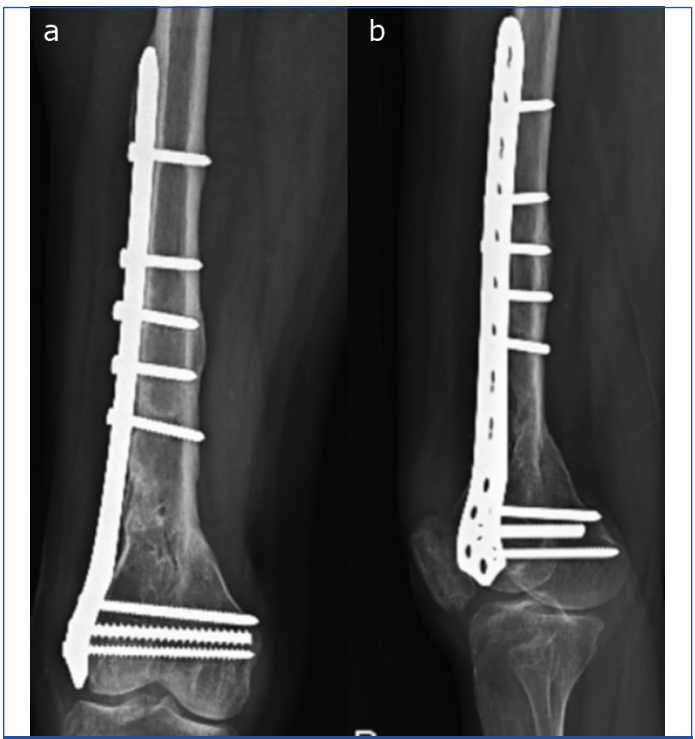
[Table/Fig-8]: a,b) Postoperative radiographs of right thigh with knee at 16 months further consolidation of distal femur site with improved knee range of motion.



[Table/Fig-9]: a,b) Postoperative radiographs of right thigh with knee at 20 months; and c,d) at 32 months suggestive of complete bone formation at the fracture site.



[Table/Fig-11]: a,b) Immediate postremoval of distal femur plate and screws, demonstrating union and maintained alignment with; c) showing knee range of motion of 0-90 degrees.



[Table/Fig-10]: a,b) Radiographs at 38 months: pre removal of distal femur plates.

[Table/Fig-12]: a,b) Full weight bearing mobilisation was started following the elective implant removal procedure on the first postoperative day.

This procedure was performed by carefully incising through the scar site of the previous surgery, removing all the screws with a screwdriver, and carefully separating the adhered plate from the bone using an osteotome. At 38.5 months, the final review confirmed maintained alignment and union with a knee range of movement of 0-90° [Table/Fig-11a-c]. Full weight-bearing mobilisation was started immediately following the implant removal procedure [Table/Fig-12a,b].

DISCUSSION

Open distal femur fractures with concomitant patella injury are uncommon and demand careful staging. Their management has continued to evolve, with various strategies described in the literature to minimise infection and address bone loss [2].

Initially, management in the present case involved external fixation, followed by delayed ORIF after soft-tissue recovery, which is widely

practiced in complex femoral injuries [3]. Where metaphyseal defects persist, autologous bone grafts offer osteogenic, osteoinductive, and osteoconductive advantages. Iliac crest grafts provide rich cancellous bone, while fibular cortical grafts add structural support, especially in cases of segmental loss [4,5]. In instances with a risk of contamination, delaying grafting until wound quiescence is prudent and aligns with published strategies for managing distal femoral bone loss [4,5].

In the present case, we opted for an 8-day interval before definitive plating to ensure satisfactory soft-tissue status, followed by a further delay of six weeks before grafting to introduce autograft into a clean, vascular bed. The patient achieved union and functional range of movement, supporting the staged approach. Functional outcomes with distal femur locking plates have also been consistently reported as satisfactory in prospective studies [6]. The use of a distal femur locking plate provided angular stability in osteoporotic-risk metaphyseal bone, though dynamic condylar screw fixation remains an alternative option with variable long-term outcomes [7]. Additionally, antibiotic beads afforded local high-dose delivery during the interim period.

Antibiotic-cement coated implants have also been explored for managing infection risks in complex fractures and non-unions, yielding encouraging outcomes [8-10]. Our eventual implant removal after union was undertaken to address hardware prominence and allow soft-tissue gliding, consistent with contemporary practice. Comparable functional outcomes have been reported with locking compression plates in intra-articular distal femur fractures as well [11].

CONCLUSION(S)

Staged management of Grade 2 open distal femur fractures with associated patella injury-consisting of debridement and temporary stabilisation, delayed ORIF after soft-tissue recovery, and planned autologous bone grafting for residual defects-can achieve union and functional recovery while mitigating infection risk. Careful sequencing, meticulous technique, and structured rehabilitation are key to favorable outcomes. In this case, timely staged interventions resulted in successful fracture union, satisfactory knee function, and overall favorable patient recovery.

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