International Journal of Research in Orthopaedics
Jindal A et al. Int J Res Orthop. 2026 Sep;12(5):1548-1552
https://www.ijoro.org

DOI: https://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20262936

Case Report

Excellent functional recovery following bicolumnar plating, cerclage wires and nail through screw for peri-implant distal femur fracture after proximal femoral nail anti-rotation-II nailing: a case report from a resource-limited setting

Anish Jindal, Utkarsh Jain*, Priyanshu Suman

Central Institute of Orthopaedics, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India

Received: 21 June 2026
Accepted: 05 August 2026

***Correspondence:**
Dr. Utkarsh Jain,
E-mail: drutkarsh13@gmail.com

ABSTRACT

Peri-implant distal femur fractures occurring before union of the index proximal femur fracture are rare and pose significant surgical challenges due to the presence of existing implants, compromised bone stock, and complex fracture patterns. Optimal management strategies remain poorly defined. A 27-year-old male previously treated with a proximal femoral nail anti-rotation (PFNA-II) for a right subtrochanteric femur fracture sustained a second high-energy road traffic accident approximately three months postoperatively, before radiological union of the index fracture. Radiographs demonstrated an extra-articular peri-implant distal femur fracture at the distal tip of the nail with metaphyseal comminution, displacement of the distal locking screws, and extension of the original subtrochanteric fracture line into the diaphysis. Surgical management consisted of a hybrid fixation construct comprising a lateral distal femoral locking plate, a plate-to-nail screw through the existing distal locking hole, two cerclage wires for fragment control, and a medial buttress plate to achieve bicolumnar fixation. At 12-month follow-up, complete radiological union was achieved at both the distal femur and subtrochanteric fracture sites. There was no implant failure, loss of reduction, or need for revision surgery. The patient regained full independent weight-bearing, demonstrated a full active straight-leg raise, and achieved knee flexion greater than 90°. Bicolumnar plating supplemented by a plate-to-nail screw and cerclage wiring provided stable fixation and successful union in this complex peri-implant fracture. This technique represents a practical and reproducible salvage option for managing distal femoral peri-implant fractures around an in-situ cephalomedullary nail, particularly in resource-constrained settings.

Keywords: Peri-implant fracture, Distal femur fracture, PFNA-II, Subtrochanteric fracture, Bicolumnar plating, Cerclage wire

INTRODUCTION

Subtrochanteric femur fractures account for approximately 10–15% of all proximal femur fractures, occurring predominantly in younger patients following high-energy trauma. Intramedullary nailing with the proximal femoral nail antirotation (PFNA-II) is the treatment of choice, providing reliable rotational control and load sharing.[1] Peri-implant fractures around the distal end of the nail represent a recognised complication arising from stress concentration at the nail terminus, particularly following subsequent trauma.[2]

Such peri-implant fractures present a particular challenge when they occur while the primary fracture has not yet united, as the surgeon must simultaneously address an actively healing proximal fracture and a new distal injury. Alternative fixation options such as cable plate systems have been described in the literature.[3,4] In resource-limited government hospital settings, however, access to

specialised implants may be restricted, requiring surgeons to achieve stable fixation using routinely available hardware.

We describe a hybrid construct — a distal femoral locking plate (DFLP) with a supplemental plate-to-nail screw through the existing distal locking hole, cerclage wires for fragment control, and a medial proximal humerus internal locking system (PHILOS) buttress plate for bicolumnar stability — that achieved complete union at both fracture levels with an excellent functional outcome.

CASE REPORT

Initial presentation and management

A 27-year-old male presented to the emergency department of Safdarjung Hospital, New Delhi, following a high-energy road traffic accident with a right subtrochanteric femur fracture (Figure 1). He was haemodynamically stable, neurologically intact, and had no significant medical comorbidities. After appropriate resuscitation and preoperative optimisation, he underwent closed reduction and internal fixation with a PFNA-II nail. Postoperative radiographs (Figure 2) confirmed satisfactory nail position with both distal locking screws in situ. He was mobilised with toe-touch weight-bearing and discharged for outpatient follow-up.

Figure 1: Initial pelvis AP radiograph demonstrating the right subtrochanteric femur fracture prior to surgical intervention.

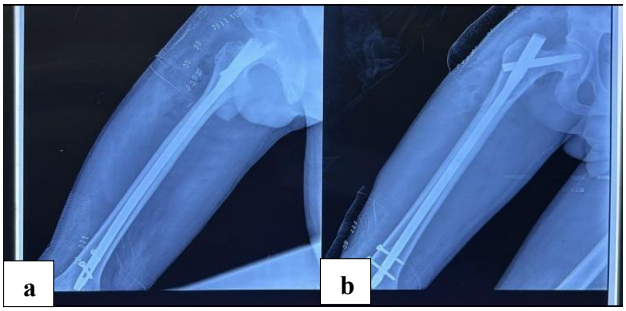

Figure 2 (a and b): Immediate postoperative AP and lateral femur radiographs following PFNA-II nailing confirming satisfactory nail position with both distal locking screws in situ.

Re-presentation with peri-implant fracture

Approximately three months after the index surgery, prior to radiological union of the subtrochanteric fracture, the patient sustained a repeat high-energy road traffic accident. He presented with acute pain, swelling, deformity of the right thigh, and inability to bear weight. Plain radiographs (Figures 3a and b) demonstrated a peri-implant extra-articular distal femur fracture around the distal end of the nail with metaphyseal comminution and displacement of the distal locking screws. The lateral view additionally revealed propagation of the original subtrochanteric fracture line into the diaphysis. The proximal nail fixation and the helical blade was intact with no evidence of loosening.

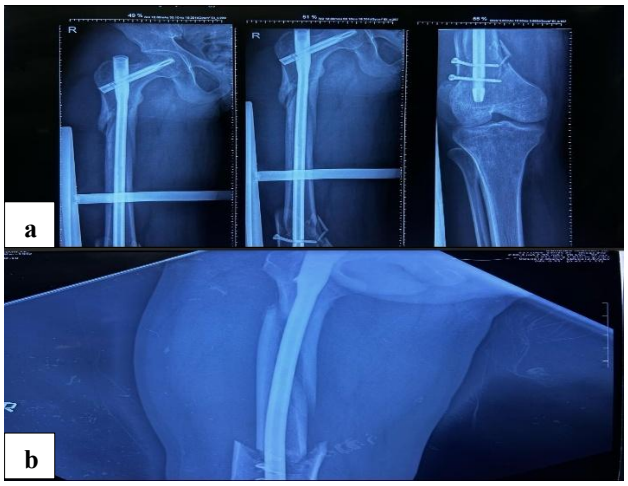

Figure 3: (a) Emergency AP radiographs at re-presentation demonstrating the peri-implant extra-articular distal femur fracture at the nail tip with displaced distal locking screws, and (b) lateral femur radiograph at re-presentation showing the peri-implant distal femur fracture at the nail tip and propagation of the original subtrochanteric fracture line into the diaphysis.

Surgical technique

Given the intact proximal fixation, the decision was made to retain the PFNA-II nail and address the distal fracture with supplemental fixation. Cable plate system was considered for peri implant fracture fixation but was unavailable at our institution due to logistical and procurement constraints inherent to a government hospital setting. The construct was therefore planned using implants routinely available in our inventory.

The patient was positioned supine on a radiolucent table. A lateral parapatellar approach extended proximally along the iliotibial band exposed the distal femur and fracture site. Comminuted fragments were reduced under fluoroscopic guidance and the displaced distal locking screws were removed. A DFLP was applied laterally spanning the fracture from the condylar block to the

proximal diaphysis. A locking screw from the DFLP was directed through the corresponding distal locking hole of the retained PFNA-II nail, linking the plate and nail into a unified mechanical assembly. Two 18-gauge stainless steel cerclage wires were applied circumferentially at the comminuted metaphyseal zone to reduce butterfly fragments and restore cortical continuity (Figure 4). For medial column buttressing available implant options included a one-third tubular plate, a reconstruction plate and a proximal humerus internal locking system (PHILOS) plate. A PHILOS plate was selected for its pre-contoured low-profile design and multiple angular-stable locking screw options suited to the medial metaphyseal contour. Final fluoroscopy confirmed satisfactory reduction and stable fixation.

Figure 4: Intraoperative photograph showing the DFLP applied laterally with the plate-to-nail screw through the existing PFNA-II distal locking hole and cerclage wires securing comminuted metaphyseal fragments; the medial buttress plate was subsequently applied to complete the bicolumnar construct.

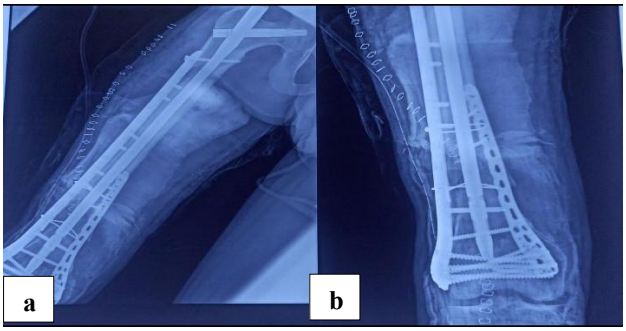

Figure 5 (a and b): Postoperative femur and hip AP and lateral radiographs confirming satisfactory positioning of the bicolumnar construct and intact proximal PFNA-II fixation.

Postoperative course and outcome

Immediate postoperative radiographs (Figure 5) confirmed satisfactory positioning of the distal femur implant, fracture reduction, acceptable axial alignment and intact proximal PFNA-II fixation. Physiotherapy was commenced on the second postoperative day with isometric quadriceps exercises and passive knee mobilisation. Non-weight-bearing ambulation was permitted at two weeks, progressing to partial weight-bearing at six weeks guided by radiological healing.

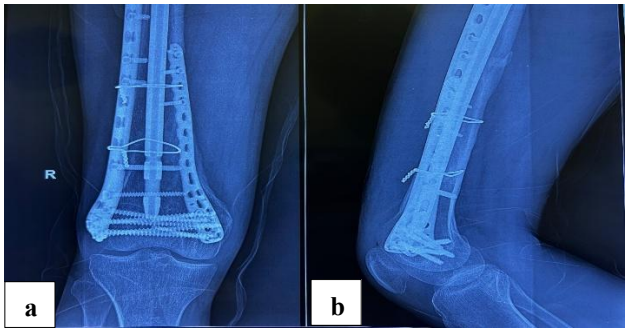

Figure 6 (a and b): Follow-up knee AP and lateral radiographs at 12 months demonstrating complete union of the distal femur fracture with all hardware in situ and no implant failure.

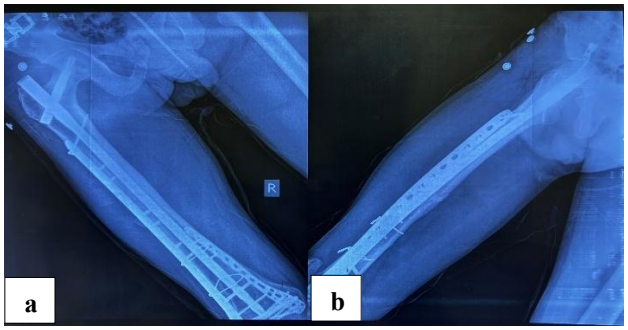

Figure 7 (a and b): Follow-up femur and hip AP and lateral radiographs at 12 months confirming complete union at the subtrochanteric level with remodelling callus and intact proximal PFNA-II fixation.

Figure 8: Clinical photographs at 12-month follow-up (a) full active straight-leg raise with no extensor lag, confirming restored quadriceps function, (b) active knee flexion exceeding 90 degrees, and (c) patient standing independently with symmetric limb alignment and no significant leg length discrepancy.

At 12-month follow-up, radiographs of the distal femur (Figure 6) confirmed complete union at the distal fracture site with all hardware in situ and no implant failure. Radiographs of the full femur and hip (Figure 7) demonstrated complete union at the subtrochanteric level

with remodelling of callus around the PFNA-II nail and no evidence of blade cutout or avascular necrosis of the femoral head. Clinically, the patient demonstrated full active straight-leg raise with no extensor lag, active knee flexion exceeding 90 degrees, and symmetric standing alignment with no significant leg length discrepancy (Figure 8), ambulating fully independently without aids.

DISCUSSION

Peri-implant fractures around the distal end of the nail following intramedullary fixation arise from predictable biomechanical principles: stress concentration at the nail terminus, amplified by the stress-shielding effect along the diaphysis, predisposes the cortex at this level to fracture following a subsequent loading event.[2,5] In this case, the additional complexity arose from the occurrence of a new peri-implant injury before the index subtrochanteric fracture had achieved radiological union, presenting a simultaneous dual biological and mechanical challenge at two levels of the same femur.

Several implant options exist for peri-implant fractures around retained intramedullary nails. Cable plate systems use circumferential cables that can achieve stable fixation irrespective of the nail obstructing conventional screw trajectories and have been described with good outcomes in the periprosthetic fracture literature.[3,6] In our case, the unavailability of these implant systems in the government hospital setting necessitated a construct built from routinely available inventory, guided by sound biomechanical principles.

The DFLP was applied laterally, its angular stability and broad condylar screw configuration well-suited to the distal femoral anatomy. A supplemental screw from the DFLP was directed through the existing distal locking hole of the retained PFNA-II, linking the two implants into a mechanically unified assembly and reducing interfragmentary micromotion at the fracture site. The bicolumnar approach by adding a medial PHILOS buttress plate was selected to address the metaphyseal comminution and resist varus collapse, consistent with biomechanical literature demonstrating the superior stability of bicolumnar constructs over single lateral plating alone in distal femur fractures.[7]

The use of cerclage wires provided additional comminution control. Contemporary evidence supports the safe use of cerclage wires when applied with preservation of the periosteal soft-tissue envelope, with no significant adverse effect on fracture biology.[8,9] Notably, the peri-implant distal femur fracture occurred at a time when the index subtrochanteric fracture had not yet achieved radiological union, presenting a dual biological challenge. The mechanical stability conferred by the construct allowed early rehabilitation while union progressed at both levels simultaneously.

At 12-month follow-up, radiographs confirmed complete union at both the distal femur and subtrochanteric fracture sites, with remodelling of callus and no implant failure. Clinically, the patient demonstrated full active straight-leg raise, knee flexion exceeding 90 degrees, symmetric standing alignment and full independent weight-bearing which is an excellent functional outcome by any standard measure. This case illustrates that in resource-constrained environments, careful pre-operative planning and sound biomechanical thinking can replicate outcomes achievable with more specialised hardware, and that a hybrid construct built from routinely available implants is a viable and effective salvage strategy.

CONCLUSION

Peri-implant distal femur fractures occurring before union of the index subtrochanteric fracture present a compound biological and mechanical challenge. A bicolumnar plating construct comprising a DFLP, a supplemental plate-to-nail screw through the existing distal locking hole, cerclage wires for comminution control and a medial buttress plate represents an effective, resource-conscious salvage strategy. In this case, complete union was achieved at both fracture levels by 12 months with an excellent functional outcome. This construct should form part of the orthopaedic trauma surgeon's repertoire when managing complex peri-implant distal femur fractures in settings where specialised implants are unavailable.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Ekström W, Karlsson-Thur C, Larsson S, Ragnarsson B, Alberts KA. Functional outcome in treatment of subtrochanteric femoral fractures with the proximal femoral nail and the medoff sliding plate. J Orthop Trauma. 2007;21(1):18-25.
2. Koso RE, Terhoeve C, Steen RG, Zura R. Healing, nonunion, and re-operation after internal fixation of diaphyseal and distal femoral fractures: a systematic review and pooled analysis. Int Orthop. 2018;42(11):2675-83.
3. Choi JK, Gardner MJ, Yoon RS, Liporace FA. The effect of cable position on the stability of a cable plate construct for periprosthetic femur fractures. J Orthop Trauma. 2010;24(10):630-4.
4. Ebraheim NA, Liu X, Patil V, Sanford CG Jr. Plating of distal femur fractures around a retained intramedullary nail: technique and results. Injury. 2009;40(3):284-8.
5. Talbot M, Zdero R, Garneau D, Cole PA, Schemitsch EH. Fixation of long bone segmental defects: a biomechanical study. Injury. 2008;39(2):181-6.
6. Buttaro MA, Farfalli G, Paredes Núñez M, Comba F, Piccaluga F. Locking compression plate fixation of

Vancouver type-B1 periprosthetic femoral fractures. J Bone Joint Surg Am. 2007;89(9):1964-9.
7. Beltran MJ, Blair JA, Huh J, Kirby JM, Hsu JR. Bicolumnar fixation of distal femur fractures: a biomechanical analysis. J Orthop Trauma. 2013;27(3):123-9.
8. Apivatthakakul T, Phaliphot J, Leuvitoonvechkit S. Percutaneous cerclage wiring, does it disrupt periosteal blood supply? An anatomical study. Injury. 2013;44(2):168-72.
9. Apivatthakakul T, Sananpanich K, Sim R. Cerclage wiring in association with locked plating for comminuted metaphyseal fractures: biomechanical study. Injury. 2007;38(Suppl 4):S8-14.

Cite this article as: Jindal A, Jain U, Suman P. Excellent functional recovery following bicolumnar plating, cerclage wires and nail through screw for peri-implant distal femur fracture after proximal femoral nail anti-rotation-II nailing: a case report from a resource-limited setting. Int J Res Orthop 2026;12:1548-52.