

Nail and Plate Combination Fixation for Distal Femur Fractures: Critical Narrative Review

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Abstract: Background: A retrograde nail combined with a lateral plate may permit early loading in selected distal femur fractures, but comparative clinical evidence is mainly observational. Objective: To critically assess whether nail and plate combination (NPC) fixation improves construct survival and mobility compared with a lateral locked plate (LLP) or retrograde intramedullary nail (rIMN). Methods: A focused narrative review centered on a 2026 Journal of Orthopaedic Trauma cohort and selected original comparative studies. No systematic search or meta-analysis was performed. Results: In the 2026 cohort, construct failure occurred in 1 of 83 NPC fractures, 2 of 37 rIMN fractures, and 15 of 76 LLP fractures. Immediate weight bearing was permitted in 70%, 32%, and 3%, respectively. The association between NPC and fewer failures than LLP persisted in a limited adjusted analysis, but the confidence interval was wide. Other retrospective studies favored NPC for some healing and mobility endpoints; a multicenter randomized trial compared LLP with rIMN but did not test NPC. Conclusion: NPC is a plausible option when a single implant is judged insufficient or early loading is especially valuable. Current evidence does not prove a universal causal advantage, nor does it establish that every NPC can safely permit immediate unrestricted loading. [1–4]

Keywords: distal femur fracture; nail and plate fixation; retrograde nail; lateral locked plate; construct failure; weight bearing

1. Introduction

Distal femur fractures require restoration of alignment, stable fixation, and a rehabilitation plan that a patient can follow. Osteoporotic bone, metaphyseal comminution, an articular component, and a short distal segment can make a single fixation device difficult to optimize. A retrograde nail shares load centrally, while a lateral locked plate can control a distal articular block and coronal alignment. Combining them is mechanically appealing, but a second implant increases operative complexity and adds material to tissues already injured by the fracture. [1,2]

A June 2026 Journal of Orthopaedic Trauma (JOT) cohort by Verlinsky and colleagues compared NPC, LLP, and rIMN. Its title states that NPC reduces failure and improves mobility. This review examines the underlying denominators, treatment selection, and rehabilitation differences before translating those associations into clinical advice. It separates native acute fractures from periprosthetic and critical-defect situations for which construct feasibility and evidence may differ. [1–4]

2. Review Approach

We appraised the publicly available abstract and bibliographic record for the 2026 JOT study, a 2023 ten-center propensity-matched comparison, a 2026 one-center retrospective cohort, and a 2023 multicenter randomized LLP-versus-rIMN trial. This is a selective critical narrative review, without registered protocol, duplicate screening, formal risk-of-bias scoring, or quantitative pooling. Surgical details and missing-data mechanisms in subscription reports require full-text verification before journal submission. [1–4]

The 2026 three-construct cohort

Verlinsky and colleagues retrospectively studied 196 distal femur fractures in 188 adults treated from 2019 to 2024 at one Level I trauma center. Eligible injuries were OTA/AO 33A or 33C; partial-articular injuries, pathologic fractures, multifocal femoral injuries, and critical bone defects were excluded. NPC was used in 83 fractures, rIMN in 37, and LLP in 76. Mean ages were 70, 55, and 65 years. The nail-only cohort was younger and included more men. These imbalances illustrate why construct choice may track fracture morphology, host factors, and surgeon intent rather than act like a randomized intervention. [1]

The primary endpoint called construct failure combined displaced implant breakage, gross loss of reduction, and reoperation for nonunion. It occurred in 1/83 NPC fractures (1.2%), 2/37 rIMN fractures (5.4%), and 15/76 LLP fractures (19.7%). An analysis controlling for age, body mass index, and open fracture status reported a greater failure hazard for LLP relative to NPC (hazard ratio 17.43; 95% CI 2.23–136.10; $P = .006$). The interval signals substantial uncertainty about effect size. NPC versus rIMN did not meet the conventional significance threshold (hazard ratio 7.62; 95% CI 0.66–88.24; $P = .104$). A low event count in the NPC group makes adjusted estimates vulnerable to instability and residual confounding. [1]

Table 1: Unadjusted findings from the 2026 JOT cohort. Reoperation percentages and denominators are presented as reported in its abstract; the LLP reoperation count and percentage do not exactly match 76 as a denominator, so the full article should be checked. [1]

Reported endpoint	NPC versus rIMN	LLP and interpretation
Fractures analyzed	83 versus 37	76 LLP fractures
Construct failure	1/83 (1.2%) versus 2/37 (5.4%)	15/76 (19.7%); composite endpoint
Immediate loading allowed	70% versus 32%	3%; policy differs by construct
All-cause reoperation	7/83 (8.4%) versus 4/37 (10.8%)	18 patients (24.7%) as reported
Deep infection	6/83 (7.2%) versus 1/37 (2.7%)	1/76 (1.3%); $P = .085$ overall

All-cause reoperation was reported in 8.4% of NPC, 10.8% of rIMN, and 24.7% of LLP patients. Deep infection was recorded in six NPC, one rIMN, and one LLP cases; the overall comparison did not reach $P < .05$ ($P = .085$). That result should not be described as proof of equal infection risk, especially with few events and potentially different soft-tissue exposures. The primary composite includes reoperation for nonunion as well as mechanical failure, so it reflects both biology and treatment decisions. Separating component events and indications for revision would clarify the mechanism of any benefit. [1]

Mobility is a treatment outcome and a treatment decision

Immediate weight bearing was allowed in 70% after NPC, 32% after rIMN, and only 3% after LLP. Among patients aged at least 60 years, NPC was associated with a higher discharge mobilization category than a single construct (odds ratio 2.93, $P = .049$). These findings matter to frail patients who may not manage prolonged restricted loading. They also reflect a clinician-selected rehabilitation policy: an instruction to bear weight, actual observed loading, and walking ability are distinct measures. A patient cannot demonstrate the same discharge mobility under a restrictive order, even if the construct might have tolerated more. Baseline walking ability, cognition, medical recovery, and access to therapy can additionally shape discharge categories. The association does not isolate the mechanical contribution of adding a plate to a nail. [1]

The practical interpretation is that NPC may provide a surgeon enough confidence to authorize earlier loading in certain fractures. It is stronger than a claim that NPC independently caused all of the observed mobility difference. Conversely, the study does not show that earlier loading caused failures in the LLP group: restrictions may have been assigned because fractures or constructs appeared more vulnerable. Randomization of either constructs or postoperative loading would be needed to separate these effects more convincingly. [1]

Comparison with other original studies

Shi and colleagues reported a ten-center retrospective experience with 33 nail-and-plate fractures drawn alongside 867 LLP cases and a propensity-matched comparison of 30 LLP patients.

One NPC patient required an unplanned noninfection reoperation, versus seven matched LLP patients (3% versus 23%; $P = .023$); two NPC patients also underwent infection-related reoperation. No NPC patient required surgery to promote union or showed varus collapse at final follow-up, whereas three matched LLP cases showed varus collapse. The propensity analysis strengthens comparability for measured variables, but 33 NPC cases and possible unmeasured fracture or surgeon differences limit causal inference. Infection-inclusive and infection-excluding reoperations must not be interchanged. [2]

Patel and colleagues later analyzed 191 patients at one center, including 38 NPC and 153 single-device cases (131 LLP and 22 rIMN). At one year, reported nonunion was 0% versus 12% ($P = .03$), reoperation 10% versus 26% ($P = .05$), and gait impairment 26% versus 58% ($P < .01$). Weight bearing as tolerated at discharge was ordered for 63% versus 3%, while discharge home occurred in 42% versus 15%. The direction resembles the Verlinsky findings, but a comparator dominated by LLP and a much higher frequency of loading permission in NPC again tie construct and rehabilitation decisions together. These cohorts should not be assumed independent of local treatment protocols, although the centers and study periods differ. [3]

In contrast, Dunbar and colleagues randomized 160 patients across 20 centers to LLP or rIMN, with 126 followed at one year. They found no clear difference in function, walking, stairs, or adverse-event categories between those two single-device options. This trial shows that both can be reasonable in selected fractures; it does not compare either with NPC. A nonsignificant LLP-versus-rIMN result cannot be used as indirect proof that NPC is superior, particularly because eligibility, fracture complexity, and rehabilitation protocols differ across studies. [4]

Choosing a construct and designing the next trial

Construct selection should start with reduction, fracture geometry, available distal fixation, implant compatibility, bone quality, and the soft-tissue envelope. The surgeon should specify what each component contributes and avoid assuming that placing two implants automatically compensates for poor reduction or inadequate distal purchase. NPC may be attractive when a single lateral plate seems vulnerable to varus collapse or when permitted early loading is a central goal. These are decision considerations supported by biomechanics and observational associations, not validated thresholds established by the reviewed studies. [1–4]

A pragmatic multicenter trial could randomize patients for whom both strategies are technically feasible to NPC versus a prespecified contemporary single construct, stratified by articular involvement, metaphyseal comminution, open injury, age, and baseline mobility. Rehabilitation should either be standardized or explicitly randomized and analyzed as a second intervention. Core outcomes should distinguish mechanical breakage, loss of alignment, nonunion, infection, unplanned reoperation, permitted loading, achieved loading, walking capacity, and patient-reported function.

Prespecified one-year follow-up and absolute risk differences with confidence intervals would make benefits and harms easier to interpret. [1–4]

3. Conclusion

The 2026 JOT cohort found fewer recorded failures after nail-and-plate fixation than after lateral locked plating, while most nail-and-plate patients were allowed immediate loading. Two other retrospective comparisons support a favorable association, but implant choice, fracture selection, and rehabilitation policy remain major alternative explanations. A randomized trial establishes that LLP and rIMN are both reasonable single-device options; it has not tested the combined construct. NPC is a credible option for selected difficult fractures and early-mobility goals, with infection, operative burden, and longer-term patient function still requiring balanced assessment. [1–4]

Declarations

This narrative review draft contains no new patient data. The submitting authors should add identities, affiliations, funding and conflict disclosures, and confirm study details against full texts and target-journal requirements before submission.

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