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Close Fracture 1/3 Distal Os Femur Dextra: A Case Report

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Abstract

Distal femoral fractures require systematic trauma assessment and accurate anatomical characterization to guide stabilization. This descriptive case report presents the clinical evaluation, radiographic diagnosis, and operative management of a closed comminuted fracture involving the distal third of the right femur. A 56-year-old woman presented after a motorcycle accident in which her right lower limb supported the impact of a fall. She experienced severe continuous thigh pain, with a visual analog scale score of 9/10, swelling, deformity, shortening, and inability to move the limb. Initial examination revealed a Glasgow Coma Scale score of 15, preserved distal pulses, warm peripheral perfusion, and no clinical evidence of shock. Her blood pressure was 160/112 mmHg, with a documented history of hypertension. Anteroposterior and lateral femoral radiographs demonstrated comminuted discontinuity in the distal third of the right femur. Emergency care involved immobilization, intravenous fluids, and analgesia, followed by preoperative preparation. Open reduction and internal fixation were performed under general anesthesia through a lateral approach using a plate and screws. Postoperative imaging, fracture union, rehabilitation progress, and long-term functional outcomes were not documented. This case illustrates the value of integrating clinical assessment, neurovascular examination, radiographic findings, and operative planning while acknowledging the limitations of incomplete follow-up.

Keywords: *Comminuted Fracture, Distal Femur, Internal Fixation, Open Reduction, Traffic Injury.*

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INTRODUCTION

Distal femoral fractures represent a clinically consequential subset of lower-extremity trauma because disruption of the supracondylar region can compromise mechanical alignment, knee function, and the capacity for independent mobility (Nauth et al., 2024). Their management requires more than confirmation of bony discontinuity, as fracture morphology, surrounding soft tissues, associated injuries, and the physiological condition of the patient jointly determine the immediate priorities of care. Contemporary reviews identify substantial heterogeneity in fracture patterns, patient characteristics, and available stabilization strategies, which limits the usefulness of a uniform treatment pathway (Singh et al., 2024). Closed injuries require accurate assessment of displacement, comminution, and potential articular extension, since an intact skin envelope does not exclude extensive internal structural damage. Current clinical discussions emphasize the relationship between reduction quality, stable fixation, and preservation of knee function as central considerations in distal femoral fracture treatment (Shawky et al., 2023). Treatment decisions also involve uncertainty regarding the relative benefits and harms of competing interventions, rather than the selection of a universally superior implant (Claireaux et al., 2022). These considerations establish distal-third femoral fractures as a clinically significant condition requiring systematic assessment and individualized therapeutic planning to minimize complications and preserve functional capacity.

Recent advances in distal femoral fracture management have concentrated on retrograde intramedullary nailing and locking-plate fixation, with comparative investigations examining their mechanical characteristics and clinical outcomes across heterogeneous fracture populations (Aggarwal et al., 2023). Evidence from larger systematic reviews indicates that the comparative performance of these fixation techniques must be interpreted in relation to fracture configuration, patient characteristics, and methodological differences among the included studies (Kim et al., 2024). These findings demonstrate that implant selection cannot be reduced to a single therapeutic preference because satisfactory stabilization requires consideration of anatomical reconstruction, mechanical stability, and individual clinical requirements. Complex fracture configurations have encouraged investigation of

combined fixation strategies, including integrated nail-and-plate constructs supplemented by bone grafting in selected osteoporotic intra-articular distal femoral injuries (Kale et al., 2024). Postoperative rehabilitation has emerged as another important component of fracture management, particularly regarding the relationship between early weight-bearing and clinical outcomes following surgical fixation (Aebischer et al., 2025). Contemporary evidence consequently supports an individualized approach that integrates fracture morphology, fixation strategy, and rehabilitation considerations, although the applicability of aggregated findings to specific traumatic presentations remains dependent on the characteristics of each case.

Despite substantial progress in surgical techniques and clinical outcome evaluation, existing comparative studies predominantly synthesize findings across heterogeneous fracture patterns and treatment indications, potentially obscuring the reasoning underlying the management of individual closed distal-third femoral injuries (Aggarwal et al., 2023). Systematic evidence regarding therapeutic interventions provides an essential foundation for evaluating treatment effectiveness but does not necessarily explain how initial examination findings and radiographic characteristics are translated into sequential clinical decisions (Claireaux et al., 2022). Technical case literature demonstrates the importance of documenting reduction procedures and stabilization considerations in patients with severe metaphyseal comminution, highlighting the value of detailed descriptions of fracture-specific management (Abe & Iga, 2025). Differences between traumatic non-periprosthetic fractures and periprosthetic injuries further complicate the interpretation of available evidence because these populations may exhibit substantially different complication profiles and treatment requirements (Direder et al., 2024). The existing literature therefore provides extensive information regarding fixation alternatives and postoperative outcomes while offering less direct insight into the integrated assessment and treatment rationale of an individual closed comminuted distal femoral fracture following motorcycle-related trauma. This limitation constitutes a contextual and clinical documentation gap rather than an absence of established knowledge regarding distal femoral fracture management. Addressing this gap requires detailed examination of the relationship between injury mechanism, clinical presentation, fracture morphology, and stabilization decisions without extending conclusions beyond the evidentiary capacity of an individual case report.

The practical significance of this documentation gap becomes apparent when complex distal femoral fractures require therapeutic decisions based on incomplete or insufficiently integrated clinical information. Appropriate management depends on recognizing fracture configuration, achieving satisfactory reduction, and selecting fixation strategies capable of maintaining stability throughout the anticipated healing process (Shawky et al., 2023). Anatomical and biomechanical considerations further demonstrate that restoration of alignment and preservation of knee-related function are fundamental objectives in the management of distal femoral injuries (Nauth et al., 2024). Rehabilitation planning introduces additional considerations because the timing and extent of postoperative weight-bearing must be evaluated in relation to fixation stability and the available clinical evidence (Aebischer et al., 2025). Complication risks also vary among fracture subgroups, as demonstrated by evidence identifying a substantially greater complication burden in periprosthetic distal femoral fractures than in non-periprosthetic injuries (Direder et al., 2024). Detailed clinical documentation is consequently valuable for clarifying the rationale behind diagnostic evaluation, therapeutic selection, and recovery planning while preventing inappropriate generalization across anatomically or clinically dissimilar fracture populations.

The present case report is positioned within the literature as an anatomically focused clinical account of a 56-year-old woman presenting with a closed comminuted fracture involving the distal third of the right femur following a motorcycle accident. Unlike comparative investigations that evaluate fixation outcomes across large patient populations, the present study emphasizes the relationship between individual injury characteristics, diagnostic interpretation, and the clinical reasoning underlying treatment decisions (Kim et al., 2024). Its clinical focus also differs from reports investigating osteoporotic intra-articular fractures requiring combined fixation constructs because the interpretation of the present injury is restricted to the anatomical and clinical characteristics established by the patient's documented findings (Kale et al., 2024). Previous case-based evidence illustrates the importance of describing sequential reduction strategies for severe metaphyseal comminution, although the technical approach adopted in one fracture configuration cannot automatically be generalized to another (Abe & Iga, 2025). Broader reviews of distal femoral fracture management establish the

available therapeutic principles but leave opportunities for focused clinical reports demonstrating how these principles are considered in individual traumatic presentations (Singh et al., 2024). The specific contribution of the present report lies in integrating the mechanism of injury, clinical assessment, radiographic fracture characteristics, and rationale for operative stabilization within a single documented case of a closed distal-third right femoral fracture. This contribution represents a contextual and interpretive form of clinical novelty rather than a claim of an unprecedented fracture pattern, a newly developed surgical technique, or superior treatment effectiveness.

This case report aims to describe the clinical presentation, diagnostic evaluation, and management of a 56-year-old woman with a closed comminuted fracture involving the distal third of the right femur following a motorcycle accident. The investigation specifically examines how the documented mechanism of injury, physical examination findings, and radiographic characteristics contribute to fracture identification and clinical assessment. Particular attention is directed toward explaining the rationale for operative stabilization in relation to the anatomical characteristics and mechanical requirements of the fracture. The report also seeks to clarify the relationship between fracture morphology, reduction considerations, fixation planning, and anticipated functional recovery within the limitations of the available clinical documentation. Its scientific contribution consists of a structured clinical interpretation that connects diagnostic findings with therapeutic reasoning in the management of an individual distal femoral injury. The findings are intended to provide a case-based reference for clinical evaluation and treatment planning while maintaining the distinction between observations from a single patient and conclusions requiring broader comparative evidence.

RESEARCH METHODS

This study employed a descriptive clinical case report design based on the medical information documented during a surgical-clerkship case presentation at Kartini Regional General Hospital, Karanganyar Regency, Indonesia. The case involved a 56-year-old woman who sustained a closed comminuted fracture of the distal third of the right femur following a motorcycle accident. Clinical data were obtained from the documented injury history, physical examination, trauma assessment, plain radiographic findings, emergency management, and operative treatment, without prospective patient recruitment or experimental intervention. The clinical assessment focused on fracture morphology, anatomical involvement, and associated traumatic conditions, reflecting the principal diagnostic considerations described in contemporary distal femoral fracture literature (Nauth et al., 2024). Operative management was documented as open reduction and internal fixation, with the description restricted to procedures explicitly recorded in the original clinical report. Published orthopedic literature was incorporated to contextualize diagnostic interpretation and therapeutic considerations, particularly the relationship between fracture characteristics and surgical stabilization strategies, without constituting an independent systematic review or comparative investigation (Shawky et al., 2023).

Clinical information was organized chronologically, beginning with the mechanism of injury and presenting symptoms, followed by primary and secondary trauma surveys, relevant medical history, diagnostic imaging, emergency treatment, and definitive operative stabilization. Anteroposterior and lateral radiographs of the femur constituted the documented imaging sources, with their original clinical interpretations retained without introducing additional measurements, classification systems, or radiological findings. The descriptive evaluation emphasized the relationship between documented fracture morphology and operative considerations, consistent with the clinical documentation approach applied in case-based reports of complex distal femoral fractures (Abe & Iga, 2025). Data analysis was conducted through descriptive clinical interpretation, integrating the recorded examination findings, radiographic characteristics, and treatment procedures to explain the diagnostic assessment and rationale for surgical management without statistical testing or comparative outcome analysis. Supporting literature was examined narratively to contextualize established treatment principles, without claiming a systematic search strategy, formal evidence appraisal, or quantitative synthesis of published findings (Claireaux et al., 2022). Accuracy and traceability were maintained by preserving the clinical information contained in the original report and excluding undocumented postoperative imaging, fracture union assessments, rehabilitation progress, long-term functional outcomes, and other information that could not be substantiated from the available case documentation.

RESULTS AND DISCUSSION

Clinical Presentation and Initial Trauma Assessment

A 56-year-old woman presented to the emergency department of Kartini Regional General Hospital, Karanganyar Regency, Indonesia, with severe right thigh pain following a motorcycle traffic accident. The documented mechanism involved a fall in which the right lower extremity supported the patient's body weight, exposing the femur to traumatic mechanical loading. The patient reported continuous and intense pain, with a visual analog scale (VAS) score of 9/10, accompanied by swelling, visible deformity, and an inability to move the affected extremity. These manifestations indicated substantial musculoskeletal injury requiring immediate clinical assessment and stabilization. The patient denied loss of consciousness, nausea, and vomiting following the accident, providing preliminary information regarding her neurological condition and associated symptoms. Traumatic distal femoral fractures commonly present with localized pain, deformity, and functional impairment, although the severity of individual manifestations depends on fracture morphology and the mechanism of injury (Singh et al., 2024). The combination of severe pain, abnormal limb configuration, and movement restriction established a strong clinical suspicion of femoral fracture before radiographic confirmation, while the initial evaluation remained directed toward identifying potentially life-threatening associated injuries.

The primary trauma survey demonstrated a patent airway without evidence of obstruction, indicating that immediate airway compromise was not identified during the documented assessment. Respiratory examination revealed spontaneous breathing, symmetrical thoracic expansion, and normal vesicular breath sounds without apparent respiratory distress. Circulatory evaluation showed warm peripheral extremities, palpable arterial pulses, and capillary refill time of less than two seconds, with no clinical signs of hypovolemic shock. Neurological assessment demonstrated a Glasgow Coma Scale (GCS) score of 15, equal and reactive pupils, and preserved pupillary light reflexes, indicating normal consciousness at the time of examination. Exposure assessment identified swelling of the right thigh and shortening of the affected lower extremity compared with the contralateral side, without an open wound or other obvious external injury. The combination of preserved airway function, spontaneous ventilation, and maintained peripheral circulation supported continued diagnostic evaluation, although the potential for occult traumatic injury remains clinically relevant in patients presenting with major femoral fractures (Nauth et al., 2024).

The secondary trauma survey provided additional physiological and anatomical information necessary to characterize the patient's condition before definitive orthopedic management. Recorded vital signs included blood pressure of 160/112 mmHg, heart rate of 82 beats per minute, respiratory rate of 22 breaths per minute, body temperature of 36.6°C, and peripheral oxygen saturation of 98%. The patient remained conscious and oriented, with a GCS score of 15, supporting the consistency of the neurological findings obtained during the primary assessment. The elevated blood pressure was notable because it exceeded the expected resting range and occurred in a patient with a documented history of hypertension. Severe traumatic pain may complicate physiological assessment, but the available documentation does not establish whether the recorded blood pressure resulted primarily from chronic hypertension, acute pain, or another contributing factor. Clinical management of distal femoral fractures requires consideration of the patient's general physiological condition alongside the anatomical characteristics of the injury when planning definitive treatment (Shawky et al., 2023). The recorded findings indicated preserved consciousness and peripheral oxygenation without documented circulatory collapse, while the increased blood pressure represented an additional consideration for subsequent preoperative evaluation.

The general physical examination documented a normocephalic head without conjunctival pallor, scleral icterus, or visible facial abnormalities. Examination of the ears, nose, oral cavity, and cervical region revealed no reported traumatic abnormalities, cervical deformity, enlarged lymph nodes, or jugular venous distention. Thoracic inspection demonstrated symmetrical chest expansion without retraction, while pulmonary palpation, percussion, and auscultation were documented as symmetrical and unremarkable, with resonant percussion notes and vesicular breath sounds. Cardiovascular examination identified regular first and second heart sounds without an S3 gallop, although percussion suggested a somewhat enlarged cardiac border that was not further characterized in the available documentation. Abdominal examination demonstrated a flat, nondistended abdomen without reported tenderness or hepatosplenomegaly, while skin examination revealed no cyanosis, petechiae, or rash.

These observations did not identify clinically apparent thoracoabdominal trauma during the recorded examination, but the absence of external abnormalities cannot independently exclude occult associated injuries following substantial traumatic loading (Singh et al., 2024).

Examination of the extremities demonstrated preserved muscle strength of 5/5 in both upper limbs, with warm peripheral perfusion and capillary refill time of less than two seconds. The left lower extremity was described as clinically normal, providing a contralateral reference for evaluating the structural abnormalities of the injured limb. Inspection of the right lower extremity revealed shortening and external rotation relative to the left side, accompanied by marked tenderness involving the thigh. Passive movement produced severe pain, while active movement was not possible because of the intensity of the symptoms and the associated functional limitation. Crepitus could not be assessed reliably, indicating that this examination finding was not available as an additional diagnostic indicator. Abnormal alignment and restricted mobility are clinically relevant manifestations of femoral fractures because displacement and muscular forces may alter the anatomical relationship between fracture fragments (Nauth et al., 2024). The observed shortening, external rotation, and severe movement-related pain were consistent with substantial disruption of femoral structural integrity, although physical examination alone could not establish the exact fracture configuration or the extent of comminution.

Focused neurovascular assessment demonstrated palpable dorsalis pedis and posterior tibial arterial pulses in the affected extremity, indicating the presence of clinically detectable distal arterial pulsation. The right foot remained warm, with capillary refill time of less than two seconds, providing additional evidence of maintained peripheral perfusion during the documented examination. Inspection revealed no open wound or erythema, supporting the clinical characterization of the injury as a closed fracture rather than an open traumatic bone injury. Swelling was recorded during the initial trauma assessment, whereas the subsequent focused extremity examination documented no edema, representing a difference in descriptive findings that cannot be resolved from the available record. Preserved distal pulses and capillary refill provide clinically reassuring information but do not independently establish the absence of every possible vascular injury, particularly in fractures occurring near major neurovascular structures (Shawky et al., 2023). The neurovascular findings therefore supported continued orthopedic evaluation without a documented acute vascular emergency, while emphasizing the clinical relevance of reassessment when limb swelling, pain, or perfusion characteristics change.

The patient's medical history revealed a previous diagnosis of hypertension, for which she reported regular use of antihypertensive medication. She denied diabetes mellitus, previous stroke, and other chronic medical conditions, although the original report did not provide additional laboratory or instrumental evaluation of these conditions. No known medication allergies were reported, and the available history did not identify a familial background of chronic illness. The patient also denied smoking and alcohol consumption, providing information relevant to the characterization of her general health and potential perioperative considerations. The history of hypertension was clinically relevant because the recorded blood pressure of 160/112 mmHg warranted consideration during preparation for anesthesia and operative stabilization. Contemporary distal femoral fracture management emphasizes individualized treatment planning that accounts for patient characteristics and medical circumstances rather than fracture configuration alone (Nauth et al., 2024). The available documentation supports recognition of hypertension as a preexisting condition requiring clinical consideration, but it does not establish hypertensive end-organ complications, abnormalities in preoperative investigations, or a causal relationship between the elevated blood pressure and subsequent treatment decisions.

The integrated clinical assessment identified a traumatic right femoral injury characterized by severe localized pain, limb shortening, external rotation, tenderness, and pronounced functional restriction following a motorcycle accident. Preservation of consciousness, spontaneous respiration, and peripheral circulation indicated that the patient did not exhibit documented immediate airway compromise, respiratory failure, or circulatory shock during the initial assessment. The absence of an open wound supported classification of the injury as closed, while the combination of deformity and movement limitation justified further examination to establish fracture location and morphology. Contemporary orthopedic evidence emphasizes the importance of correlating clinical manifestations with anatomical assessment because definitive management depends on the characteristics of the fracture and the patient's general condition (Shawky et al., 2023). The clinical findings were insufficient to determine the precise degree of comminution, articular involvement, or formal fracture classification

without radiographic interpretation. The initial evaluation therefore provided the diagnostic foundation for subsequent imaging, confirmation of the distal-third right femoral fracture, and consideration of operative stabilization within the limitations of the documented clinical record.

Radiographic Findings and Diagnostic Characterization of Distal Femoral Fracture

Radiographic examination was performed using anteroposterior and lateral projections of the right femur to evaluate the anatomical characteristics of the suspected fracture. These examinations provided the principal imaging evidence for identifying the affected bone segment, evaluating cortical continuity, and determining the morphological characteristics of the traumatic injury. Conventional radiography remains a fundamental diagnostic modality for distal femoral fractures because it enables initial assessment of fracture location, fragment configuration, and the relationship between the injured bone and adjacent anatomical structures (Shawky et al., 2023). The radiographic interpretation in the present case was based on the findings documented in the original clinical report rather than additional measurements or retrospective imaging reconstruction. No supplementary radiographic projections, computed tomography examinations, or quantitative measurements of fragment displacement were recorded in the available documentation. Anatomical assessment of distal femoral fractures requires particular attention to metaphyseal integrity, fracture complexity, and proximity to the articular surfaces because these characteristics may influence subsequent stabilization strategies (Nauth et al., 2024). The diagnostic interpretation was consequently restricted to the radiographic characteristics explicitly documented in the source report, without assigning additional anatomical findings that could not be substantiated.

The anteroposterior and lateral radiographs demonstrated comminuted discontinuity involving the distal one-third of the right femur, establishing the anatomical location of the traumatic fracture. The original radiographic interpretation described the general bone structure and trabecular pattern as preserved despite the localized disruption of femoral continuity. The visible articular surfaces were reported as preserved, without osteophyte formation or abnormal soft-tissue lucency in the documented imaging findings. The presence of comminution indicated a fracture configuration involving multiple bone fragments, although the available report did not specify their precise number, dimensions, or spatial relationships. Distinguishing between preserved radiographically visible joint surfaces and the definitive exclusion of articular extension is clinically relevant because conventional radiographs may not completely characterize complex distal femoral fracture patterns (Singh et al., 2024). The documented radiographic findings supporting the diagnosis are represented in Figure 1, which provides the preoperative imaging reference for the present case.



Figure 1. Preoperative anteroposterior and lateral radiographs of the right femur

The radiographic findings demonstrated anatomical correspondence with the patient's clinical presentation, particularly severe right thigh pain, visible deformity, limb shortening, and inability to

perform active movement. The traumatic mechanism involving a motorcycle accident and subsequent loading of the right lower extremity provided a clinically plausible explanation for the observed disruption of femoral continuity. Shortening and external rotation identified during physical examination were compatible with mechanical instability and altered alignment of the affected limb, although the precise degree of radiographic displacement was not documented. Distal femoral fractures may exhibit substantial morphological variation because the direction and magnitude of traumatic loading interact with regional bone geometry and surrounding muscular forces (Nauth et al., 2024). The combination of clinical deformity and radiographic comminution strengthened the diagnostic interpretation by demonstrating concordance between functional impairment and structural injury. Clinical and radiographic correlation is particularly important when evaluating complex femoral fractures because treatment planning depends on both the anatomical configuration and physiological condition of the patient (Shawky et al., 2023). The available findings supported the diagnosis of a traumatic comminuted fracture involving the distal right femur without establishing additional radiological characteristics beyond those described in the clinical record.

Fracture morphology represents an important component of diagnostic characterization because simple and complex patterns differ in the extent of bone fragmentation and the mechanical requirements of stabilization. Simple femoral fractures are commonly described using transverse, oblique, or spiral configurations, whereas complex injuries may include segmental or comminuted patterns involving multiple fragments. The present fracture was characterized as comminuted, distinguishing its documented morphology from a simple fracture consisting of two principal fragments. The illustrative configurations included in Figure 2 provide a morphological reference for understanding differences among femoral shaft fracture patterns, although they do not establish a formal classification for the presented patient. Fracture comminution may complicate anatomical reduction and mechanical stabilization because multiple fragments can limit cortical contact and influence the distribution of forces across the fixation construct (Abe & Iga, 2025). Morphological interpretation must nevertheless distinguish general fracture-pattern illustrations from the specific diagnostic findings of distal femoral injuries, which require consideration of their relationship to the knee joint and distal metaphyseal region (Singh et al., 2024).

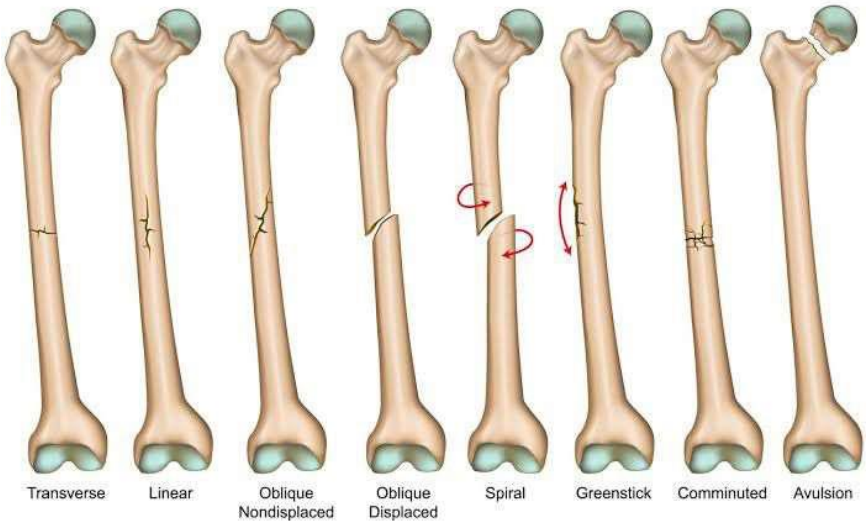


Figure 2. Illustrative patterns of femoral shaft fracture

The anatomical classification of distal femoral fractures requires differentiation between extra-articular, partial-articular, and complete-articular configurations according to the relationship between fracture lines and the distal femoral joint surface. The AO/OTA classification framework provides a structured approach to describing these configurations and distinguishing injuries according to their anatomical involvement and morphological complexity (Nauth et al., 2024). Extra-articular fractures involve the distal femoral region without fracture extension into the articular surface, whereas partial-articular fractures involve part of the joint surface while maintaining continuity between another articular segment and the femoral shaft. Complete-articular fractures are characterized by separation of

the articular component from the femoral shaft, potentially accompanied by additional metaphyseal or articular fragmentation. These distinctions have clinical significance because the extent of articular involvement influences reduction objectives, fixation requirements, and the need for precise reconstruction of joint congruity (Shawky et al., 2023). Figures 3, 4, and 5 illustrate the respective categories of distal femoral fracture classification as presented in the original manuscript. The available clinical record did not establish a verified numerical AO/OTA subtype for the patient, preventing assignment of a more specific classification without additional documented radiographic evidence.

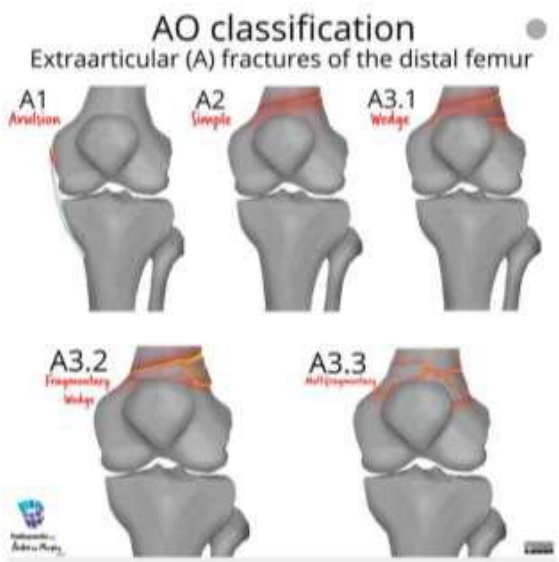


Figure 3. Illustrated AO classification of extra-articular distal femoral fractures



Figure 4. Illustrated AO classification of partial-articular distal femoral fractures



Figure 5. Illustrated AO classification of complete-articular distal femoral fractures

Evaluation of potential articular involvement is clinically relevant because fractures extending into the distal femoral joint surface may require different reduction priorities from injuries confined to the metaphyseal region. The original radiographic interpretation described the visible joint surfaces as preserved, but this observation was not accompanied by a specific statement establishing the complete absence of intra-articular fracture extension. Conventional anteroposterior and lateral projections may provide adequate initial characterization while remaining limited in their ability to demonstrate certain complex or overlapping fracture components (Singh et al., 2024). The source report discussed the potential role of computed tomography with three-dimensional reconstruction when conventional imaging does not sufficiently characterize distal femoral articular morphology. No computed tomography examination or three-dimensional reconstruction was documented for the present patient, and additional imaging findings cannot be inferred from the available material. The diagnostic interpretation therefore remained limited to a closed comminuted fracture of the distal third of the right femur, without an independently established articular classification or detailed fragment reconstruction.

Diagnostic evaluation of distal femoral trauma also requires consideration of associated skeletal and neurovascular injuries that may coexist with the principal fracture. Potential accompanying conditions include injuries involving the knee, tibial plateau, patella, adjacent ligamentous structures, and other segments of the femur, although none of these additional diagnoses was established in the documented case. The patient's severe localized thigh pain, abnormal limb alignment, and radiographically identified femoral discontinuity provided direct evidence supporting the principal fracture diagnosis. The distal femoral region is anatomically associated with important vascular and neurological structures, making peripheral perfusion and neurological assessment relevant components of the diagnostic process (Nauth et al., 2024). Clinical examination documented palpable dorsalis pedis and posterior tibial pulses, warm peripheral skin, and capillary refill time of less than two seconds, providing reassuring evidence regarding distal circulation during the recorded assessment. Preserved distal arterial pulsation does not independently exclude every possible vascular injury, particularly when evaluating complex traumatic fractures involving the distal femoral region (Shawky et al., 2023). The absence of documented vascular imaging, computed tomography, or additional neurological testing limits further interpretation of associated injuries beyond the findings recorded during the initial clinical assessment.

The integrated diagnostic assessment established a closed traumatic comminuted fracture involving the distal one-third of the right femur based on concordant clinical and radiographic findings.

The diagnosis was supported by the motorcycle-related injury mechanism, severe localized pain, limb shortening, external rotation, functional restriction, and radiographic evidence of disrupted femoral continuity. The documented preservation of visible articular surfaces and peripheral perfusion provided additional clinical information but did not establish a verified AO/OTA subtype or definitively exclude every associated intra-articular or neurovascular injury. Fracture characterization is relevant to operative planning because the anatomical distribution of fragments, mechanical stability requirements, and proximity to the knee joint influence the selection and application of fixation techniques (Aggarwal et al., 2023). The documented fracture morphology provided the anatomical basis for the treating team's decision to undertake operative stabilization, although the available record does not permit a comparative assessment of alternative fixation methods for this individual patient. These findings establish a clinically coherent diagnostic foundation for examining the subsequent emergency management, operative intervention, and limitations of the documented treatment course.

Emergency Management, Operative Stabilization, and Clinical Implications

Emergency management was initiated following the identification of a suspected right femoral fracture and completion of the documented primary and secondary trauma assessments. The affected lower extremity was immobilized to restrict movement at the fracture site and reduce additional mechanical stress during the initial treatment period. Intravenous Ringer's lactate was administered at a recorded infusion rate of 20 drops per minute as part of the emergency treatment plan. Pharmacological management included ranitidine 50 mg by injection twice daily and ketorolac 30 mg by injection three times daily, according to the original clinical documentation. These medication details represent the treatment administered or prescribed in the reported case and should not be interpreted as standardized recommendations for patients with distal femoral fractures. Initial stabilization and appropriate pain management are important components of acute fracture care because uncontrolled movement and persistent pain may complicate clinical assessment and subsequent therapeutic preparation (Shawky et al., 2023). The emergency treatment sequence reflected the clinical priorities of protecting the injured extremity, maintaining physiological stability, and preparing the patient for definitive fracture management, consistent with contemporary principles of orthopedic trauma care (Nauth et al., 2024).

Following emergency stabilization, the patient was admitted to the inpatient ward for further preparation before definitive operative management, and surgical consent was documented. The preoperative treatment plan included intravenous B-Fluid at 20 drops per minute, continuing the recorded approach to fluid administration during the preparation period. Additional prescribed medications comprised ranitidine 50 mg twice daily, ketorolac 30 mg three times daily, and cefazolin 2 g every 24 hours, as specified in the original clinical report. An anesthesiology consultation was requested, and the patient was instructed to undergo eight hours of preoperative fasting before the planned surgical intervention. The previously documented blood pressure of 160/112 mmHg and history of hypertension were relevant considerations for perioperative assessment, although the available record did not describe additional cardiovascular investigations or specific adjustments to antihypertensive treatment. Perioperative planning in patients with distal femoral fractures requires integration of fracture characteristics and individual physiological conditions, particularly when operative stabilization is considered necessary to restore structural integrity (Singh et al., 2024).

Definitive fracture management was performed through open reduction and internal fixation (ORIF), representing the operative treatment documented for the closed comminuted fracture of the distal third of the right femur. The procedure was conducted under general anesthesia, with the patient positioned supine to facilitate surgical access to the affected lower extremity. Sterile preparation and draping of the operative field were completed before surgical exposure, following the procedural sequence described in the original report. A lateral surgical approach was undertaken through the skin, subcutaneous tissue, fascia, and underlying muscle to expose the fractured femoral region. Direct visualization provided access to the fracture fragments for reduction and subsequent placement of internal fixation components. Surgical treatment of comminuted distal femoral injuries requires consideration of fragment configuration, anatomical alignment, and mechanical stability because these factors influence the technical requirements of reduction and fixation (Abe & Iga, 2025). The documented operative approach was consistent with the general objective of achieving anatomical

restoration and stable fixation, although the available report did not provide detailed measurements of fragment displacement, intraoperative alignment, or reduction accuracy (Shawky et al., 2023).

Following surgical exposure, the fracture fragments were reduced and stabilized using an internal fixation construct consisting of a plate and screws. The original operative description confirmed the use of plate-and-screw fixation but did not identify the implant manufacturer, plate configuration, screw dimensions, or number of fixation components. Irrigation of the operative field and hemostasis were performed after stabilization, followed by closure of the surgical incision and placement of a drain before completion of the procedure. These documented steps established the technical sequence of operative treatment without providing additional information regarding intraoperative complications, operative duration, or immediate postoperative radiographic confirmation. Plate fixation is among the established surgical approaches for distal femoral fractures, although the choice of implant and fixation technique depends on fracture configuration, bone characteristics, and the mechanical requirements of stabilization (Aggarwal et al., 2023). The documented intervention consequently demonstrates the selected operative method for this patient but does not independently establish the biomechanical superiority of the construct or confirm the quality of postoperative reduction.

The selection of internal fixation for the presented injury can be interpreted in relation to the mechanical characteristics of a comminuted fracture involving the distal femoral region. Multiple fracture fragments may complicate restoration of femoral continuity and create mechanical challenges associated with maintaining alignment during the healing process. The treating team selected a lateral plate-and-screw construct, providing a documented stabilization strategy for the patient's closed comminuted distal-third femoral fracture. Comparative investigations of retrograde intramedullary nailing and distal femoral plating indicate that the evaluation of fixation strategies must consider differences in fracture characteristics, surgical requirements, and reported clinical outcomes (Kim et al., 2024). Systematic evidence similarly demonstrates that comparative outcomes between these techniques require cautious interpretation because patient populations, fracture patterns, and study methodologies are not uniform (Aggarwal et al., 2023). More complex distal femoral fractures have also prompted investigation of combined nail-and-plate constructs, reflecting continuing efforts to improve mechanical stability in selected fracture configurations (Baumann et al., 2025). The present clinical documentation does not provide sufficient information to determine whether an alternative fixation construct would have produced superior outcomes, and the interpretation of treatment appropriateness must remain limited to the recorded anatomical findings and operative decisions.

Potential complications constitute an important consideration in evaluating distal femoral fracture management, particularly because the initial traumatic injury and subsequent operative intervention may introduce distinct clinical risks. Early complications associated with major femoral fractures can include significant hemorrhage, circulatory instability, neurovascular injury, fat embolism syndrome, and complications related to the surrounding soft tissues. The patient exhibited palpable distal arterial pulses, warm peripheral extremities, and capillary refill time of less than two seconds during the initial assessment, without documented clinical shock. These observations were reassuring at presentation but did not eliminate the need to consider subsequent vascular compromise, postoperative complications, or changes in the affected limb's clinical condition. Evidence from distal femoral fracture populations demonstrates that complication patterns vary according to fracture characteristics and clinical circumstances, particularly when comparing periprosthetic and non-periprosthetic injuries (Direder et al., 2024). The available case record contains no documented postoperative complications, but the absence of follow-up information prevents a definitive conclusion that infection, thromboembolic events, implant-related complications, or other adverse outcomes did not occur.

Postoperative care and rehabilitation were identified in the original clinical discussion as relevant components of continued fracture management, although the report did not document their actual implementation or measurable outcomes. Rehabilitation following distal femoral fixation generally addresses the preservation of knee mobility, recovery of muscular function, progressive restoration of weight-bearing capacity, and prevention of complications associated with prolonged immobilization. The timing and intensity of rehabilitation must be interpreted alongside fracture stability and the mechanical characteristics of the fixation construct rather than assumed to follow an identical progression in every patient. Recent systematic evidence has examined early weight-bearing after distal femoral fracture fixation, reflecting continued clinical interest in balancing functional

recovery with the mechanical requirements of fracture healing (Aebischer et al., 2025). Comparative analysis of weight-bearing and non-weight-bearing approaches in geriatric distal femoral fracture populations further demonstrates the importance of evaluating rehabilitation decisions according to the characteristics of the available evidence (Wardle et al., 2024). The presented case did not include recorded postoperative knee range of motion, muscle strength evaluation, weight-bearing progression, rehabilitation attendance, or functional mobility assessment. Consequently, the potential benefits of rehabilitation can be discussed as established clinical considerations, but improvement in mobility, prevention of stiffness, or successful functional recovery cannot be presented as observed outcomes of this patient.

The clinical course documented in this case demonstrates the sequential management of a closed comminuted distal-third right femoral fracture, beginning with emergency evaluation and immobilization and progressing to definitive operative stabilization. The relationship between traumatic mechanism, physical examination abnormalities, radiographic fracture identification, and surgical treatment provides a coherent account of the diagnostic and therapeutic decisions recorded during hospitalization. The use of ORIF with a lateral plate-and-screw construct represents the principal documented intervention, while the absence of detailed implant specifications and postoperative imaging limits further assessment of technical and mechanical outcomes. Longitudinal evaluation of distal femoral fracture treatment ordinarily requires information regarding fracture union, residual deformity, complications, knee function, and return to mobility, which were not available in the supplied clinical record (Rai et al., 2026). The contribution of this case report lies in its structured documentation of clinical presentation, diagnostic interpretation, and operative management in an individual patient with traumatic distal femoral comminution. Its findings support case-based clinical understanding of fracture assessment and stabilization but cannot establish comparative treatment effectiveness, uncomplicated healing, or long-term functional recovery without additional postoperative evidence.

CONCLUSION

This case report describes the clinical presentation, diagnostic evaluation, and operative management of a 56-year-old woman with a closed comminuted fracture involving the distal third of the right femur following a motorcycle accident. The traumatic injury was characterized by severe thigh pain, limb shortening, external rotation, visible deformity, and substantial restriction of movement. Initial trauma assessment demonstrated preserved consciousness, spontaneous respiration, and peripheral circulation without documented clinical evidence of shock. Neurovascular examination identified palpable distal arterial pulses, warm peripheral extremities, and capillary refill time of less than two seconds, indicating maintained distal perfusion during the recorded examination. Anteroposterior and lateral radiographs confirmed comminuted discontinuity involving the distal third of the right femur, supporting the clinical diagnosis. The correspondence between physical examination abnormalities and radiographic findings established the anatomical basis for subsequent therapeutic planning. These findings emphasize the clinical importance of systematic trauma assessment, careful neurovascular evaluation, and radiographic confirmation in patients presenting with suspected distal femoral fractures.

Initial management consisted of immobilization, intravenous fluid administration, analgesic treatment, and preoperative preparation before definitive surgical stabilization. Open reduction and internal fixation were performed under general anesthesia through a lateral surgical approach using a plate-and-screw construct. The documented operative procedure included fracture reduction, internal stabilization, irrigation, hemostasis, wound closure, and drain placement. The selected intervention reflected the clinical objective of restoring femoral alignment and achieving mechanical stability, although the available evidence does not establish its superiority over alternative fixation techniques. The absence of postoperative radiographs, fracture union assessments, rehabilitation records, and long-term follow-up prevents definitive evaluation of treatment effectiveness and functional recovery. Successful bone healing, prevention of complications, and restoration of independent mobility therefore cannot be established from the available clinical documentation. The principal contribution of this report is its structured integration of clinical findings, radiographic diagnosis, and operative decision-making, while highlighting the necessity of longitudinal follow-up to evaluate postoperative outcomes in distal femoral fracture management.

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