IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 24, Issue 12 Ser. 9 (December. 2025), PP 26-28
www.iosrjournals.org

Impact Of Trauma To Tensor Fascia Lata On Femor Neck

Muhammad Sagiru Abdu
Department Of Traumatology And Orthopedics, Kursk State Medical University Russia.

Abstract
Background: *Tensor fascia lata (TFL) is an anterolateral hip muscle that tensions the iliotibial band and contributes to hip stability and gait. Though research commonly examines femoral-neck fractures and hip abductor pathology, specific effects of traumatic injury to the TFL on femoral-neck biomechanics, fracture risk, and healing have not been thoroughly checked.*
Objectives: *To synthesize current evidence on TFL anatomy and function, describe clinical presentations of TFL trauma, summarize how TFL dysfunction may impact femoral-neck mechanics and outcomes, and highlight consequences for diagnosis and management.*
Methods: *A targeted literature research was performed across PubMed/PMC, orthopaedic databases, and specialty repositories for articles from 1980–2025 about TFL anatomy/function, TFL injuries or hypertrophy, surgical use of TFL (muscle-pedicle grafting) for femoral-neck pathology, femoral-neck biomechanics, and clinical case reports. Selected high-quality and recent sources were used to build a narrative synthesis.*
Results: *The TFL stabilizes the hip via tensioning of the iliotibial band and by acting as an accessory abductor/internally-rotating muscle; it is functionally connected to gluteal abductors for pelvic stability. TFL trauma may be underdiagnosed, presenting as pain, swelling, or hypertrophy; imaging (ultrasound, MRI) characterizes lesions. There are historical and recent reports of TFL being used surgically (muscle-pedicle bone grafts) to treat neglected femoral-neck fractures and early avascular necrosis, demonstrating anatomical proximity and potential biomechanical impact on femoral-neck healing. While no large clinical series prove that isolated TFL injury increases femoral-neck fracture risk, biomechanical concepts (loss of lateral tension/tension-band effect, altered abductor mechanics) plausibly increase bending moments across the femoral neck and may affect fixation stability and healing.*
Conclusions: *Trauma or dysfunction of the TFL can influence hip mechanics in ways relevant to femoral-neck loading and healing. Clinicians should consider TFL injury in lateral hip trauma, use targeted imaging, and integrate TFL status when planning fixation or rehabilitation for femoral-neck injuries. Future prospective biomechanical and clinical studies are required to assess risk and therapeutic impact.*

Date of Submission: 21-12-2025 Date of Acceptance: 31-12-2025

I. Introduction

The tensor fascia lata (TFL) is a small but biomechanically important muscle on the anterolateral hip that inserts into the iliotibial tract and contributes to pelvic stability and hip kinematics during gait (Gottschalk et al., 1989; Anatomy sources). The femoral neck is a regular site of traumatic fracture with significant morbidity, and its biomechanical environment is impactd by surrounding muscles and soft tissues (Orthobullets; recent biomechanical analyses). Although much research addresses femoral-neck fracture mechanics, and separate research addresses hip abductor pathology and TFL hypertrophy, the specific clinical and biomechanical consequences of trauma to the TFL on the femoral neck — including fracture risk, fixation stability, and healing — have not been systematically synthesized. This review gathers anatomy and biomechanical evidence, clinical cases of TFL injury/hypertrophy, and the surgical record where the TFL has been used to augment femoral-neck surgery, to clarify plausible mechanisms and clinical consequences. NCBI+2Kenhub+2

II. Methods

We performed a targeted search (PubMed/PMC, Google Scholar, ResearchGate, orthopaedic educational portals) for English-language articles from 1980 through November 2025 covering: “tensor fascia lata”, “tensor fascia lata injury”, “tensor fascia lata hypertrophy”, “tensor fascia lata muscle-pedicle graft”, “femoral neck fracture”, “femoral neck biomechanics”, “hip abductor dysfunction”, and related surgical approaches. Sources included anatomy reviews, case reports, surgical series, biomechanical studies, and contemporary review articles. Priority was given to publications that directly linked TFL anatomy/function to femoral-neck procedures or biomechanics; case reports and surgical series demonstrating TFL use in femoral-neck surgery were included to illustrate clinical relevance. Selected sources are cited throughout. (See References.) Physiopedia+2NCBI+2

Anatomy and biomechanics of the TFL and femoral neck

Anatomy: The TFL lies in the proximal anterolateral thigh, inserting into the iliotibial band (ITB). There is interindividual variability in muscle belly length and insertion, but it typically terminates proximal to the greater trochanter and tensions the ITB. The TFL works with gluteal abductors to stabilize the pelvis in single-leg stance and to resist bending forces transmitted through the femoral shaft into the femoral neck (anatomy reviews). NCBI+2Physiopedia+2

Biomechanical role: The TFL contributes to the lateral tension-band effect via the ITB, counteracting adduction moments and helping distribute forces across the proximal femur during gait. Dysfunction or loss of TFL tension (from trauma, rupture, or denervation) may increase bending moments on the femoral neck and alter the distribution of compressive and tensile stresses, potentially influencing fracture risk or fixation stability. Contemporary biomechanical evaluations of femoral-neck fixation underline the sensitivity of the neck to altered loading patterns (experimental biomechanics and fixation comparisons). Kenhub+1

Clinical presentations of TFL trauma and pathology

TFL pathology can present in several ways:

- Overuse and tendinopathy: repetitive loading leading to TFL/ITB pain. Rehab Hero
- Acute traumatic injury: direct contusion or muscle tear from blunt lateral hip trauma; may present with localized anterolateral hip pain and swelling. Imaging with ultrasound or MRI can detect muscle tears or hematoma. Rehab Hero+1
- Hypertrophy/pseudotumour: there are case reports of unilateral TFL hypertrophy presenting as a mass and hip pain; often secondary to compensatory overuse after gluteal abductor dysfunction. Such hypertrophy illustrates the muscle's adaptive capacity and altered mechanics around the hip. PMC+1

Notably, many case series emphasize that isolated TFL injury is uncommon and often occurs with concurrent abductor pathology (gluteus medius/minimus), making isolated-effects studies difficult. OUP Academic+1

Evidence linking TFL status to femoral-neck mechanics, fracture risk, and healing

Indirect and surgical evidence: Historically and in contemporary practice, the TFL has been used surgically as a muscle-pedicle bone graft (MPBG) in neglected femoral-neck fractures and as an adjunct in early avascular necrosis (AVN) to improve vascularity and provide a biological scaffold — indicating anatomical proximity and potential impact on neck healing. Several surgical series and case reports (including recent series) report favorable radiologic and clinical outcomes using TFL MPBG in selected neglected femoral-neck fractures and AVN cases, suggesting that manipulation/augmentation of the TFL region can affect femoral-neck biology and outcome. PMC+2ijoro.org+2

Direct evidence: There are no large prospective clinical studies that directly quantify how acute traumatic injury to the TFL alone changes femoral-neck fracture risk in humans. Most mechanistic links are inferential, based on anatomy/biomechanics and clinical reports linking abductor dysfunction to altered hip mechanics.

Implication: The fact that surgeons can mobilize the TFL to augment femoral-neck healing supports the hypothesis that trauma to the TFL (or its loss of function) could negatively impact femoral-neck biomechanics and healing potential, though direct causal proof is lacking. PMC+1

Biomechanical modeling: Cadaveric and implant-comparison studies show femoral-neck loading is sensitive to abductor function and lateral soft-tissue tension. Loss of lateral tensioning (from abductor deficiency or TFL dysfunction) may increase varus bending and shear across fracture sites, with potential consequences for fixation failure or nonunion. Contemporary comparisons of fixation constructs report variable mechanical stability under altered loading — reinforcing the clinical relevance of peri-articular muscle function. bioRxiv+1

Diagnostic considerations

- Clinical exam: focal anterolateral tenderness, weakness in abduction/flexion, gait abnormalities.
- Imaging: Ultrasound is important for acute muscle tears and hematoma; MRI provides excellent soft-tissue characterization and can detect hypertrophy, fatty infiltration, and associated gluteal tendon pathology. Radiographs and CT remain essential for femoral-neck pathology; surgical planning should include assessment of lateral soft tissues when feasible. jbsr.be+1

Management and rehabilitation consequences

- Acute TFL injury: conservative therapy (rest, analgesia, targeted physiotherapy) for contusions or partial tears; surgical repair only for large avulsions or persistent symptomatic cases. Attend to associated abductor pathology. Rehab Hero+1
- In femoral-neck fracture cases: assess peri-capsular and lateral soft-tissue status (including TFL and gluteal muscles) as part of preoperative planning. Abductor dysfunction and lateral tension loss may affect fixation

choice (e.g., valgus-impacted fixation strategy, plate vs. multiple screws, FNS vs. CCS) and postoperative rehabilitation protocols. Consider biologic augmentation methods where emphasized (note: TFL MPBG has historical/recent use in neglected fractures and AVN). BioMed Central+2ijoro.org+2

Rehabilitation: Early restoration of abductor function and progressive loading to re-establish lateral tension-banding may be beneficial to reduce adverse bending across the femoral neck. Specific protocols should be informed by the fracture pattern and fixation stability. Kenhub

Gaps in knowledge and future research

- Biomechanical cadaveric or finite-element studies that selectively ablate TFL contribution (with intact gluteals) could quantify changes in femoral-neck stress distribution.
- No prospective research points whether acute isolated TFL injury increases femoral-neck fracture risk or impairs healing.
- Clinical registries of hip trauma should systematically record lateral soft-tissue injuries (TFL/abductors) alongside bony injuries to allow adjusted outcome analyses.
- Trials comparing fixation methods that account for abductor/TFL status could identify best practices for cases with lateral soft-tissue compromise. bioRxiv+1

III. Conclusion

Although direct high-level evidence linking isolated TFL trauma to increased femoral-neck fracture risk or poor healing is lacking, anatomical, biomechanical, clinical, and surgical evidence together support a plausible and clinically relevant relationship. The TFL contributes to lateral tension and pelvic stability, and its injury or dysfunction may alter load distribution across the femoral neck — potentially affecting fracture mechanics, fixation success, and healing. Clinicians treating hip trauma and femoral-neck fractures should assess TFL and abductor status, consider targeted imaging, and integrate soft-tissue considerations into surgical planning and rehabilitation. Focused biomechanical and prospective clinical research is needed to quantify the magnitude of the effect and to develop evidence-based management algorithms.

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