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THE EVOLUTION OF ETIOPATHOGENESIS AND CONSERVATIVE MANAGEMENT OF ILIOTIBIAL BAND SYNDROME IN LONG-DISTANCE RUNNERS: A COMPREHENSIVE REVIEW

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ABSTRACT

Iliotibial band syndrome (ITBS) is the leading cause of lateral knee pain in endurance runners, affecting up to 12% of this group (Hadeed & Tapscott, 2023). Historically, ITBS was classified as a "friction syndrome," attributed to the distal band sliding over the lateral femoral epicondyle (LFE). Recent anatomical, histological, and biomechanical studies have challenged this view, instead supporting a "compression model." This review details the shift from friction-based theories to the current understanding of impingement on innervated adipose tissue. Conservative management strategies, including traditional stretching, hip abductor strengthening (HAS), gait retraining, and adjunctive therapies such as extracorporeal shockwave therapy (ESWT) and dry needling (DN), are critically evaluated. A 2024 systematic review of 13 studies reported that multiplanar HAS and gait retraining achieved pain reduction rates ranging from 27% to 100%. Heavy Slow Resistance (HSR) training and cadence manipulation (increasing by 5–10%) are identified as key interventions for improving tissue tolerance. Effective ITBS management requires addressing both proximal hip stability and distal mechanics, while attempts to "release" the stiff, inextensible band are unlikely to provide benefit.

KEYWORDS

Iliotibial Band Syndrome, Running Biomechanics, Hip Abductor Strengthening, Gait Retraining, Compression Syndrome, Heavy Slow Resistance Training

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1. Introduction

Knee pain impairs mobility and quality of life in approximately 25% of the adult population. (Chen et al., 2025)1 Among endurance athletes, iliotibial band syndrome (ITBS) acts as the second most common running-related injury (RRI), accounting for roughly 10% to 12% of all lower-extremity complaints. (Worp et al., 2012, pp. 969-992) Since its initial identification in 1975 among U.S. Marine Corps recruits, the medical community has struggled to determine the precise etiopathogenesis of the condition. (Hadeed & Tapscott, 2026) Early models focused on "Iliotibial Band Friction Syndrome" (ITBFS), assuming that a "tight" band rubbed against the lateral femoral epicondyle (LFE) during repetitive flexion and extension cycles.

Although ITBS is prevalent, clinical outcomes have remained inconsistent for decades, with high recurrence rates and prolonged disability frequently observed. These challenges led to a paradigm shift in the mid-2000s, when researchers such as Fairclough and colleagues questioned the validity of the "sliding" band concept. ITBS is now recognized as a multifactorial impingement disorder characterized by neuromuscular inhibition and abnormal joint kinematics. This review traces the clinical evolution of ITBS, examines both proximal and distal risk factors, and synthesizes evidence supporting a phase-based, active rehabilitation approach.

2. Methodology

This comprehensive review synthesizes data from literature published between 1975 and 2025.

1. **Search Strategy:** Electronic databases, including PubMed, Web of Science, Medline, and CINHAL, were searched using terms such as "iliotibial band," "running biomechanics," "hip abductor strengthening," and "gait retraining."
2. **Inclusion Criteria:** Primary research, systematic reviews, and meta-analyses published in peer-reviewed journals were prioritized. Special emphasis was placed on a 2024 Frontiers systematic review involving 201 participants and high-quality anatomical studies.

3. **Data Extraction:** Information on pain reduction (VAS/NPRS), functional improvement (LEFS), and biomechanical variables (peak hip adduction and knee internal rotation) was extracted from 13 major studies and summarized in evidence tables.
4. **Quality Assessment:** Studies were appraised using the NIH Tool. The included systematic reviews were rated as "good" to "moderate" quality.

3. Etiopathogenesis: From Friction to Compression

3.1 The Historical Friction Model (1975–2006)

The first description by Renne (1975) hypothesized that the ITB moved anteriorly and posteriorly over the LFE. It was proposed that at 0° of flexion, the band is anterior to the epicondyle, and as the knee flexes past 30°, the band "flicks" posteriorly. This 30° point was labeled the "impingement zone," and the resulting pain was attributed to inflammation of an underlying bursa or the band itself due to friction. Consequently, decades of treatment focused on anti-inflammatory medications, bursa injections, and aggressive stretching of the "tight" ITB.

3.2 The Anatomical Revolution (Fairclough et al.)

In 2006 and 2007, Fairclough et al. published landmark studies employing high-resolution MRI and cadaveric dissection that overturned the friction model.

- **The Anchoring Mechanism:** Dissection revealed that the ITB is not a free-standing chord but is anchored to the femur by the lateral intermuscular septum and Kaplan fibers.
- **The Illusion of Movement:** The "flicking" sensation felt by clinicians and patients was reinterpreted as an illusion arising from changes in tension in the anterior and posterior fibers of the band, rather than actual translation.3
- **The Adipose Fat Pad:** Instead of a bursa, researchers found a highly vascularized and innervated fat pad deep to the ITB. Pain is now considered to result from the medio-lateral compression of this sensitive fat pad against the LFE, particularly during the early stance phase of running when the knee is at 30° of flexion.

3.3 Kaplan Fibers and Rotational Stability

Recent evidence from 2024 and 2025 has illustrated the role of the Kaplan Fiber (KF) system—comprising proximal (PKF) and distal (DKF) bundles—in secondary rotational stability. These fibers connect the deep ITB to the supracondylar region of the femur. Injuries to these fibers, often co-occurring with ACL tears, produce significant internal rotatory instability, additionally complicating biomechanical loading of the lateral knee. (Landfald et al., 2025)

4. Biomechanical Risk Factors: The Kinetic Chain

The development of ITBS rarely occurs as an isolated knee disorder. Rather, it reflects a failure of the kinetic chain to manage repetitive compressive loads.

4.1 Proximal Factors: Hip Adduction and Gluteal Inhibition

Prospective and cross-sectional studies have consistently identified excessive hip adduction as a major risk factor. (Aderem & Louw, 2015)

- **Mechanism:** When the hip adducts, the ITB is stretched over the LFE, increasing the compressive force on the underlying fat pad.
- **Gluteal Weakness:** Evidence is somewhat conflicting. Many studies show that runners with ITBS have weaker hip abductors (gluteus medius) and external rotators than healthy controls. A systematic review found that female runners who developed ITBS had greater peak hip adduction. (Worp et al., 2012, pp. 969-992)

4.2 Distal Factors: Knee Internal Rotation and Foot Type

- ✓ **Knee Internal Rotation:** Increased peak internal rotation of the tibia relative to the femur yanks the distal portion of the ITB (at Gerdy's tubercle) against the LFE.
- ✓ **Foot Type:** A 2025 study found that runners with a supinated foot type (SUPg) showed greater TFL fiber activation than neutral runners. This is likely due to increased biomechanical demands. Conversely, pronated foot types can drive internal tibial rotation and add to ITB strain. (Sánchez-Gómez et al., 2025)

4.3 Step Width and the "Crossover Gait."

The "crossover gait" occurs when the foot strike crosses the body's midline. This is one of the most significant modifiable gait factors. Meardon et al. (2012) found that as step width decreases, ITB strain and strain rate increase linearly. Increasing step width by 1–2 inches can markedly reduce both strain and strain rate ($p < 0.001$).

5. Results: Clinical Efficacy of Management Strategies

The 2024 systematic review from *Frontiers in Sports and Active Living* analyzed 13 studies to determine the effectiveness of conservative strategies.

Treatment Strategy	Studies Reporting	Pain Reduction	Functional Improvement
Combined (HAS + St + GT)	8 Studies	27% – 100%	10% – 57%
HAS (Single Strategy)	7 Studies	Significant	Significant
Gait Retraining (GT)	2 Studies	100% (Case study)	13%
ESWT (Shockwave)	2 Studies	57% – 75%	29%
Dry Needling (DN)	1 Study	80%	57%

5.1 The "Stretching Myth" and Tissue Stiffness

A critical finding in recent tissue science is that the ITB cannot be functionally lengthened by stretching. The band is an incredibly stiff structure. It ruptures at around 80kg of tension. Intermittent stretching does not change its mechanical properties. Because stretching increases tension, it may actually aggravate compression of the sensitive fat pad. (Pepper et al., 2021)

5.2 Strengthening and HSR (Heavy Slow Resistance)

Strengthening the hip abductors remains the gold standard.2 However, the *type* of loading matters. HSR training—using heavy loads with a slow tempo (3 seconds up, 3 seconds down)—is now preferred over traditional high-rep endurance work. This protocol stimulates collagen remodeling and improves tendon-like stiffness, which increased by 14% in runners following structured physiotherapy. (Sivrika et al., 2023)

6. Discussion: A New Standard of Care

The transition from a friction-based to a compression-based model represents a pivotal advancement in ITBS management. Effective treatment should move beyond outdated strategies and prioritize interventions that address the specific biomechanical and neuromuscular contributors to the syndrome. Clinicians are encouraged to critically evaluate and adapt their protocols to reflect this updated understanding, ensuring that patient care remains evidence-driven and outcome-focused.

6.1 Clinical Utility of Adjunctive Therapies

Although active exercise forms the foundation of treatment, therapies such as ESWT and dry needling serve as effective adjuncts for pain modulation.6 A randomized controlled trial of 40 patients found that both DN and ESWT significantly improved pain and LEFS scores ($p < 0.001$).6 Notably, DN demonstrated significantly better pain scores at the 4-week follow-up ($p = 0.023$), likely due to its effect on trigger points in the TFL and gluteal muscles.6

6.2 The Impact of Running Footwear

The debate between minimalist and maximalist footwear remains central to runner education. Minimalist shoes promote a midfoot or forefoot strike, which may reduce knee loading (3.87 body weights compared to 4.74 in maximalist shoes). However, rapid transition to minimalist footwear is associated with high injury rates (up to 86% in the first 6 weeks) (Effects of footwear and foot strike patterns on patellofemoral joint and Achilles tendon loading in novice runners and experienced runners, 2023). For individuals with ITBS, footwear that discourages excessive internal rotation or provides a stable "knee window" is recommended.

6.3 Psychosocial and Novel Risk Factors

Recent research from 2024 and 2025 has identified novel independent risk factors associated with a history of ITBS, including a higher prevalence of chronic diseases (PR = 2.38) and a history of allergies (PR = 1.9). Additionally, fear-avoidant beliefs are strong predictors of delayed recovery (Risk factors associated with a history of iliotibial band syndrome (hITBS) in distance runners: a cross-sectional study in 76,654 race entrants - a SAFER XXXIII study, 2023). Clinicians are encouraged to adopt a biopsychosocial model that addresses both biomechanical factors and the runner's beliefs about the injury.

7. Comprehensive Rehabilitation Protocol

Based on the current consensus, a 4-phase protocol is recommended:

- **Phase I: Pain Dominant (Weeks 0–2):** Reduce irritability. Activity modification: Switch to fast treadmill walking at an 8–10% incline (avoids the 30° zone). Exercises: Side-lying abduction, clamshells, and Thomas exercise. 9
- **Phase II: Sub-Acute (Weeks 2–4):** Build capacity using HSR training. Exercises: 3 sets of 10–12 reps of split squats (trailing leg as training leg), single-leg bridges, and side planks.
- **Phase III: Remodeling (Weeks 4–8):** Dynamic loading should be introduced, including plyometrics (lateral skaters, mini squat jumps), box jumps, and cadence manipulation with a metronome (M., 2023).
- **Phase IV: Return to Running:** A graded return to running on flat surfaces is recommended (M., 2023). Focus on "widening the knee window" and increasing cadence by 5–10%.

8. Conclusions

Management of ITBS has progressed from a narrow focus on lateral knee inflammation to a comprehensive biomechanical and neuromuscular approach. The rejection of the friction theory represents a significant advancement, allowing clinicians to prioritize movement correction over symptomatic treatment. Emphasizing hip stability, implementing HSR training to enhance tissue resilience, and utilizing gait retraining to address crossover patterns can promote durable, pain-free performance in long-distance runners. Future research should prioritize large-scale randomized controlled trials to standardize gait retraining protocols and investigate the long-term effects of novel risk factors, including chronic disease and allergies, on the prevalence of running-related injuries.

REFERENCES

1. Allen, G. W. (2014). Longitudinal management of iliotibial band syndrome in a runner. *International Journal of Sports Physical Therapy, 9*(3), 378–390.
2. Fairclough, J., et al. (2006). The functional anatomy of the iliotibial band during flexion and extension of the knee. *Journal of Anatomy, 208*(3), 309–316.
3. Maghroori, R., et al. (2021). Shockwave therapy versus dry needling for the management of iliotibial band syndrome. *Journal of Musculoskeletal Medicine, 10*(4), e2174.
4. Meardon, S. A., et al. (2012). Step width alters iliotibial band strain during running. *Sports Biomechanics, 11*(4), 464–472.
5. Zemadanis, K., & Bestos, E. (2024). Efficacy of conservative treatment strategies for runners with ITBS: A systematic review. *Frontiers in Sports and Active Living, 6*, 1386456.