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Topical Phytotherapeutics in Siddha Medicine for Achilles Tendinopathy: Clinical Perspectives and Expanded Insights

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Abstract: Achilles tendinopathy is a chronic, degenerative musculoskeletal condition characterized by pain, stiffness, and impaired functional performance of the tendon. It arises primarily from repetitive mechanical overload and inadequate healing responses, leading to collagen disorganization and persistent inflammation (Maffulli et al., 2020; Cook and Purdam, 2009). Siddha medicine, a traditional system originating in South India, provides a distinct therapeutic framework through Pura Maruthuvam (external therapies), which includes Ottradam (fomentation), Pottanam (herbal poultice), Thailam (medicated oil application), and Kalimbu (topical ointments). These interventions combine thermotherapy, phytotherapy, and manual techniques to modulate local tissue pathology. This article elaborates on the Siddha conceptual understanding of tendon disorders, details therapeutic procedures, and explores the pharmacological actions of key medicinal plants, highlighting their relevance in integrative management of Achilles tendinopathy.

Keywords: *Achilles Tendinopathy; Siddha Medicine; Pura Maruthuvam; Ottradam; Pottanam; Thailam; Kalimbu; Vatha Disorders; Phytotherapy; Herbal Medicine; Thermotherapy; Transdermal Drug Delivery; Inflammation; Tendon Degeneration.*

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I. INTRODUCTION

The Achilles tendon, the strongest and largest tendon in the human body, plays a critical role in locomotion by transmitting forces from the calf muscles to the foot. Despite its strength, it is particularly susceptible to overuse injuries due to its limited blood supply and high mechanical loading during activities such as running and jumping. Achilles tendinopathy represents a spectrum of tendon disorders characterized by pain, swelling, and functional impairment (Maffulli et al., 2020).

From a biomedical perspective, the condition is no longer considered purely inflammatory but rather degenerative, involving collagen fiber disruption, increased ground substance, neovascularization, and tenocyte dysfunction (Cook and Purdam, 2009; Scott et al., 2015). Conventional treatments include physiotherapy, non-steroidal anti-inflammatory drugs (NSAIDs), and in severe cases, surgical intervention. However, these approaches may not always yield satisfactory long-term outcomes and can be associated with adverse effects (Dean et al., 2014).

In contrast, traditional systems such as Siddha medicine emphasize restoring internal balance and enhancing the body's natural healing capacity. External therapies in Siddha provide localized treatment, minimizing systemic exposure while addressing both symptoms and underlying pathology (Uthamarayan, 2006).

II. SIDDHA PERSPECTIVE ON TENDON DISORDERS

Siddha medicine conceptualizes health as a balance between three fundamental humors: Vatham, Pitham, and Kabam (Shanmugavelu, 2015). Among these, Vatham governs movement, nerve function, and musculoskeletal integrity. Disturbances in Vatham are therefore closely linked to disorders of tendons, ligaments, and joints.

Achilles tendinopathy is commonly interpreted as a form of Vatha Soolai, a condition characterized by pain, stiffness, and restricted movement. The imbalance of Viyanan Vayu—a subtype of Vatham responsible for circulation and coordinated movement—leads to decreased lubrication and elasticity of tendon fibers (Ramasamy, 2013). This results in clinical manifestations such as stiffness

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(Stambam), pricking pain, and reduced mobility.

Additionally, Siddha theory attributes disease progression to the accumulation of deranged humors that obstruct physiological channels, impairing the flow of vital energy (Uyir thathukkal). External therapies are therefore employed to "liquefy" and disperse these accumulated humors, restore circulation, and re-establish tissue homeostasis (Narayanasamy, 2012).

- *External Therapeutic Modalities (Pura Maruthuvam)*

Siddha medicine describes 32 types of external therapies, many of which are specifically designed to manage pain and inflammation. In the context of Achilles tendinopathy, the following modalities are particularly significant:

- *Ottradam (Fomentation)*

Ottradam involves the application of heat using cloth bundles filled with herbal materials such as leaves, powders, or grains. The heat induces vasodilation, increases local blood flow, and promotes sweating. This facilitates the removal of metabolic waste products and reduces muscle and tendon stiffness (Lehmann, 1982; Govindarajan and Vijayakumar, 2010).

From a Siddha perspective, fomentation helps pacify aggravated Vatham by restoring warmth and moisture to affected tissues.

- *Pottanam (Herbal Poultice)*

Pottanam utilizes heated herbal powders or plant materials applied directly to the affected area. The combination of heat and medicinal compounds enhances transdermal absorption, allowing active phytochemicals to penetrate underlying tissues (Singh et al., 2011).

This therapy is particularly beneficial in reducing localized swelling, alleviating pain, and improving flexibility. It also promotes lymphatic drainage and reduces tissue congestion (Nadler, 2004).

- *Thailam (Medicated Oil Application)*

Medicated oils prepared with herbs such as Vitex negundo are applied through therapeutic massage (Thokkanam). This technique improves circulation, enhances tissue elasticity, and reduces stiffness.

Massage also provides mechanical stimulation that helps break down adhesions and improve tendon gliding. Additionally, lipid-soluble phytochemicals present in the oils facilitate deeper tissue penetration, enhancing anti-inflammatory effects (Field, 2014).

- *Kalimbu (Herbal Ointment)*

Kalimbu refers to semi-solid herbal formulations applied topically. These preparations may produce either warming or cooling effects depending on their composition. They are used to relieve pain, reduce inflammation, and support tissue repair by delivering bioactive compounds directly to the site of injury (Mukherjee, 2002).

- *Pharmacological Profile of Key Siddha Herbs*

The therapeutic efficacy of Siddha external treatments is largely attributed to the diverse phytochemical constituents of medicinal plants:

- *Curcuma Longa (Turmeric)*

Curcumin, the primary bioactive compound, possesses potent anti-inflammatory and antioxidant properties. It modulates key signaling pathways such as NF-κB, thereby reducing the production of inflammatory cytokines (Aggarwal and Harikumar, 2009). Curcumin also protects tendon cells from oxidative stress and may promote collagen synthesis (Hewlings and Kalman, 2017).

- *Zingiber Officinale (Ginger)*

Ginger contains active compounds such as gingerols and shogaols, which inhibit prostaglandin and leukotriene synthesis. These actions contribute to its analgesic and anti-inflammatory effects (Grzanna et al., 2005). Its warming properties also enhance circulation and provide symptomatic relief from deep-seated tendon pain (Mashhadi et al., 2013).

- *Vitex Negundo (Nochi)*

Vitex negundo is widely used in Siddha medicine for its Vatha-pacifying properties. It contains flavonoids and other compounds that inhibit inflammatory enzymes such as COX-2 and stabilize mast cells, thereby reducing inflammation and edema (Dharmasiri et al., 2003; Tandon, 2005).

- *Saussurea Lappa (Koshtam)*

This plant contains sesquiterpene lactones with strong anti-inflammatory activity. It may help prevent tendon degeneration by inhibiting inflammatory mediators and supporting structural integrity (Pandey et al., 2007; Wang et al., 2008).

III. DISCUSSION

Siddha external therapies offer a multifaceted approach to managing Achilles tendinopathy by integrating thermal, mechanical, and pharmacological mechanisms.

Thermotherapy techniques such as Ottradam and Pottanam enhance blood flow to the Achilles tendon, which is relatively avascular. Improved circulation facilitates nutrient delivery and waste removal, both essential for tissue repair (Lehmann, 1982).

Simultaneously, phytochemicals delivered through the skin exert localized anti-inflammatory effects. Curcumin and ginger derivatives modulate inflammatory pathways, while Vitex negundo reduces tissue swelling and stabilizes inflammatory responses (Aggarwal and Harikumar, 2009; Dharmasiri et al., 2003).

Massage therapy further contributes by improving tissue mobility, reducing adhesions, and enhancing neuromuscular coordination (Field, 2014).

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Unlike systemic pharmacological treatments, Siddha therapies focus on localized intervention, minimizing adverse effects while promoting long-term healing. This integrative approach aligns with modern concepts of regenerative medicine and highlights the potential of traditional practices in contemporary healthcare.

IV. CONCLUSION

Siddha medicine provides a comprehensive and holistic approach to the management of Achilles tendinopathy through its external therapeutic modalities. By combining thermotherapy, phytotherapy, and manual techniques, these treatments address both the symptoms and underlying causes of tendon degeneration.

Medicinal plants such as turmeric, ginger, Vitex negundo, and Saussurea lappa play a crucial role in modulating inflammation and supporting tissue repair. The emphasis on restoring Vatha balance further enhances functional recovery and long-term outcomes.

As interest in integrative and non-invasive therapies continues to grow, Siddha external treatments offer valuable insights and promising complementary strategies for managing chronic musculoskeletal disorders.

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