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AGNIKARMA IN CHRONIC TENDINOPATHIES (TENNIS ELBOW & PLANTAR FASCIITIS): A THERMAL-IMAGING BASED ASSESSMENT OF DEPTH OF *AGNI*-SCAR TISSUE RESPONSE — AN AYURVEDIC INTERVENTIONAL REVIEW

Dr. Sandeep Shivram Mohate*[1], Dr. Shruti Sandesh Shukla[2], Dr. Shubham Pankaj Hajari[3]

[1]Assistant Professor, Department of Shalya Tantra, RJS Ayurved Medical College, Kokamtham, Kopargaon, Dist. Ahmednagar, Maharashtra.

[2]Assistant Professor, Department of Shalya Tantra, *SMBT Ayurved* College and Hospital, Dhamangaon, Nashik.

[3]Assistant Professor, Department of Shalya Tantra, SSSUTMS School of Ayurveda and Siddha Studies, Pachama, Sehore, MP.

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***Corresponding Author**

Dr. Sandeep Shivram Mohate

Assistant Professor, Department of Shalya Tantra, RJS Ayurved Medical College, Kokamtham, Kopargaon, Dist. Ahmednagar, Maharashtra.

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ABSTRACT

Background: Chronic tendinopathies such as Lateral Epicondylitis (Tennis Elbow) and Plantar Fasciitis remain painful, recurrent, and resistant to conservative management. *Agnikarma* is a para-surgical thermal cauterization modality described extensively in Ayurveda for *Vata-Kapha* dominant *Snayu-Sandhi-Asthi* disorders, provides deep-penetrating heat to relieve pain, reduce fibrosis & restore function.[1][2] Thermal imaging offers real-time visualization of tissue temperature and depth of therapeutic burn.

Aim/Objectives

1. To analyse Ayurvedic theoretical basis of *Agnikarma* in *Snayugata Vyadhi* with emphasis on pathogenesis involving *Vata-Kapha* and *Rakta-dushti*.
2. To evaluate chronic tendinopathy response to *Agnikarma* using infra-red thermography (IRT).

3. To estimate burn-depth and thermal spread pattern of *Agni*-Scar using imaging-based study indicators.

Materials & Methods: A narrative Ayurvedic & biomedical review was conducted reviewing *Bruhatrayi, Nighantu Nidanika, Panchakarma treatise* along with PubMed-indexed clinical research. Thermal imaging studies used FLIR-T640 IRT system, analysing pre-treatment baseline, immediate post-*Agni* thermal mapping & day-7 scar tissue healing. Parameters assessed include surface temperature rise, diffusion diameter, healing time, and pain-VAS response.[3][4][5]

Key Findings

● *Agnikarma* triggers-controlled collagen remodelling within degenerative tendons; thermal diffusion layer depth estimated 4–7 mm depending on *Shalaka* metal & dwell time.

● Thermal imaging showed peak temperature 68–92°C at contact, with gradual fall-off over 6–12 minutes indicating *Vata-Kapha-bhedana* effect.

● Pain relief of 40–75% VAS improvement within 3–10 days reported across several trials.[6][7][8]

● Plantar fascia & lateral epicondyle showed scar depth pattern dependent on pressure & copper/iron *shalaka* conduction.

Conclusion: *Agnikarma* is a potent intervention for chronic degenerative tendinopathies where fibrosis, stiffness & micro-tears persist. Infra-red thermal imaging confirms controlled and predictable burn depth, supporting tissue remodelling physiology. Future randomized thermal-guided studies will strengthen evidence and standardize dosimetry parameters.

KEYWORDS: *Agnikarma*, thermal imaging, tendinopathy, plantar fasciitis, tennis elbow, *Vata-Kapha*, IR thermography, *Snayugata vyadhi.*

INTRODUCTION

Chronic tendinopathies (Tennis elbow, Plantar Fasciitis) affect 3–5% of population globally & account for recurrent MSK disability.[9] Micro-tears, neo-vascular ingrowth, collagen disarray and persistent inflammatory mediators make chronic tendons less responsive to NSAIDs or physiotherapy.

Modern Tendinopathy Physiology

- Collagen I → Collagen III degenerative shift
- Thickened, hypo vascular tendon bed

- Myxo-degeneration, macro-pain signalling
- Reduced tensile strength & persistent nociception.

Ayurvedic Correlation

Chronic tendon degeneration aligns with.

Modern	Ayurveda
Collagen disarray	*Snayu-Kshaya / Snayugata Vata*
Chronic ache, stiffness	*Vata-Kapha Sanchaya*
Micro-inflammation	*Rakta-dushti / Ama-sanchiti*
Poor healing	*Dhatu agni-mandya, Oja-kshaya*

Agnikarma is indicated as *Vata-Kapha-hara, Shoolaghna* & *Sandhigata roga prashamana*.[10][11]

MATERIALS AND METHODS

Review Type

Qualitative integrative review and imaging-based clinical summary

Ayurvedic Source Material

- *Sushruta Samhita — Agnikarma Adhyaya*
- *Astanga Hridaya — Chikitsa & Sutra Sthana*
- *Sharangadhara, Bhaisajyaratnavali, Chakradatta*
- *Kashyapa Samhita (Snayu & Bala-roga* correlation)

Modern Databases

PubMed, Scopus, Google Scholar, AYU, J-Ayurveda Integrative Med, Musculoskeletal Research Journals.

Search Keywords

Agnikarma, IR thermography, thermal burn depth, plantar fasciitis Ayurveda, tendon degeneration, shalaka temperature analysis.

Inclusion

- Chronic >6 weeks tendinopathy
- *Agnikarma* micro-cauterization
- Imaging-based or measurable outcome

REVIEW AND OBSERVATIONS

A. *Agnikarma* Classical Concept

Agnikarma involves controlled cauterization using heated metals — *Tamra, Loha, Panchadhatu shalaka.*[12]

Mechanisms described

- *Srotoshodhana* — clearing obstructions
- *Stambha-Shaithilya* correction of Kapha-Vata
- *Shoolahara* — instant analgesia
- *Ropanakaraka* — promotes new granulation tissue[13][14]

B. Tendinopathies Indications

Condition	Classical interpretation
Tennis Elbow (Lateral epicondylitis)	*Kurpara-sandhigata vata / Snayu-vedana*
Plantar Fasciitis	*Vatakantaka / Pada-shoola*

Agnikarma administered over epicondyle or calcaneal tubercle reduces *Ruk-Shoola-Stambha* by deep tissue heat penetration.[15]

C. Thermal Imaging Study Summary

Thermal imaging mapped real-time heat distribution

Variable	Recorded Range
Peak *shalaka*-skin contact	68–92°C
Surface dissipation	8–12 min
Thermal penetration	4–7 mm depth
Ideal burn count	7–27 dots/point pattern
Pain VAS Improvement	40–75% within 7–15 days

Recovery tracked using Temperature gradient showing proportional correlation with pain relief.

D. Pain-Reduction Mechanism

1. Thermal denaturation of pain mediators
2. Collagen cross-link optimization
3. Micro-circulation enhancement
4. Neuromodulation and analgesic gate inhibition.

E. Clinical Protocol Standardization.

Parameter	Recommendation
Shalaka metal	Tamra > Loha for deep tendon lesions
Temperature	600–750°C flame heating → skin 70–90°C
Number of burns	5 × 5 dot grid → chronic cases
Follow-up	7–21 days with *Dashamoola taila abhyanga*
Adjuvant therapy	*Nadi-swedana, Rooksha-pinda sweda, Rasna-Eranda churna* internally

DISCUSSION

Agnikarma demonstrates superior results where NSAIDs, steroid injections & physiotherapy fail. Thermal imaging confirms uniform burn depth, correlating well with pain regression. Ayurveda's principle - *Ushna-tikshna-agni guna pacifies Vata-Kapha* manifests as collagen repair and micro-circulation enhancement.[16][17]

CONCLUSION

Agnikarma is an effective treatment for chronic tendinopathies offering pain-relief, inflammation resolution & structural healing. Infra-red thermography scientifically validates its penetration and scar-depth action. The integration of classical knowledge with thermal-imaging evidence elevates *Agnikarma* from descriptive tradition to measurable interventional science.

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