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"USE OF TARPANA IN OCULAR SURFACE DISORDERS: CLASSICAL INSIGHTS AND MODERN CORRELATIONS"

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ABSTRACT

Introduction: Tarpana, one of the classical *Netra Kriyakalpa* procedures described in Ayurveda, involves retaining medicated ghee or oil over the eyes within a dough boundary. Traditionally, it is indicated for *Netra rukshata* (dry eye), *Abhighata janya vyadhi* (traumatic eye disorders), *Timira* (incipient cataract), and ocular fatigue. Modern ophthalmology identifies ocular surface disorders, particularly dry eye disease, keratopathy, and corneal ulcers, as conditions requiring prolonged ocular lubrication and surface healing. **Methods:** A comprehensive literature review was conducted using Ayurvedic classics (*Sushruta Samhita, Ashtanga Hridaya, Sharangadhara Samhita*), PubMed, Scopus, and Google Scholar databases. Keywords included "Tarpana," "Ayurveda," "ocular surface disorders," "dry eye," and "ocular drug delivery." Inclusion criteria comprised classical Ayurvedic descriptions, pharmacological studies on Tarpana formulations, and clinical trials on ocular surface disorders. Exclusion criteria included studies with inadequate methodology or non-ocular applications. **Results:** Classical references highlight Tarpana's nourishing, lubricating, and strengthening actions on ocular tissues. Ghee-based formulations such as *Triphala Ghrita* and *Jeevantyadi Ghrita* are frequently recommended. Pharmacological studies demonstrate antioxidant, anti-inflammatory, and cytoprotective effects of their phytoconstituents. Modern parallels equate Tarpana to prolonged ocular drug contact, similar to sustained-release delivery systems. Clinical studies report improvement in dry eye symptoms, ocular fatigue in digital strain, and healing of corneal ulcers with Tarpana therapy. **Discussion:** Tarpana provides a holistic, site-specific ocular therapy combining lubrication, antioxidant protection, and tissue rejuvenation. Modern evidence corroborates its efficacy but emphasizes the need for standardization, sterility, and randomized controlled trials. **Conclusion:** Tarpana represents a promising traditional intervention for ocular surface disorders, bridging classical wisdom and modern ophthalmology. Its pharmacological validation and clinical evidence position it as a complementary therapy with significant global potential.

KEYWORDS: Ayurveda, Dry Eye, Netra Kriyakalpa, Ocular Surface Disorders, Tarpana

INTRODUCTION

The eye, described in Ayurveda as the most delicate sense organ (*Sarvendriyanam nayanam pradhanam*), is prone to disorders arising from environmental stress, lifestyle factors, and systemic imbalances[1-2]. Classical texts such as *Sushruta Samhita* and *Ashtanga Hridaya* emphasize localized therapies under *Netra Kriyakalpa*, among which Tarpana occupies a central role. It is a unique therapeutic procedure wherein medicated ghee or oil is retained over the eyes to nourish and protect ocular tissues[3-4].

Ocular surface disorders, particularly dry eye disease, have emerged as a major public health concern globally. The condition is characterized by tear film instability, ocular discomfort, and visual disturbance, often aggravated by digital device usage and environmental pollution. Current management primarily involves lubricating drops, anti-inflammatory agents, and punctal plugs. However, these interventions often provide short-term relief and require repeated administration due to rapid tear clearance[5-7]. Ayurvedic Tarpana offers a sustained drug contact mechanism, enhancing ocular surface lubrication and drug penetration while minimizing systemic absorption. Several pharmacological and clinical studies have validated its therapeutic potential[8-9].

This review aims to explore the classical descriptions of Tarpana, evaluate its pharmacological basis, and correlate it with modern management of ocular surface disorders. The objective is to critically analyze the therapeutic relevance of Tarpana as a complementary strategy for conditions like dry eye disease, keratopathy, and ocular surface injury[10].

MATERIALS AND METHODS

A structured literature review was conducted between January–August 2025.

- **Sources:** Classical Ayurvedic texts (*Sushruta Samhita, Ashtanga Hridaya, Sharangadhara Samhita, Chakradatta*), commentaries, and *Nighantus* were reviewed for references to Tarpana. Modern scientific data were obtained from PubMed, Scopus, Web of Science, and Google Scholar[11].
- **Search terms:** "Tarpana Ayurveda," "ocular surface disorders," "dry eye disease," "Triphala Ghrita," "Ayurvedic ophthalmology. [12]"
- **Inclusion criteria:** (a) Ayurvedic references on Tarpana and ocular disorders; (b) in-vitro and in-vivo pharmacological studies on Tarpana formulations; (c) clinical trials or observational studies on ocular surface disorders treated with Tarpana[13].
- **Exclusion criteria:** Non-ocular uses of Tarpana, anecdotal reports lacking methodology, and duplicate data[14].
- **Type of studies reviewed:** Classical Ayurvedic references, experimental pharmacological research, randomized controlled trials (RCTs), observational clinical studies, and systematic reviews[15].

Data were synthesized thematically under classical concepts, pharmacological validation, modern correlations, and clinical evidence.

OBSERVATION AND RESULTS

1. Classical Foundations of Tarpana

Ayurvedic classics describe *Tarpana* as a unique therapeutic procedure under *Netra Kriyakalpa*, meant to provide nourishment and lubrication to ocular tissues. According to *Sushruta Samhita (Uttara Tantra 18/4-7)*, Tarpana is recommended for patients suffering from ocular fatigue, burning sensation, dryness, and diminished visual acuity. It is also prescribed in degenerative conditions such as *Timira* (early cataract/vision loss) and *Kacha* (progressive opacity of vision).

The term "Tarpana" originates from "trup" meaning to satiate or nourish. The therapy involves retaining medicated ghee (*ghrita*) over the eyes for a specified duration using a dough ring (*vartika*). Classical commentators emphasize that this allows direct contact of the unctuous medium with the ocular surface, thereby ensuring maximum absorption and therapeutic benefit.

Several types of ghrita are indicated:

- Triphala Ghrita: Balances *tridosha*, particularly useful in *Abhishyanda* (ocular inflammation) and *Netra shushkata* (dryness).
- Mahatriphala Ghrita: Enriched with additional herbs, used in degenerative and vision-threatening disorders.
- Jivaniya Ghrita: Rejuvenates ocular tissues, applied in fatigue and senile changes.

Thus, Ayurveda lays a strong foundation by conceptualizing ocular surface disorders in terms of

dosha vitiation, tissue depletion (*dhatu kshaya*), and loss of ocular lubrication (*sneha kshaya*), directly addressed by Tarpana.

2. Pharmacological Mechanisms: Linking Tradition to Modern Science

Modern pharmacology provides supportive explanations for the efficacy of Tarpana:

1. **Role of Ghrita as a Base**
   - Rich in omega-3 and omega-6 fatty acids which support anti-inflammatory pathways.
   - Contains fat-soluble vitamins (A, D, E, K) essential for corneal and conjunctival health.
   - Acts as a lubricant, reducing tear evaporation and restoring ocular surface integrity.
2. **Active Herbal Constituents**
   - *Triphala* (Haritaki, Vibhitaki, Amalaki): Antioxidant, antimicrobial, and mucoprotective properties.
   - *Yashtimadhu* (Glycyrrhiza glabra): Promotes epithelial repair and prevents oxidative stress.
   - *Jivaniya gana* (rejuvenating herbs): Enhance cellular metabolism, improving tissue resilience.
3. **Mechanism of Action**
   - Prolonged retention ensures deeper tissue penetration through corneal epithelium.
   - Sustained contact enhances absorption of lipophilic phytoconstituents.
   - Local drug delivery minimizes systemic side effects, offering targeted therapy.

This dual explanation establishes that the classical rationale of *snehana* and *poshana* correlates strongly with modern mechanisms of epithelial regeneration, tear film restoration, and anti-inflammatory activity.

3. Correlation with Modern Ocular Surface Disorders

a. Dry Eye Disease (DED)

Classically compared with *Netra shushkata*, dry eye disease is characterized by reduced tear production, increased evaporation, and ocular discomfort.

- *Tarpana* replenishes ocular lubrication, stabilizes tear film, and prevents epithelial desiccation.
- Clinical studies using *Triphala Ghrita Tarpana* demonstrated improvement in Schirmer's test, TBUT, and patient-reported outcomes.

b. Keratitis and Keratopathy

Inflammatory or degenerative corneal changes have been compared with *Abhishyanda* and *Timira* in Ayurveda.

- Ghee-based formulations reduce oxidative stress and provide anti-inflammatory support.
- *Mahatriphala Ghrita* is reported to improve corneal clarity and reduce stromal haze.

c. Computer Vision Syndrome (CVS)

A modern entity related to excessive screen use, CVS shows parallels with classical descriptions of *Abhishyanda* due to environmental aggravation.

- Tarpana reduces strain, ocular fatigue, and photophobia, acting as both preventive and therapeutic intervention.

d. Post-Surgical Corneal Epithelial Defects

Tarpana has been used as an adjunctive therapy after ocular surgeries, aiding faster epithelial recovery and reducing postoperative irritation.

4. Clinical Outcomes: Evidence from Trials and Case Studies

Several studies from Ayurvedic and integrative medicine journals have evaluated Tarpana:

1. **Triphala Ghrita Tarpana in Dry Eye**
   - AYU Journal (2010): 30 patients treated with *Triphala Ghrita Tarpana* showed statistically significant improvement in tear secretion and symptom scores.
   - Long-term follow-up indicated sustained benefits compared to artificial tear substitutes.
2. **Mahatriphala Ghrita in Keratopathy**
   - *Journal of Ayurveda Integr Med* (2018): Reported corneal clarity improvement, reduced photophobia, and better vision in early keratopathy cases.
3. **Tarpana in Computer Vision Syndrome**
   - *Ancient Science of Life* (2015): Improvement in subjective symptoms like burning, watering, and headache was reported in young professionals.
4. **Comparative Trials**
   - Studies comparing Tarpana with lubricating eye drops suggest Tarpana has longer-lasting effects, possibly due to sustained ocular absorption.

5. Safety and Tolerability

Tarpana is generally safe when performed under proper aseptic conditions.

- Mild transient effects: blurring of vision, heaviness, or slight burning sensation during procedure.
- Precautions: contraindicated in acute infections, glaucoma, or open ocular injuries.

- Comparative Safety: Unlike corticosteroid eye drops, Tarpana does not raise intraocular pressure or cause cataract.

6. Challenges and Limitations

Despite promising evidence, several limitations remain:

- Lack of large-scale randomized controlled trials.
- Absence of standardized pharmaceutical protocols for ghrita formulations.
- Limited pharmacokinetic data regarding ocular absorption.
- Concerns about sterility and shelf life of ghrita-based preparations.

7. Future Prospects

- Development of sterile, ready-to-use Tarpana formulations with improved shelf life.
- Integration with modern ocular diagnostic tools (tear osmolarity, confocal microscopy).
- Exploration of Tarpana as an adjunct to autologous serum and cyclosporine in refractory cases.
- Collaboration between Ayurveda and modern ophthalmology institutions for multicentric trials.

DISCUSSION

Tarpana represents a unique therapeutic approach combining lubrication, nutrition, and regenerative effects for ocular surface health. Classical texts describe its role in *Timira*, *Abhishyanda*, *Netra shushkata*, and degenerative eye disorders. Modern parallels align Tarpana with conditions such as dry eye disease, keratoconjunctivitis, and corneal epithelial damage[16].

From a pharmacological standpoint, ghrita-based formulations act as natural lubricants, while herbal components provide anti-inflammatory, antioxidant, and antimicrobial actions. The prolonged retention enhances bioavailability, offering an advantage over conventional eye drops which are rapidly drained from the ocular surface[17].

Modern therapies for ocular surface disorders, such as lubricating drops, autologous serum, and immunomodulators (e.g., cyclosporine), are effective but often expensive and limited by compliance. Tarpana, with its multi-target approach, offers a cost-effective, holistic alternative.

Clinical trials on *Triphala Ghrita Tarpana* and *Mahatriphala Ghrita* have demonstrated improvements in tear secretion, corneal clarity, and subjective relief. However, gaps remain in large-scale randomized controlled trials, pharmacokinetic studies, and standardization of ghrita formulations. Integrating modern diagnostic tools like tear osmolarity, impression cytology, and confocal microscopy can help validate Tarpana further[18].

Another area requiring exploration is the mechanism of drug penetration through ocular barriers. The lipophilic nature of ghrita suggests enhanced corneal absorption, but molecular evidence is sparse. Additionally, concerns regarding microbial contamination and sterility need to be addressed through modern pharmaceutical validation[19].

Future prospects lie in developing standardized, sterile Tarpana formulations with defined shelf life, combined with integrative clinical trials comparing Tarpana with gold-standard therapies. Collaborative research between Ayurveda and modern ophthalmology can establish Tarpana as a mainstream adjunct therapy for ocular surface disorders[20].

CONCLUSION

Tarpana, as described in Ayurveda, is a scientifically relevant therapy for ocular surface disorders such as dry eye disease, keratopathy, and computer vision syndrome. Classical Ayurvedic texts emphasized its role in nourishing and rejuvenating the eyes, while modern evidence confirms its ability to improve tear film stability, reduce inflammation, and promote corneal epithelial healing.

The pharmacological richness of ghrita and herbal ingredients like Triphala and Yashtimadhu provide a multifaceted therapeutic effect that aligns with modern strategies, including lubricants, antioxidants, and immunomodulators. Clinical studies, though limited in scale, consistently show beneficial outcomes with minimal adverse effects.

While current evidence is promising, further large-scale randomized controlled trials, standardization of formulations, and pharmaceutical validations are required. Developing sterile, ready-to-use Tarpana formulations and integrating modern diagnostic assessments will bridge the gap between traditional wisdom and evidence-based ophthalmology.

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