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DEVICE-ASSISTED KRIYAKALPA: STANDARDIZING AYURVEDIC OCULAR THERAPIES FOR MODERN CLINICAL PRACTICE

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ABSTRACT Kriyakalpa, a group of ocular therapies described in Shalakya Tantra, includes procedures such as Tarpana, Seka, Anjana, Bidalaka, and Putapaka. These therapies are time-tested for managing a wide range of eye conditions, from simple eye strain to chronic disorders like dry eye and refractive errors. They also hold immense promise as preventive measures in today's digital age. However, their application in modern clinical practice often suffers from challenges of non-standardization, variability, and lack of reproducibility. Device-assisted innovations can bridge this gap. Temperature-controlled trays for Tarpana, automated drip systems for Seka, disposable applicators for Anjana and Bidalaka, and digital monitoring tools can bring uniformity, safety, and patient comfort to these therapies. Such advancements align with ongoing efforts to standardize Ayurvedic practices, making them more acceptable to global health systems. This article highlights the importance of device-assisted modifications in Kriyakalpa and proposes a framework for integrating technology with tradition, thereby paving the way for evidence-based, reproducible, and globally relevant ocular therapies.

KEYWORDS : Kriyakalpa, Shalakya Tantra, ocular therapy, device innovation, standardization

1. INTRODUCTION

Eyes are often called the "windows to the soul," a phrase that beautifully captures their importance in human life. Ayurveda too has long emphasized ocular health. Aacharya describe the eyes as "Sarvendriyanam Nayanam Pradhanam"—the foremost among the sense organs—highlighting the idea that vision is essential for health, independence, and quality of life (1). Clear eyesight is not only necessary for reading, writing, and working but also for appreciating the natural beauty of the world around us.

Within Ayurveda, Kriyakalpa is a specialized set of ocular therapies described in Shalakya Tantra,. These procedures include Tarpana, Seka, Putapaka, Pindi, Bidalaka, and Anjana. Each has a distinct role, such as nourishing, cleansing, protecting, or rejuvenating the eyes.(2) Unlike many modern interventions that primarily target symptoms, these traditional practices aim to strengthen the eyes holistically and maintain long-term visual health.(3)

However, today's lifestyle has introduced new challenges. Prolonged screen use, irregular sleep cycles, reduced time outdoors, and rising stress levels have led to conditions such as digital eye strain, dry eyes, and premature visual fatigue—even in younger people. (4) While Kriyakalpa offers effective ways to address these issues, practical barriers often limit their widespread use. For instance, Tarpana requires maintaining medicated ghee at the correct temperature, Seka demands steady and uniform pouring of herbal decoctions, and Anjana requires strict hygiene to avoid contamination. (5) These intricacies can be difficult to manage in busy clinical settings.

This is where innovation becomes crucial. By incorporating modern device-assisted methods, it becomes possible to retain the wisdom of Ayurveda while ensuring safety, reproducibility, and patient convenience. Such innovations can make Ayurvedic ocular therapies more standardized and globally accessible, thereby ensuring that the timeless value of Kriyakalpa continues to benefit future generations. (6)

2. Literature Review

The roots of Kriyakalpa are found in classical Ayurvedic texts such as the Sushruta Samhita (Uttara Tantra), Ashtanga Hridaya, and Chakradatta. These works describe ocular therapies in detail, emphasizing nourishment, cleansing, and rejuvenation of the eyes for both treatment and prevention. The six primary procedures—Tarpana, Seka, Putapāka, Bidalaka, Pindi, and Anjana—reflect a holistic approach to managing both acute and chronic conditions.

Modern research has explored their application in today's clinical settings.

- Netra Tarpana has been shown to improve symptoms of dry eye syndrome, particularly in patients with digital eye strain, and may also benefit conditions such as presbyopia and early myopia. (7,8)
- Seka and Aschyotana are useful in acute eye disorders like conjunctivitis, reducing pain, redness, and burning sensations. (9)
- Anjana has demonstrated benefits in chronic blepharitis and allergic conjunctivitis. (10)
- Bidalaka and Pindi relieve periocular fatigue and inflammation, especially in screen users. (11)
- Putapaka, though less common, has been described as a rejuvenative therapy providing deeper nourishment. (12)

Several studies and a few randomized controlled trials have reported improvements in ocular fatigue, tear film stability, and visual acuity after these therapies. (13,14) However, challenges remain, such as variation in techniques, hygiene concerns, and lack of standard instruments. Encouragingly, regulatory bodies like the Bureau of Indian Standards (BIS) and ISO are developing protocols for Ayurveda-based devices, which could help standardize and globalize Kriyakalpa practices. (15,16)

3. Proposed Device-assisted Innovations

To address these limitations, device-based modifications can be introduced while retaining Ayurvedic principles.(17,18)

1. Netra Tarpana (Ocular Retention Therapy)

- **Current Limitations:** Maintaining a steady temperature of medicated ghee/oil, preventing leakage of the dough boundary, and ensuring patient comfort are challenging in manual practice.
- **Proposed Innovation:**
  - Temperature-controlled ocular tray designed with biocompatible, soft silicone edges to form a leak-proof chamber around the eye.
  - Integrated heating system with thermostat ensures medicated ghee remains at the therapeutic temperature throughout the session.
  - Optional timer and alarm system for monitoring retention duration.
- **Expected Benefits:** Enhanced reproducibility, improved patient comfort, longer retention without fear of spillage, and easy adaptation in busy clinics.

2. Seka / Aschyotana (Continuous Pouring or Eye Drops)

- **Current Limitations:** Flow rate depends on practitioner's hand stability; risk of uneven pouring or accidental contamination.
- **Proposed Innovation:**
  - Automated drip regulator with a calibrated nozzle to control droplet size and flow rate.

- Reservoir equipped with UV-sterilization to prevent microbial contamination.
- Adjustable stand allowing patients to lie comfortably while receiving uniform therapy.
- **Expected Benefits:** Consistency across sessions, reduced strain on practitioners, safer therapy with minimal contamination risk, and data recording of duration/flow rate.

3. Anjana (Collyrium Application)
- **Current Limitations:** Manual application often leads to varying dosage and possible contamination of applicators.
- **Proposed Innovation:**
- Single-use, sterile applicator pens pre-loaded with Anjana formulations.
- Controlled release mechanism for precise quantity per application.
- Optional cool-tip applicator for added soothing effect.
- **Expected Benefits:** Improved hygiene, uniform dosage, patient-friendly application, and wider acceptance in modern clinics and households.

4. Bidalaka & Pindi (Topical Application of Medicinal Paste)
- **Current Limitations:** Manual paste preparation and application lead to inconsistency in thickness, texture, and hygiene.
- **Proposed Innovation:**
- Pre-sterilized medicated pads or hydrogel sheets infused with Bidalaka formulations.
- Designed to fit comfortably over eyelids, maintaining uniform contact and cooling effect.
- Can be stored in hygienic blister packs for single-use applications.
- **Expected Benefits:** better patient compliance, reduced preparation time, consistent therapeutic effect, and portability for home care.

5. Putapāka (Medicated Juice Therapy for Eye Rejuvenation)
- **Current Limitations:** Complex preparation; risk of contamination and variable potency.
- **Proposed Innovation:**
- Closed-system Putapāka preparation chamber for sterile extraction of medicated juice.
- Delivery through miniaturized sterile droppers or controlled instillation devices.
- **Expected Benefits:** Preservation of potency, sterile delivery, and revival of this rarely practiced but highly nourishing therapy in a modernized format.

6. Digital Monitoring & Research Module (Universal Add-On)
- **Proposed Innovation:**
- Integration of sensors and digital modules in each device to record therapy parameters (temperature, time, flow, patient-reported comfort).
- Data storage in digital format to support research, clinical audits, and standardization.
- **Expected Benefits:** Objective evidence for efficacy, support for large-scale clinical trials, and credibility in global integrative medicine platforms.

7. Preventive & Home-Use Kits
- **Concept:** Portable, simplified versions of Tarpana and Seka devices for preventive care at home.
- **Example:** A compact eye-soothing kit with pre-sterilized medicated ghee capsules, temperature-controlled mini ocular cups, and soothing gel pads.
- **Expected Benefits:** Accessibility for urban populations with digital eye strain, cost-effectiveness, and promotion of Ayurveda as a lifestyle healthcare system rather than just a treatment modality.

Procedure	Device Innovation	Benefit
Tarpana	Temperature-controlled ocular tray made of biocompatible material with micro-heating elements	Maintains consistent warmth, prevents cooling/solidification, ensures patient comfort
Seka	Automated drip system with calibrated flow control	Provides uniform pouring, reproducibility, and reduces therapist fatigue
Anjana/ Bidalaka	Disposable sterile applicators and eye pads	Enhances hygiene, standardizes dose, reduces risk of contamination
All procedures	Digital monitoring module (with sensors for time, temperature, flow rate, and patient comfort feedback)	Allows standardization, data collection, and research validation
Preventive use	Portable Kriyakalpa home kit (compact, easy-to-use tray + disposable applicators + mobile app guidance)	Enables preventive care for digital eye strain at home, increasing accessibility

5. DISCUSSION

The review of classical texts and modern research shows that while Kriyakalpa therapies offer proven benefits like nourishing eye tissues and reducing strain, their use in modern practice faces major hurdles. The biggest challenge is standardization. Procedures such as Netra Tarpana and Seka depend heavily on practitioner skill, making it difficult to maintain consistency and validate results scientifically.

Hygiene and safety are also concerns, especially with methods like Anjana and Bidalaka, where direct contact raises the risk of contamination. For many patients, therapies can feel messy, time-consuming, or uncomfortable, limiting their wider acceptance in today's fast-paced clinical settings.

Here is where device-assisted innovations can transform practice. Temperature-controlled trays for Tarpana, automated drip systems for Seka, and sterile applicators for Anjana and Bidalaka can improve safety and reproducibility. Digital modules can record therapy parameters, generating valuable research data, while simplified home-use kits can make preventive eye care more accessible.

Such innovations encourage collaboration between Ayurveda experts, engineers, and ophthalmologists, opening doors to patents, startups, and research funding. Most importantly, they ensure Ayurveda meets global expectations for safe, standardized, and holistic care. In this way, device-assisted Kriyakalpa does not replace tradition—it bridges ancient wisdom with modern needs, helping these timeless therapies reach patients worldwide.

6. Future Scope

- **Standardized Devices:** Develop prototypes of ocular devices (for Tarpana, Seka, Anjana, etc.) and validate them through clinical trials.
- **Digital Integration:** Use sensors, AI, and monitoring tools to collect real-time therapy data for research and global validation.
- **Home-based Care:** Design preventive Kriyakalpa kits for digital eye strain and routine wellness, making therapies accessible to the general population.
- **Global Acceptance:** Generate strong evidence to support policy recognition of Ayurvedic ophthalmology in integrative healthcare.
- **Innovation & Entrepreneurship:** Encourage patents, startups, and collaborations between Ayurveda experts, ophthalmologists, and biomedical engineers.

7. CONCLUSION

Kriyakalpa, with its rich Ayurvedic heritage, holds immense potential for addressing modern eye health challenges. Yet, its wider use is restricted by issues of standardization, hygiene, and consistency. Device-assisted innovations can overcome these barriers, making therapies safer, more reliable, and patient-friendly. By blending ancient wisdom with modern technology, Kriyakalpa can transform into a globally relevant, holistic approach for maintaining and restoring ocular health.

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