RESEARCH PAPER

"Clinical Evaluation of Ayurvedic Management in Asthenopia Associated with Digital Screen Use: A Prospective Case Series"

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Abstract:

Background: Digital eye strain (asthenopia) is a common functional visual disorder associated with prolonged digital screen use and is characterized by eye strain, visual fatigue, headache, blurred vision, and ocular dryness. Conventional management primarily involves refractive correction, artificial tears, and ergonomic interventions, which may provide only temporary symptomatic relief. In Ayurveda, similar manifestations are described under the early stages of *Timira*, where treatment aims to restore ocular function through local and systemic therapeutic interventions.

Objective: To evaluate the clinical effectiveness and safety of a standardized Ayurvedic treatment protocol in patients with digital eye strain associated with prolonged electronic device use.

Methods: A prospective observational case series was conducted among 10 patients with clinically diagnosed asthenopia attending the Shalakya Tantra Outpatient Department of Parul Ayurved Hospital, Vadodara, India. Participants received a six-week standardized Ayurvedic treatment protocol comprising *Netra Tarpana*, *Netra Prakshalana*, *Saptamrita Lauha*, *Triphala Churna*, and *Yashtimadhu Churna*, along with standardized lifestyle and ergonomic advice. Clinical outcomes were assessed using a composite asthenopia symptom score, visual comfort, and functional improvement. Pre- and post-treatment scores were compared using the Wilcoxon signed-rank test.

Results: The mean composite asthenopia symptom score decreased from 7.9 ± 2.6 at baseline to 0.8 ± 0.9 after treatment, representing a mean reduction of 7.1 ± 2.5 points ($Z = -2.803$, $P = 0.002$). Significant improvement was observed in eye strain, headache, blurred vision, ocular fatigue, and dryness. Visual comfort and tolerance to prolonged near work improved in all participants. No treatment-related adverse events were reported.

Conclusion: The findings of this prospective observational case series suggest that a standardized Ayurvedic therapeutic protocol may improve symptoms of digital eye strain and was well tolerated. However, larger randomized controlled trials incorporating objective ophthalmic outcome measures are required to confirm its efficacy and long-term safety.

Keywords: Asthenopia; Digital eye strain; Computer vision syndrome; Ayurveda; *Netra Tarpana*; *Triphala*; *Saptamrita Lauha*; Prospective observational study.

How to cite this article: Dav C, Keskar M, Babaria A. Clinical evaluation of Ayurvedic management in asthenopia associated with digital screen use: a prospective case series. Int J Drug Deliv Technol. 2026;16(74s): 2274-2280. DOI: 10.25258/ijddt.16.74s.188

Introduction

Asthenopia, commonly referred to as digital eye strain (DES) or computer vision syndrome (CVS), is a functional visual disorder characterized by eye strain, visual fatigue, headache, blurred vision, burning sensation, ocular dryness, and difficulty in maintaining visual focus following prolonged near work or digital screen exposure.[1,2] The rapid adoption of computers, smartphones, and other digital devices in occupational, educational, and recreational settings has led to a marked increase in the prevalence of DES worldwide.[1,2] Recent systematic reviews indicate that more than half of regular digital device users experience one or more symptoms of digital eye strain, making it an important occupational and public health concern.[1] Persistent visual discomfort adversely affects productivity, learning efficiency, sleep quality, and overall quality of life.[1,2] The pathophysiology of digital eye strain is multifactorial and involves reduced blink rate, tear film instability, increased tear evaporation, accommodative and vergence stress, ocular surface inflammation, and prolonged exposure to high-energy visible blue light.[3,4] These physiological changes contribute to ocular discomfort, visual fatigue, transient blurred vision, and dry eye symptoms that often worsen with increasing duration of screen use.[3,4] Current management includes refractive error correction, artificial tear substitutes, ergonomic modifications, scheduled visual breaks, and limitation of screen exposure.[4,5] Although these interventions improve symptoms in many patients, relief is often temporary and does not adequately address the underlying functional disturbances associated with prolonged digital device use.[1,4] Therefore, safe and multimodal therapeutic approaches capable of improving ocular surface health and visual function remain an area of growing clinical interest.[1,4] According

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to Ayurveda, the clinical features of asthenopia closely resemble the early stage of Timira, in which impairment of visual function occurs because of vitiation of Vata and Pitta Dosha, affecting the Drishti Mandala before the development of structural ocular pathology.[6,7] Management is directed towards restoring ocular homeostasis through Chakshushya, Rasayana, and Tridosha-shamaka therapies.[6,7] Classical ophthalmic procedures such as Netra Tarpana and Netra Prakshalana, together with internal formulations including Saptamrita Lauha, Triphala Churna, and Yashtimadhu Churna, are traditionally indicated to nourish ocular tissues, improve visual endurance, reduce ocular fatigue, and maintain tear film stability.[8,9] Experimental and pharmacological studies have demonstrated antioxidant, anti-inflammatory, cytoprotective, and free-radical scavenging activities of Triphala and Glycyrrhiza glabra, providing a plausible scientific basis for their potential therapeutic role in ocular surface disorders associated with prolonged digital screen exposure.[8,9]

Despite the increasing burden of digital eye strain, evidence supporting standardized Ayurvedic management remains limited, with most available publications comprising case reports, narrative reviews, or small observational studies.[1,10] Clinical studies evaluating comprehensive Ayurvedic therapeutic protocols with systematic outcome assessment are scarce.[10] Therefore, the present prospective observational case series was undertaken to evaluate the clinical effectiveness and safety of a standardized Ayurvedic treatment protocol comprising Netra Tarpana, Netra Prakshalana, Saptamrita Lauha, Triphala Churna, and Yashtimadhu Churna in patients presenting with asthenopic symptoms associated with prolonged digital screen use

Materials and Methods

Study Design and Setting

This prospective, single-arm observational case series was conducted to evaluate the clinical effectiveness and safety of a standardized Ayurvedic therapeutic regimen in patients with digital eye strain (asthenopia).[2] The study was carried out in the Outpatient Department of Shalakya Tantra, Parul Ayurved Hospital, Parul Institute of Ayurved, Parul University, Vadodara, Gujarat, India. Owing to the exploratory nature of this pilot study, a convenience sample of ten consecutive eligible patients was enrolled.

Participant Selection

Patients aged 18–40 years presenting with symptoms suggestive of digital eye strain were screened for eligibility. The diagnosis of asthenopia was established based on detailed clinical history, digital screen exposure history, symptom assessment, and comprehensive ophthalmic examination.[1,2]

Baseline ophthalmic evaluation included best-corrected visual acuity, anterior segment examination using slit-lamp biomicroscopy, refraction assessment, intraocular pressure measurement, and fundus examination to exclude underlying ocular pathology. A total of 15 patients presenting with symptoms suggestive of digital eye strain were screened for eligibility. of these, 12 patients fulfilled the predefined inclusion criteria and were considered eligible for participation. Two eligible patients declined participation in the study; therefore, the remaining 10 consecutive patients who provided written informed consent were enrolled and received the prescribed Ayurvedic intervention. All enrolled participants completed the 6-week treatment and follow-up assessments, and no participant was lost to follow-up or discontinued the intervention. Consequently, data from all 10 participants were included in the final statistical analysis.

Inclusion Criteria

- Age between 18 to 40 years
- Clinical diagnosis of asthenopia associated with digital screen use
- Daily screen exposure ≥4 hours/day
- Normal ophthalmic examination or mild refractive error not requiring immediate intervention

Exclusion Criteria

- Pathological refractive errors
- Ocular surface disorders, glaucoma, retinal diseases, or other significant ocular pathology
- Previous ocular surgery or trauma
- Presence of systemic diseases known to affect ocular health

Ethical Considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.[11] Written informed consent was obtained from all participants before enrolment, and confidentiality of patient information was maintained throughout the study.

Clinical Presentation

The common presenting symptoms included eye strain and ocular heaviness, frontal or peri-orbital headache, blurred vision following prolonged digital device use, burning sensation or dryness of the eyes, and reduced visual comfort and work efficiency.[3]

Intervention

All Ayurvedic formulations were procured from a GMP-certified Ayurvedic pharmacy and stored according to the manufacturer's recommendations until use. The treatment protocol consisted of both local ocular therapies and internal Ayurvedic medications administered according to standardized classical Ayurvedic treatment protocols.

Table 1 Ayurvedic Intervention Protocol Used in Patients with Asthenopia (n = 10)

Intervention	Formulation	Dose	Route of administration	Frequency	Duration
Local ocular therapy	*Netra Tarpana* (Triphala Ghrita)[6,7]	Sufficient quantity for ocular retention	Topical ocular	Once daily	5 Consecutive days
	Netra Prakshalana (Triphala Kwatha)[6,12]	Freshly prepared decoction	Ocular wash	Once daily	15 days
Internal medication	*Saptamrita Lauha*[9]	250 mg tablet	Oral	Twice daily after meals	6 weeks
	Triphala Churna[9,14]	3 gm powder with warm water	Oral	Once daily at bedtime	6 weeks
	Yashtimadhu Churna[9,14]	2 gm powder	Oral	Twice daily after meals	6 weeks

Treatment Procedure

Netra Tarpana was performed according to the standard operating procedure described in classical Shalakya Tantra literature. A dough ring prepared from black gram flour was placed around both eyes, and lukewarm Triphala Ghrita was retained within the reservoir under aseptic conditions for the prescribed duration. Netra Prakshalana was performed using freshly prepared, filtered, lukewarm Triphala Kwatha.

Internal medications were administered for six weeks according to the prescribed dosage schedule. Treatment compliance was assessed during each follow-up visit through pill count and patient interview.

Lifestyle Modification

All participants received standardized counselling regarding digital eye care, including adoption of the 20–20–20 rule, conscious blinking exercises, maintenance of proper ergonomic posture, appropriate viewing distance from digital devices, adequate workplace illumination, and healthy sleep hygiene.

Table 2 Asthenopia Symptom Severity Scoring System[2]

Score	Severity	Clinical Interpretation
0	None	Symptom absent
1	Mild	Occasional symptom with minimal discomfort
2	Moderate	Frequent symptom causing noticeable discomfort
3	Severe	Persistent symptom causing marked discomfort

Symptom severity was assessed using an investigator-developed four-point ordinal scale (0 = none, 1 = mild, 2 = moderate, and 3 = severe), adapted from previously published symptom assessment methods for digital eye strain.[2,5] Five symptoms (eye strain, headache, blurred vision, burning/dryness, and ocular heaviness or fatigue) were assessed using the above scoring system. The individual symptom scores were summed to generate a composite asthenopia symptom score, ranging from 0 to 15, with higher scores indicating greater symptom severity.

Outcome Measures

- Change in composite asthenopia symptom score from baseline to Week 6
- Reduction in individual symptom severity scores
- Improvement in visual comfort duration during digital device use
- Improvement in daily functional performance and work efficiency
- Safety and tolerability of the intervention, assessed by monitoring adverse events throughout the study

Statistical Analysis

Data were analysed using **IBM SPSS Statistics version 27.0** (IBM Corp., Armonk, NY, USA). Continuous variables are presented as mean ± standard deviation (SD), whereas categorical variables are expressed as frequencies and percentages. As symptom scores represented ordinal data and the study involved a small sample size (n = 10), comparisons between baseline and post-treatment scores were performed using the **Wilcoxon signed-rank test**. All statistical tests were two-tailed, and a $P < 0.05$ was considered statistically significant.

Results

Table 3 Baseline Demographic and Clinical Characteristics of Patients with Asthenopia (n = 10)

Parameter	Observation
Total patients (n)	10
Age (years) Mean ± SD	26.4 ± 5.2
Gender	Male: 6 (60%); Female: 4 (40%)
Daily Screen exposure	6–10 hours
Emmetropia	4 (40%)
Mild refractive error	6 (60%)

A total of 10 patients were enrolled and completed the study. The mean age of the participants was 26.4 ± 5.2 years. Six participants (60%) were male and four (40%) were female. All participants reported prolonged digital screen exposure. ranging from 6 to 10 hours per day. Baseline ophthalmic examination revealed emmetropia in four patients (40%) and mild refractive error in six patients (60%).

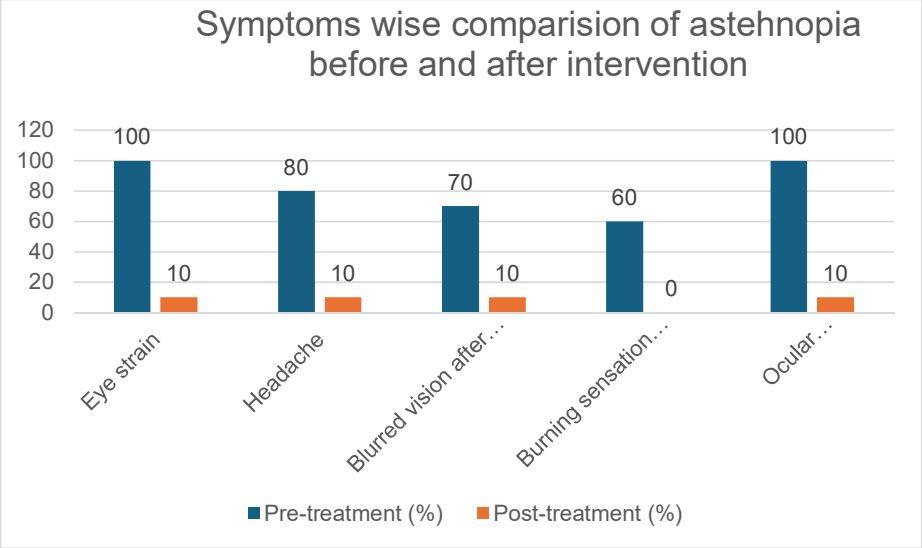

Figure 1 Symptom-wise comparison of asthenopia before and after intervention

The frequency of all asthenopic symptoms decreased following completion of the Ayurvedic intervention. Eye strain and ocular fatigue/heaviness, which were present in all participants at baseline, were reported by only one participant after treatment. Burning sensation and ocular dryness resolved completely in all affected participants.

Table 4 Overall severity distribution of asthenopic symptoms before and after treatment (n = 10)

Severity Category	Pre-treatment, n (%)	Post-treatment, n (%)
Absent (Score 0)	7 (14.0)	45 (90.0)
Mild (Score 1)	11 (22.0)	4 (8.0)
Moderate (Score 2)	25 (50.0)	1 (2.0)
Severe (Score 3)	7 (14.0)	0 (0.0)
Total observations	**50 (100.0)**	**50 (100.0)**

Values represent the total number of symptom observations (5 symptoms × 10 patients = 50 observations) categorized according to symptom severity at baseline and after completion of treatment.

Table 5 Change in Total Asthenopia Symptom Score Following Ayurvedic Treatment

Parameter	Mean ± SD
Baseline total score	7.9. ± 2.6
Post-treatment score	0.8 ± 0.9
Mean reduction	7.1 ± 2.5

Wilcoxon signed-rank test (Z)	-2.803
P value	0.002

The mean composite asthenopia symptom score decreased from 7.9 ± 2.6 at baseline to 0.8 ± 0.9 after six weeks of treatment, representing a mean reduction of 7.1 ± 2.5 points. Comparison of baseline and post-treatment scores using the Wilcoxon signed-rank test demonstrated a statistically significant reduction (Z = −2.803, P = 0.002). Improvement in symptom scores was observed in all participants.

Improvement in Visual Comfort

Seven participants (70%) demonstrated marked improvement in visual comfort, whereas three participants (30%) showed moderate improvement. The average duration of comfortable near work increased from approximately 30–40 minutes at baseline to 90–120 minutes after completion of treatment.

Ophthalmic Findings

Objective Ophthalmic Findings

No deterioration in best-corrected visual acuity or refractive status was observed during the study period. Slit-lamp bio microscopy findings remained normal in all participants throughout the study. Participants reporting ocular dryness experienced subjective improvement in tear film stability. No signs of ocular surface irritation or inflammation were observed.

Safety and Tolerability

No adverse drug reactions or procedure-related complications were reported during the study period. All local ocular procedures were well tolerated, and 100% treatment compliance was achieved among the enrolled participants.

Follow-Up Findings

During 8-week follow-up after completion of therapy, sustained symptom relief was observed in 9 out of 10 patients. Mild recurrence of eye strain was reported in one patient, associated with excessive screen exposure. No serious ocular complaints or treatment-related adverse events were observed during the follow-up period were noted

The mean composite asthenopia symptom score decreased from 7.9 ± 2.6 at baseline to 0.8 ± 0.9 after six weeks of Ayurvedic treatment, corresponding to a mean reduction of 7.1 ± 2.5 points. The reduction was statistically significant (Wilcoxon signed-rank test: Z = −2.803, P = 0.002).

Discussion

The present prospective observational case series provides preliminary clinical evidence supporting the potential role of a standardized Ayurvedic therapeutic regimen in alleviating symptoms of asthenopia associated with prolonged digital screen exposure. Digital eye strain has emerged as an increasingly prevalent occupational and lifestyle-related health concern because of the widespread use of computers, smartphones, and other digital devices. Recent reviews have reported that digital eye strain affects a substantial proportion of regular screen users worldwide, with ocular fatigue, headache, blurred vision, burning sensation, and dryness being the most frequently reported symptoms.[1,2] In the present study, the composite asthenopia symptom score decreased significantly from 7.9 ± 2.6 at baseline to 0.8 ± 0.9 after six weeks of treatment (Wilcoxon signed-rank test, Z = −2.803, *P* = 0.002). Improvement was observed in all participants, with complete resolution of burning sensation and ocular dryness and marked reductions in eye strain, headache, blurred vision, and ocular fatigue. Although the study included a small number of participants, the consistent improvement across all patients suggests that the standardized Ayurvedic treatment protocol may have clinical benefit and deserves further evaluation in larger controlled studies. The present findings are consistent with those reported by **Gangamma et al.**, who evaluated **Triphala eye drops and Saptamrita Lauha** in patients with computer vision syndrome.[10] Their study demonstrated significantly greater clinical improvement in patients receiving the combined Ayurvedic treatment compared with placebo, supporting the therapeutic role of both local ocular therapy and systemic medication in relieving digital eye strain symptoms. Similar to their findings, the present study demonstrated substantial improvement in ocular discomfort, headache, blurred vision, and visual fatigue following combined Ayurvedic therapy. Comparable observations were also reported by **Dhiman et al.**, who investigated Ayurvedic management of computer vision syndrome using **Netra Tarpana**, oral herbal medication, and ergonomic counselling.[13] Their pilot study showed that the combination of local ocular therapy and systemic treatment produced greater symptomatic improvement than ergonomic counselling or local therapy alone. The favourable outcomes observed in the present study are consistent with these findings and further support the concept that multimodal Ayurvedic management may be more effective than isolated interventions. The improvement in burning sensation and ocular dryness observed in the present study is biologically plausible. From a biomedical perspective, prolonged digital device use reduces blink frequency, increases tear evaporation, destabilizes the tear film, and produces ocular surface inflammation. Contemporary reviews have consistently identified tear film instability and reduced blinking as major contributors to digital eye strain.[1,2] The complete resolution of burning sensation and dryness observed in the present study suggests that the local ocular procedures may have improved ocular surface lubrication and tear film stability.

The beneficial effect of **Netra Tarpana** is also supported by previous Ayurvedic clinical research. In a randomized

comparative trial evaluating **Triphala Ghrita Tarpana** in patients with dry eye syndrome (*Shushkakshipaka*), significant improvement was observed in burning sensation, blurred vision, ocular irritation, and photophobia following treatment. These findings support the traditional Ayurvedic concept that medicated ghee nourishes ocular tissues (*Chakshushya*) while improving tear film stability and ocular surface health. From the Ayurvedic perspective, asthenopia closely resembles the early manifestations of *Timira*, wherein **Vata** and **Pitta Dosha** vitiation affects the ocular tissues (*Drishti Mandala*).[6,7] The present treatment protocol combined local ocular procedures (*Netra Tarpana* and *Netra Prakshalana*) with systemic medications (*Saptamrita Lauha*, *Triphala Churna*, and *Yashtimadhu Churna*), thereby addressing both local pathology and systemic imbalance. *Triphala* possesses documented antioxidant and anti-inflammatory properties, whereas *Yashtimadhu* exhibits anti-inflammatory and tissue-soothing effects.[8] *Saptamrita Lauha* is traditionally indicated for maintaining ocular health and visual function.[9] The combined actions of these interventions may explain the broad improvement observed across multiple symptoms. An important observation in the present study was the persistence of symptomatic improvement during the **8-week post-treatment follow-up**, with **90% of participants** maintaining symptom relief after completion of therapy. Only one participant reported mild recurrence of eye strain, which was associated with continued excessive digital screen exposure. Sustained improvement following treatment is clinically relevant because prolonged daily screen exposure remains one of the strongest risk factors for persistent digital eye strain.[1,2] Participants also demonstrated a marked improvement in visual endurance, with the average duration of comfortable near work increasing from approximately **30–40 minutes** at baseline to **90–120 minutes** after treatment. Similar improvements in functional visual performance have been reported in previous clinical studies evaluating Ayurvedic and conventional interventions for computer vision syndrome, suggesting that reduction of ocular fatigue may translate into improved occupational and academic performance. The treatment protocol demonstrated an excellent safety profile. No adverse drug reactions, ocular complications, or treatment-related discontinuations were observed, and all participants completed the prescribed therapy. These findings are consistent with previous Ayurvedic clinical studies reporting good tolerability of **Netra Tarpana**, **Triphala-based formulations**, and **Saptamrita Lauha** when administered under appropriate clinical supervision. Despite these encouraging findings, several limitations should be acknowledged. The small sample size (**n = 10**) limits the generalizability of the results. The absence of a control group precludes causal inference and does not exclude placebo effects or regression to the mean. Furthermore, symptom assessment relied primarily on subjective clinical scoring, while objective ophthalmic parameters such as tear break-up time, Schirmer's test, blink rate, accommodative function, and validated digital eye strain questionnaires were not included. Finally, all participants received standardized ergonomic counselling, including limitation of screen exposure, adoption of the 20–20–20 rule, appropriate workplace illumination, conscious blinking exercises, and sleep hygiene.[2,5] These measures are independently known to improve digital eye strain and therefore represent potential confounding factors. Consequently, the observational design cannot distinguish the independent contribution of Ayurvedic interventions from that of lifestyle modification. Future studies should include adequately powered randomized controlled trials comparing standardized Ayurvedic therapy with conventional treatment or placebo while incorporating objective ocular surface assessments, validated patient-reported outcome measures, and longer follow-up periods. Such studies would provide stronger evidence regarding the efficacy, safety, and long-term role of Ayurvedic interventions in the management of digital eye strain.

Limitations

This study was limited by its small sample size, single-center design, lack of a control group, short follow-up period, and depends on symptom-based outcome measures. Future randomized controlled trials with larger sample sizes, objective ophthalmic assessments, and longer follow-up are required to validate these findings.

Conclusion

The findings of this prospective observational case series suggest that a standardized Ayurvedic therapeutic regimen, comprising Netra Tarpana, Netra Prakshalana, Saptamrita Lauha, Triphala Churna, and Yashtimadhu Churna, together with standardized lifestyle modification, may improve symptoms of digital eye strain (asthenopia) associated with prolonged digital screen use. Clinically meaningful reductions were observed in eye strain, ocular fatigue, headache, blurred vision, and ocular dryness, accompanied by improved visual comfort and tolerance to prolonged near work. The treatment protocol was well tolerated, with no adverse events reported during the study period. However, the findings should be interpreted cautiously because of the observational design, small sample size, absence of a control group, and the concurrent implementation of ergonomic counselling, which may have contributed to the observed improvements. Larger, adequately powered randomized controlled trials incorporating objective ophthalmic outcome measures and longer follow-up periods are required to establish the efficacy, safety, and long-term clinical utility of Ayurvedic interventions for the management of digital eye strain.

Credit Author Statement

First Author: Conceptualization, Data collection, Methodology, Writing – original draft.

Second Author: Supervision, Validation, Critical review, Editing.

Use of Artificial Intelligence (AI)
Generative AI tools were used only for improving readability and language clarity. No AI tools were used for data analysis, interpretation, or generation of scientific content. All content was critically reviewed by the authors.

Funding
The authors received no financial support for the research, authorship, or publication of this article.

Conflict of Interest Declaration
The authors declare no conflict of interest related to study.

Acknowledgement
The authors sincerely thank all the participants for their voluntary participation in this study. The authors also acknowledge the Department of Shalakya Tantra, Parul Ayurved Hospital, Parul Institute of Ayurved, Parul University, Vadodara, Gujarat, India, for providing the necessary facilities and support to conduct this study.

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