Research Article

AN OPEN LABELLED COMPARATIVE CLINICAL STUDY TO EVALUATE THE EFFECT OF *GO-GHRITA TARPANA* AND *TRIPHALA-GHRITA TARPANA* ON ANTERO-POSTERIOR DIAMETER IN AXIAL-MYOPIA

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ABSTRACT

Background and Objective: Axial-myopia is characterized by blurriness of vision for distance caused by increased in A-P diameter. Usual treatment for myopia is optical correction by optical glass and contact lens. To restore distance vision, surgical intervention like, LASIK is adopted, which has complications like dry eye syndrome and astigmatism. The Ayurvedic approach of the disease mainly concentrates on treating the disease and preventing the progression of the disease. There are many hypothetical theories regarding mode of action of *Tarpana* on Myopia and *Timira*. In this study, an attempt is made to observe the effect of *Tarpana* on A-P diameter of eyeball and to know the difference between *Tarpana* by plain *Go-Ghrita* and *Triphala Ghrita*.

Materials and Methods: 20 patients of Group A, were treated with *Go-Ghrita Tarpana* (two sittings of 7 days each, with the gap of 14 days) and in Group B, 20 patients were treated with *Triphala-Ghrita Tarpana* (two sittings of 7 days each, with the gap of 14 days).

Results: The data of both the groups were collected according to the objective and subjective parameters and analyzed using the most appropriate statistical test (repeated measures of ANOVA, Bonferroni Test and Mann- Whitney U Test). The efficacy is statistically significant within the group at $P < 0.001$ and statistically insignificant between the groups at $P > 0.05$ among all the parameters.

Interpretation and Conclusion: On comparison of *Go-Ghrita Tarpana* with *Triphala-Ghrita Tarpana*, both have an equal effectiveness on distant vision, Optical correction and A-P diameter.

INTRODUCTION

Simple myopia is a type of refractive error with overall prevalence 20%-40% of population, sharpest rise occurs at school going age [1]. It is estimated that over 285 million people in the world have vision impairment and that 42% of this is due to uncorrected refractive errors and will have major increase by 2050 [2].

The normal A-P diameter of eyeball of a person differs with age and myopes tend to have longer axial length comparing to that with emmetropes[3]. Axial-myopia is leading among all variety of myopia, which is caused due to increase in antero-posterior diameter of eyeball. Use of spectacles neither cures nor prevents the progression of this pathology. Methods for the correction of Axial-myopia are not without complications, including corneal infections due to contact lens wear and corneal scarring [4,5], dry eye [6,7] and persistent corneal haze [8] from refractive surgery [9]. Refractive surgeries for treatment of myopia are both costly and not suitable for children's eye [10]. Axial-myopia closely resembles with *Timira*

involving *Prathama Patala*. *Timira* is characterized by blurring of vision in the initial stage [11], and on chronicity leads even to blindness [12]. *Tarpana* is one of the main *Netra Kriya-Kalpa* applied for the management of *Timira* [13], which is potential and ensures better results. There are many hypothetical theories regarding mode of action of *Tarpana* on Myopia and *Timira*. In this study, an open labeled comparative clinical trial was carried out and an attempt was made to observe the effect of *Tarpana* on A-P diameter of eyeball and to know the difference between *Tarpana* by plain *Go-Ghrita* and *Triphala Ghrita*. This randomize open labelled comparative clinical trial was carried out, to assess the changes in Antero-Posterior diameter of axial-myopia with *Tarpana* and to assess the efficacy of *Chakshushya Dravya* in the management of Axial-myopia.

METHODOLOGY

Study Population

Patient attaining, OPD & IPD of Shree Jagdguru Gavisiddeshwara Ayurvedic Medical College and Hospital, Koppal were selected for study. This study was presented before institutional ethical committee (IEC) of SJGAMC, Koppal and got clearance vide Ref. No. HK/ICEC/2019-20/139/dt.16/09/2019

and it has been registered in CTRI vide Ref. No. CTRI/2019/09/021269.

Criteria of Selection of Patient

Inclusion Criteria

- Patients having signs and symptoms of axial myopia.
- Patients between the age group of 7 to 20 years.
- Patients with refractive error up to 5 Dioptre.

Exclusion Criteria

- Other forms of Refractive errors and their complications.
- Patients having other ocular disease.
- Those who are contraindicated for tarpana.

Study Design

40 Patients with symptoms of Axial-Myopia, irrespective of the sex, fulfilling the inclusion criteria were selected and randomly divided into two equal groups. The parameters were collected prior to the treatment.

The Raw drugs (Fig. 1) were procured from market and were authenticated and formulated (Fig. 2) by the Dept. of *Dravya* Guna and *Rasa Shashtra & Bhaishajya Kalpana*, Shree Jagdguru Gavisiddeshwara Ayurvedic Medical College and Hospital respectively.

Fig. 1: Ingredients of *Triphala Ghrita*

Amalaki   *Bibhitaki*   *Haritaki*   *Prakshepa Dravya*

Fig. 2: *Triphala Ghrita* Preparation

Go-Ghrita   *Murchhita Ghrita*   *Ghrita-Paka*   **Filtering** *Triphalaghrita*

Fig. 3 Modified *Tarpana* Goggles & *Tarpana* Kit

20 patients were treated with *Go-Ghrita Tarpana* and 20 patients were treated with *Triphala Ghrita Tarpana*, 2 sittings of 7 days each, with the gap of 14 days in group A and B respectively. The *Tarpana karma* (Fig. 3) was done using *Tarpana* Goggles (Fig. 3 Modified *Tarpana* Goggles & *Tarpana* Kit). This is prepared by making a hole of 1cm radius in the center part of swimming goggle on each eyepiece. The other classical *Tribidha Upakrama* of *Netra Tarpana* Procedures was followed and patient was told to blink slowly during this 10-minute procedure.

Assessment criteria

Assessment was done based on changes found in the clinical signs of the disease. For this purpose, the clinical signs were given suitable scores according to their severity, and assessment was done before, during and after treatment.

Objective Parameters

- Visual Acuity
- Refractive power
- Antero-Posterior diameter of eye ball

Table. 1 & 2: Grading of Objective Parameters

V/A FOR DISTANCE	
Snellen's chart reading	Grade
6/6	0
6/9	1
6/12	2
6/18	3
6/24	4
6/36	5
6/60	6

Optical Correction					
Grade 0	0	Grade 7	-1.75D	Grade 14	-3.50D
Grade 1	-0.25D	Grade 8	-2.00D	Grade 15	-3.75D
Grade 2	-0.50D	Grade 9	-2.25D	Grade 16	-4.00D
Grade 3	-0.75D	Grade 10	-2.50D	Grade 17	-4.25D
Grade 4	-1.00D	Grade 11	-2.75D	Grade 18	-4.50D
Grade 5	-1.25D	Grade 12	-3.00D	Grade 19	-4.75D
Grade 6	-1.50D	Grade 13	-3.25D	Grade 20	-5.00D

Statistical Analysis

The data of Visual acuity, Optical correction and A-P diameter reading were collected and the qualitative data were graded by following the conventional method of Grading (Table. 1 & 2). The visual acuity 6/6 was considered as Grade 0, 6/9 as Grade 1, so as 6/60 as Grade 6. For the optical correction, the diaptoric power -0.25D is consider as Grade 1 so as -5.00D as grade 20.

The data were collected and the effect of treatment on individual parameters were analyzed by Repeated Measures of ANOVA and Bonferroni tests within the groups and Mann-Whitney U rank test was applied between the groups.

AIMS AND OBJECTIVE OF THE STUDY

- To assess the effect of *Go-Ghrita Tarpana* on the Antero-Posterior (A-P) Diameter of Eyeball.
- To assess the effect of *Triphala-Ghrita Tarpana* on the Antero-Posterior (A-P) Diameter of Eyeball.
- To compare the effect of *Go-Ghrita Tarpana* and *Triphala-Ghrita Tarpana* on A-P diameter of Eyeball in axial-myopia.

OBSERVATION AND RESULTS

Visual Acuity for distant: (Table No. 3, 4, 5. Graph 1)

Table 3: Showing the effect on distant vision within Group A

Table: Effect of Treatment within the GROUP A (GO- GHRITA) on DISTANT VISION (VA)									
N=40	Descriptives		Repeated measures of ANOVA test						
Observations Recorded on	Mean	±SD	Tests of Measure	Source of variation	Sum of Squares	Mean Square	F	P	Remarks
Day 0	3.05	2.20	Within-Subjects Effects	Time	41.90	8.38	44.85	<0.001	HS
Day 7	2.15	2.36		Residual	36.43	0.19			
Day 21	2.08	2.24	Within-Subjects Contrasts	Time	28.00	28.00	125.31	<0.001	HS
Day 28	1.88	2.24		Error	8.71	0.22			
Day 58	1.92	2.18	Between-Subjects Effects	Intercept	1109.40	1109.40	38.90	<0.001	HS
Day 88	1.82	2.07		Error	1112.27	28.52			

	Pairwise Comparisons By: Bonferroni			Mean Difference (I-J)	95% CI for Difference		SE	Sig.	Remarks
	(I) Time	(J) Time	% Change		Lower Bound	Upper Bound			
GROUP A	Day 0	Day 7	30%	0.90	0.50	1.30	0.128	0.000	HS
		Day 21	32%	0.98	0.58	1.37	0.127	0.000	HS
		Day 28	39%	1.18	0.79	1.56	0.123	0.000	HS
		Day 58	37%	1.13	0.77	1.48	0.114	0.000	HS
		Day 88	40%	1.23	0.90	1.55	0.104	0.000	HS
	Day 7	Day 21	3%	0.08	-0.13	0.28	0.066	1.000	IS
		Day 28	13%	0.28	0.03	0.53	0.08	0.021	MS
		Day 58	10%	0.23	-0.04	0.49	0.084	0.160	IS
		Day 88	15%	0.33	0.02	0.63	0.097	0.028	MS
	Day 21	Day 28	10%	0.20	0.00	0.40	0.064	0.051	IS
		Day 58	7%	0.15	-0.16	0.46	0.098	1.000	IS
		Day 88	12%	0.25	-0.04	0.54	0.093	0.158	IS
	Day 28	Day 58	-3%	-0.05	-0.32	0.22	0.087	1.000	IS
		Day 88	3%	0.05	-0.22	0.32	0.087	1.000	IS
	Day 58	Day 88	5%	0.10	-0.09	0.29	0.06	1.000	IS
IS - Insignificant; MS - Moderately Significant; S - Significant; HS - Highly significant.									

Table 4: Showing the effect on distant vision within Group B

Table: Effect of Treatment within the GROUP B (TRIPHALA GHRITA) on DISTANT VISION (VA)

N=40	Descriptives		Repeated measures of ANOVA test						
Observations Recorded on	Mean	±SD	Tests of Measure	Source of variation	Sum of Squares	Mean Square	F	P	Remarks
Day 0	3.47	2.16	Within-Subjects Effects	Time	61.98	12.40	52.53	<0.001	HS
Day 7	2.60	2.45		Residual	46.02	0.24			
Day 21	2.35	2.36	Within-Subjects Contrasts	Time	48.89	48.89	77.54	<0.001	HS
Day 28	2.13	2.30		Error	24.59	0.63			
Day 58	2.05	2.22	Between-Subjects Effects	Intercept	1421.07	1421.07	47.25	<0.001	HS
Day 88	2.00	2.20		Error	1172.93	30.08			

Pairwise Comparisons By: Bonferroni			Mean Difference (I-J)	95% CI for Difference		SE	Sig.	Remarks
(I) Time	(J) Time	% Change		Lower Bound	Upper Bound			
Day 0	Day 7	25%	0.88	-0.29	0.09	0.13	0.000	HS
	Day 21	32%	1.13	0.47	1.28	0.14	0.000	HS
	Day 28	39%	1.35	0.69	1.56	0.158	0.000	HS
	Day 58	41%	1.43	0.86	1.85	0.16	0.000	HS
	Day 88	43%	1.48	0.93	1.92	0.16	0.000	HS
Day 7	Day 21	10%	0.25	0.01	0.49	0.078	0.041	MS
	Day 28	18%	0.48	0.20	0.75	0.088	0.000	HS
	Day 58	21%	0.55	0.20	0.90	0.113	0.000	HS
	Day 88	23%	0.60	0.25	0.95	0.112	0.000	HS
Day 21	Day 28	10%	0.23	0.02	0.43	0.067	0.026	MS
	Day 58	13%	0.30	0.07	0.53	0.073	0.003	S
	Day 88	15%	0.35	0.11	0.59	0.076	0.001	HS
Day 28	Day 58	4%	0.08	-0.13	0.28	0.066	1.000	IS
	Day 88	6%	0.13	-0.08	0.33	0.064	0.866	IS
Day 58	Day 88	2%	0.05	-0.06	0.16	0.035	1.000	IS

IS - Insignificant; MS - Moderately Significant; S - Significant; HS - Highly significant.

Table 5: Showing the effect on Visual Acuity for distant between the Groups A and B
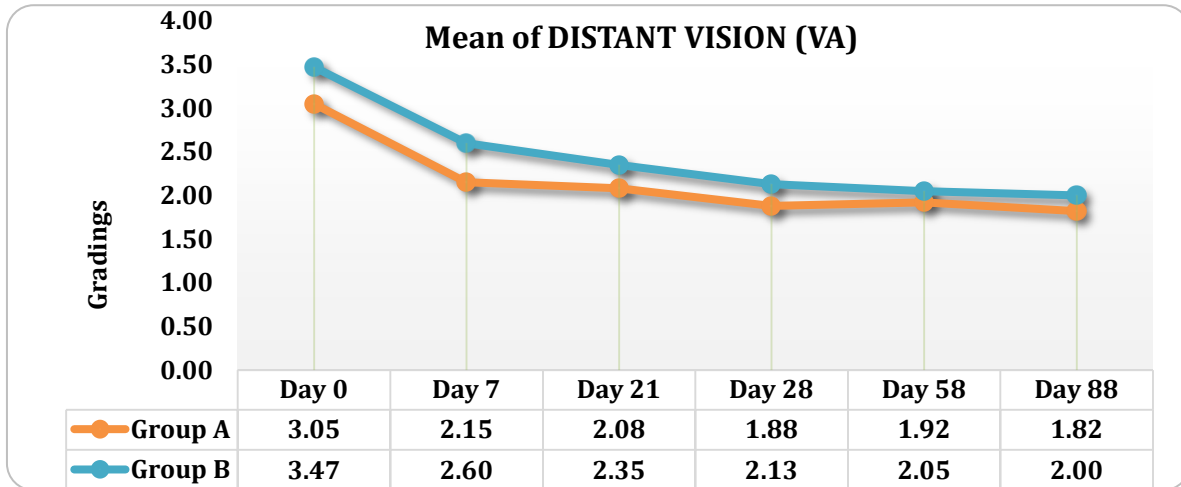
Table : Comparisons Between Groups A and B in DISTANT VISION (VA)

Assessment Observations Recorded on	Descriptive Statistics			Mann-Whitney U Test Ranks			Test Statistics		
	Group	Mean	± S.D.	N	Mean Rank	Sum of Ranks	U	Z	P	Remarks
Day 7	Group A	2.15	2.36	40	38.25	1530.0	710.0	0.900	>0.05	IS
	Group B	2.60	2.45	40	42.75	1710.0				
Day 21	Group A	2.07	2.24	40	38.90	1556.0	736.0	0.638	>0.05	IS
	Group B	2.35	2.36	40	42.10	1684.0				
Day 28	Group A	1.88	2.24	40	38.66	1546.5	726.5	0.745	>0.05	IS
	Group B	2.13	2.30	40	42.34	1693.5				
Day 58	Group A	1.92	2.18	40	38.76	1550.5	730.5	0.702	>0.05	IS
	Group B	2.05	2.22	40	42.24	1689.5				
Day 88	Group A	1.82	2.07	40	38.93	1557.0	737.0	0.640	>0.05	IS
	Group B	2.00	2.20	40	42.08	1683.0				

IS - Insignificant; MS - Moderately Significant; S - Significant; HS - Highly significant.

The mean value of Visual Acuity for distance (Table 3, 4, 5) in Group A, was reduced from 3.05 to 2.15, 1.88 and 1.82 in day 7 by 30%, day28 by 13%, and day 88 by 5% respectively, which is highly significant at p<0.001. In Group B, the mean value of Visual Acuity for distant was reduced from 3.47 to 2.60 by 25%, 2.13 by 18%, 2.00 by 2% in day 7, 28 and 88 respectively, which is highly significant at p<0.001. The statistical significance between the Groups before and after treatment were insignificant at >0.05 in distance vision. Thus, it showed that both the groups are highly significant within the groups and insignificant between the groups, while treating distance vision.

Graph 1: Line Diagram showing the effect on Distance Vision (VA) between the Group A and B

Mean of DISTANT VISION (VA)

	Day 0	Day 7	Day 21	Day 28	Day 58	Day 88
Group A	3.05	2.15	2.08	1.88	1.92	1.82
Group B	3.47	2.60	2.35	2.13	2.05	2.00

Optical correction (spherical): (Table 6, 7, 8 , Graph 2)

Table 6: Showing the effect on optical correction (spherical) within Group A

Table: Effect of Treatment within the GROUP A (GO- GHRITA) on CORRECTION READING									
N=40	Descriptives			Repeated measures of ANOVA test					
Observations Recorded on	Mean	±SD	Tests of Measure	Source of variation	Sum of Squares	Mean Square	F	P	Remarks
Day 0	5.88	5.20	Within-Subjects Effects	Time	70.34	14.07	24.60	<0.001	HS
Day 7	4.90	5.63		Residual	111.50	0.57			
Day 21	4.88	5.78	Within-Subjects Contrasts	Time	55.16	55.16	43.45	<0.001	HS
Day 28	4.40	5.69		Error	49.51	1.27			
Day 58	4.33	5.74	Between-Subjects Effects	Intercept	5500.84	5500.84	29.29	<0.001	HS
Day 88	4.35	5.77		Error	7324.33	187.80			

	Pairwise Comparisons By: Bonferroni			Mean Difference (I-J)	95% CI for Difference		SE	Sig.	Remarks
	(I) Time	(J) Time	% Change		Lower Bound	Upper Bound			
GROUP A	Day 0	Day 7	17%	0.98	0.39	1.56	0.188	0.000	HS
		Day 21	17%	1.00	0.28	1.72	0.229	0.001	HS
		Day 28	25%	1.48	0.68	2.27	0.256	0.000	HS
		Day 58	26%	1.55	0.83	2.28	0.232	0.000	HS
		Day 88	26%	1.53	0.81	2.24	0.229	0.000	HS
	Day 7	Day 21	1%	0.03	-0.32	0.37	0.11	1.000	IS
		Day 28	10%	0.50	-0.01	1.01	0.164	0.062	IS
		Day 58	12%	0.58	0.13	1.02	0.143	0.004	S
		Day 88	11%	0.55	0.08	1.02	0.152	0.012	MS
	Day 21	Day 28	10%	0.48	0.09	0.86	0.124	0.007	S
		Day 58	11%	0.55	0.13	0.97	0.134	0.003	S
		Day 88	11%	0.53	0.05	1.00	0.152	0.020	MS
	Day 28	Day 58	2%	0.08	-0.23	0.38	0.097	1.000	IS
		Day 88	1%	0.05	-0.34	0.44	0.124	1.000	IS
	Day 58	Day 88	-1%	-0.03	-0.26	0.21	0.076	1.000	IS

IS - Insignificant; MS - Moderately Significant; S - Significant; HS - Highly significant.

Table 7: Showing the effect on optical correction (spherical) within Group B

Table: Effect of Treatment within the GROUP B (TRIPHALA GHRITA) on CORRECTION READING

	N=40	Descriptives		Repeated measures of ANOVA test						
	Observations Recorded on	Mean	±SD	Tests of Measure	Source of variation	Sum of Squares	Mean Square	F	P	Remarks
GROUP B	Day 0	6.18	4.92	Within-Subjects Effects	Time	97.73	19.55	23.25	<0.001	HS
	Day 7	4.87	5.39		Residual	163.93	0.84			
	Day 21	4.70	5.35	Within-Subjects Contrasts	Time	62.40	62.40	25.00	<0.001	HS
	Day 28	4.28	5.40		Error	97.34	2.50			
	Day 58	4.45	5.51	Between-Subjects Effects	Intercept	5568.07	5568.07	33.14	<0.001	HS
	Day 88	4.43	5.55		Error	6552.27	168.01			

Pairwise Comparisons By: Bonferroni			Mean Difference (I-J)	95% CI for Difference				
(I) Time	(J) Time	% Change		Lower Bound	Upper Bound	SE	Sig.	Remarks
Day 0	Day 7	21%	1.30	-0.21	0.26	0.238	0.000	HS
	Day 21	24%	1.48	0.56	2.04	0.261	0.000	HS
	Day 28	31%	1.90	0.66	2.29	0.303	0.000	HS
	Day 58	28%	1.73	0.95	2.85	0.314	0.000	HS
	Day 88	28%	1.75	0.74	2.71	0.32	0.000	HS
Day 7	Day 21	4%	0.18	-0.24	0.59	0.133	1.000	IS
	Day 28	12%	0.60	-0.06	1.26	0.211	0.107	IS
	Day 58	9%	0.43	-0.20	1.05	0.199	0.586	IS
	Day 88	9%	0.45	-0.17	1.07	0.199	0.443	IS
Day 21	Day 28	9%	0.43	0.06	0.79	0.118	0.013	MS
	Day 58	5%	0.25	-0.15	0.65	0.128	0.866	IS
	Day 88	6%	0.28	-0.13	0.68	0.129	0.592	IS
Day 28	Day 58	-4%	-0.18	-0.51	0.16	0.107	1.000	IS
	Day 88	-4%	-0.15	-0.48	0.18	0.105	1.000	IS
Day 58	Day 88	1%	0.03	-0.11	0.16	0.044	1.000	IS

IS - Insignificant; MS - Moderately Significant; S - Significant; HS - Highly significant.

Table 8: Showing the effect on Optical correction (spherical) between the Groups A and B

Table : Comparisons Between Groups A and B in CORRECTION READING

Assessment Observations Recorded on	Descriptive Statistics			Mann-Whitney U Test Ranks				Test Statistics		
	Group	Mean	± S.D.	N	Mean Rank	Sum of Ranks	U	Z	P	Remarks
Day 7	Group A	4.90	5.63	40	40.21	1608.5	788.5	0.114	>0.05	IS
	Group B	4.87	5.39	40	40.79	1631.5				
Day 21	Group A	4.88	5.78	40	40.34	1613.5	793.5	0.064	>0.05	IS
	Group B	4.70	5.35	40	40.66	1626.5				
Day 28	Group A	4.40	5.69	40	40.19	1607.5	787.5	0.125	>0.05	IS
	Group B	4.28	5.40	40	40.81	1632.5				
Day 58	Group A	4.33	5.74	40	39.18	1567.0	747.0	0.533	>0.05	IS
	Group B	4.45	5.51	40	41.83	1673.0				
Day 88	Group A	4.35	5.77	40	39.51	1580.5	760.5	0.399	>0.05	IS
	Group B	4.43	5.55	40	41.49	1659.5				

IS - Insignificant; MS - Moderately Significant; S - Significant; HS - Highly significant.

The mean value of Optical correction (Table 6, 7, 8) in Group A, was reduced from 5.88 to 4.90, 4.40 and 4.35 by 17% in day 7, by 10% in day 28 and by 1% in day 88 respectively, which is highly significant at p<0.001. In Group B, the mean value of Optical correction was reduced from 6.18 to 4.87, 4.28 and changed to 4.43 by 21%, 12% and 1% in day 7, 28 and 88 respectively, which is highly significant at p<0.001. The statistical significance between the Groups before and after treatment were insignificant at >0.05 in Optical correction (spherical). Thus, it showed that both the groups are highly significant within the groups and insignificant between the groups, while considering Optical correction.

Graph 2: Line Diagram showing the effect on Optical correction between the Group A and B
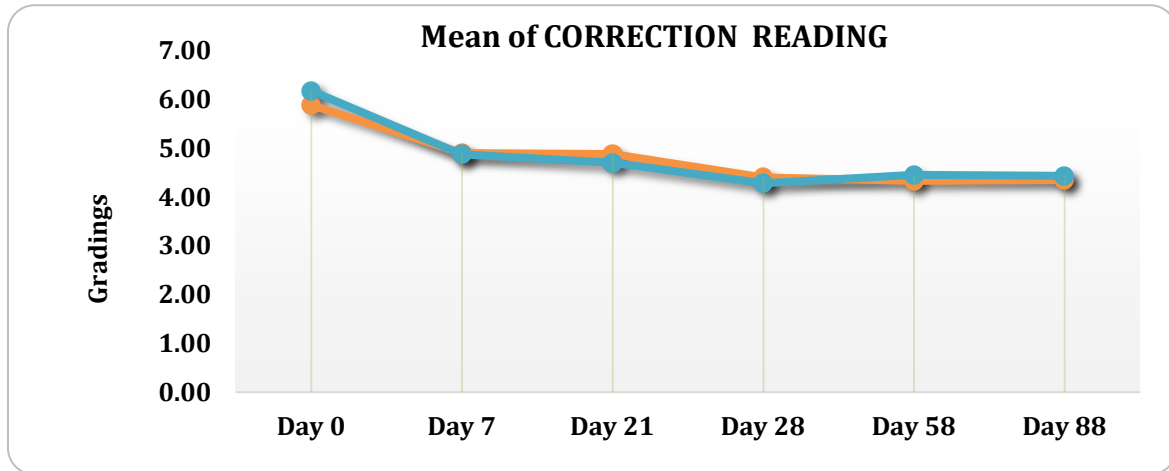
Table 9: Showing the effect on A-Scan reading within Group A

A-SCAN: (Table 9, 10, 11, Graph 3)

Table: Effect of Treatment within the GROUP A (GO- GHRITA) on A- SCAN									
N=40	Descriptives			Repeated measures of ANOVA test					
Observations Recorded on	Mean	±SD	Tests of Measure	Source of variation	Sum of Squares	Mean Square	F	P	Remarks
Day 0	23.67	0.93	Within-Subjects Effects	Time	6.6	1.3	19.43	<0.001	HS
Day 7	23.70	0.91		Residual	13.2	0.1			
Day 21	23.62	0.97	Within-Subjects Contrasts	Time	6.1	6.1	85.95	<0.001	HS
Day 28	23.45	1.02		Error	2.8	0.1			
Day 58	23.38	1.03	Between-Subjects Effects	Intercept	132634.0	132634.0	24878	<0.001	HS
Day 88	23.24	0.96		Error	207.9	5.3			

	Pairwise Comparisons By: Bonferroni			Mean Difference (I-J)	95% CI for Difference		SE	Sig.	Remarks
	(I) Time	(J) Time	% Change		Lower Bound	Upper Bound			
GROUP A	Day 0	Day 7	-0.11%	-0.03	-0.28	0.22	0.08	1.000	IS
		Day 21	0.20%	0.05	-0.15	0.25	0.063	1.000	IS
		Day 28	0.93%	0.22	-0.01	0.45	0.073	0.064	IS
		Day 58	1.23%	0.29	0.11	0.47	0.058	0.000	HS
		Day 88	1.80%	0.43	0.24	0.61	0.058	0.000	HS
	Day 7	Day 21	0.32%	0.08	-0.07	0.22	0.047	1.000	IS
		Day 28	1.05%	0.25	0.06	0.44	0.061	0.003	S
		Day 58	1.35%	0.32	0.11	0.53	0.066	0.000	HS
		Day 88	1.91%	0.45	0.26	0.65	0.062	0.000	HS
	Day 21	Day 28	0.73%	0.17	0.04	0.31	0.043	0.004	S
		Day 58	1.03%	0.24	0.08	0.41	0.054	0.001	HS
		Day 88	1.60%	0.38	0.23	0.53	0.049	0.000	HS
	Day 28	Day 58	0.30%	0.07	-0.11	0.25	0.057	1.000	IS
		Day 88	0.87%	0.21	0.05	0.36	0.048	0.002	S
	Day 58	Day 88	0.57%	0.13	0.01	0.26	0.04	0.030	MS
IS - Insignificant; MS - Moderately Significant; S - Significant; HS - Highly significant.									

Table 10: Showing the effect on A-Scan reading within Group B

				Repeated measures of ANOVA test					
N=40	Descriptives								
Observations Recorded on	Mean	±SD	Tests of Measure	Source of variation	Sum of Squares	Mean Square	F	P	Remarks
Day 0	23.62	0.80	Within-Subjects Effects	Time	7.90	1.58	20.95	<0.001	HS
Day 7	23.74	0.68		Residual	14.71	0.08			
Day 21	23.49	0.76	Within-Subjects Contrasts	Time	6.77	6.77	66.05	<0.001	HS
Day 28	23.37	0.86		Error	4.00	0.10			
Day 58	23.31	0.88	Between-Subjects Effects	Intercept	132051.2	132051.2	37315	<0.001	HS
Day 88	23.22	0.85		Error	138.01	3.54			

Table: Effect of Treatment within the GROUP B (TRIPHALA GHRITA) on A- SCAN

GROUP B

Pairwise Comparisons By: Bonferroni			Mean Difference (I-J)	95% CI for Difference		SE	Sig.	Remarks
(I) Time	(J) Time	% Change		Lower Bound	Upper Bound			
Day 0	Day 7	-0.52%	-0.12	-0.26	-0.01	0.074	1.000	IS
	Day 21	0.57%	0.14	-0.35	0.11	0.068	0.812	IS
	Day 28	1.07%	0.25	-0.08	0.35	0.06	0.002	S
	Day 58	1.31%	0.31	0.07	0.44	0.062	0.000	HS
	Day 88	1.71%	0.40	0.12	0.51	0.069	0.000	HS
Day 7	Day 21	1.09%	0.26	0.09	0.43	0.054	0.000	HS
	Day 28	1.59%	0.38	0.19	0.56	0.059	0.000	HS
	Day 58	1.83%	0.43	0.22	0.65	0.068	0.000	HS
	Day 88	2.22%	0.53	0.31	0.74	0.069	0.000	HS
Day 21	Day 28	0.51%	0.12	-0.05	0.29	0.053	0.478	IS
	Day 58	0.75%	0.18	-0.01	0.36	0.059	0.074	IS
	Day 88	1.15%	0.27	0.06	0.48	0.068	0.005	S
Day 28	Day 58	0.24%	0.06	-0.06	0.18	0.038	1.000	IS
	Day 88	0.65%	0.15	-0.03	0.33	0.057	0.177	IS
Day 58	Day 88	0.40%	0.09	-0.07	0.26	0.053	1.000	IS

IS - Insignificant; MS - Moderately Significant; S - Significant; HS - Highly significant.

Table 11: Showing the effect on A-Scan reading between the Groups A and B

Table : Comparisons Between Groups A and B in A- SCAN

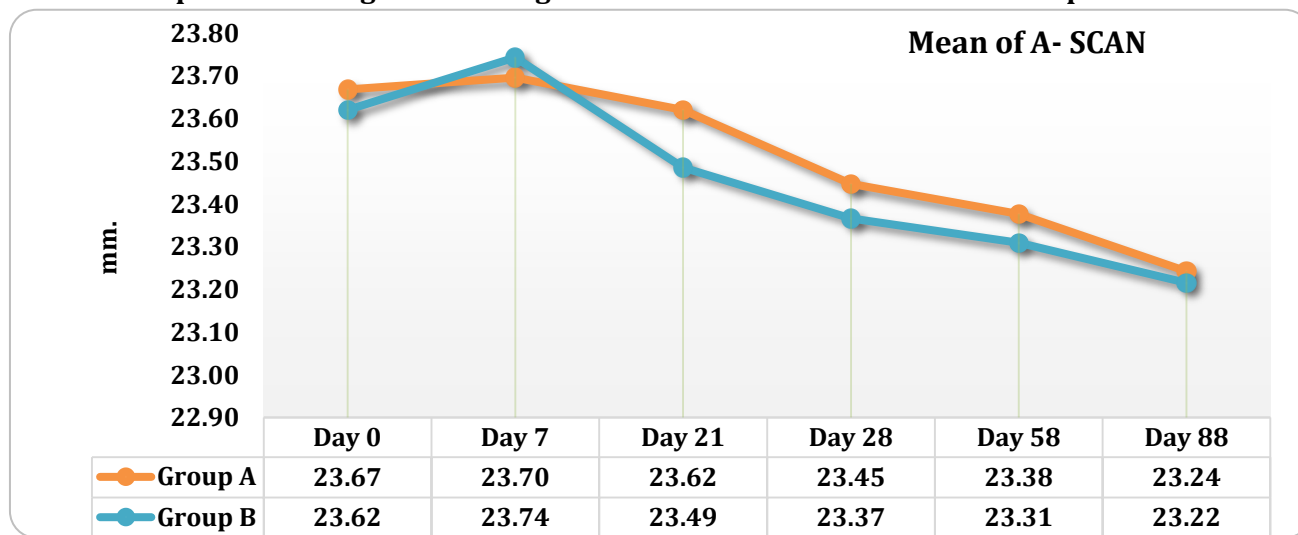|	Group Statistics					Independent Samples t-Test			
Assessment Observations Recorded on	Group	n	Mean	±SD	±SE	Mean Diff.	t	P	Remarks
Day 7	Group A	40	23.70	0.910	0.144	-0.048	-0.266	>0.05	IS
	Group B	40	23.74	0.677	0.107				
Day 21	Group A	40	23.62	0.972	0.154	0.135	0.692	>0.05	IS
	Group B	40	23.49	0.759	0.120				
Day 28	Group A	40	23.45	1.022	0.162	0.081	0.381	>0.05	IS
	Group B	40	23.37	0.862	0.136				
Day 58	Group A	40	23.38	1.034	0.164	0.067	0.313	>0.05	IS
	Group B	40	23.31	0.876	0.138				
Day 88	Group A	40	23.24	0.964	0.152	0.027	0.133	>0.05	IS
	Group B	40	23.22	0.853	0.135				

IS - Insignificant; MS - Moderately Significant; S - Significant; HS - Highly significant.

The A-Scan reading (Table 9,10,11) in Group B, was increased from 23.62 to 23.74 (day 0 to day 7) i.e. by 0.52% after first sitting of Tarpana and it reduced from 23.74 to 23.49 (day 7 to day 21) i.e. by 1.09% improvement before second sitting of Tarpana, it is highly significant at P<0.001. It was reduced from 23.49 to 23.37 (day 21 to day 28) by 0.51%.It is again reduced from 23.37 to 23.31 by 0.24% (day 28 to day 58) and then reduced to 23.22 by Day 88 by 0.40% which is highly significant at p<0.001. While comparing day 0 with day 88, the mean A-P diameter was reduced from 23.62mm tov23.22 mm by 1.71%.

The mean value of A-Scan reading in Group A, was increased from 23.67 to 23.70 (day 0 to day 7) i.e. by 0.11% after first sitting of *Tarpana* and it reduced from 23.70 to 23.45 in 28 by 0.73%, and to 23.24 by 0.57% in day 88, which is highly significant at $p<0.001$. While comparing day zero with day 88, the mean A-P diameter was reduced from 23.67mm to 23.24 mm by 1.80%. In Group B, on day 7 after first sitting of *Tarpana* mean value was increased from 23.62 to 23.74 by 0.52%.

Then on day 28 reduced from 23.74 to 23.37 by 0.51% and to 23.22 by 0.40% in day 88, which is highly significant at $p<0.001$. While comparing day 0 with day 88, the mean A-P diameter was reduced from 23.62mm to 23.22 mm by 1.71%.The statistical significance between the Groups before and after treatment were insignificant at >0.05 in A-Scan reading. Thus, it showed that both the groups are highly significant within the groups and insignificant between the groups, while considering A-Scan reading.

Graph 3: Line Diagram showing the effect on A-Scan between the Group A and B

Mean of A- SCAN

	Day 0	Day 7	Day 21	Day 28	Day 58	Day 88
Group A	23.67	23.70	23.62	23.45	23.38	23.24
Group B	23.62	23.74	23.49	23.37	23.31	23.22

OTHER OBSERVATIONS

In the present study, 45% patients were *Vata-Pittaja Prakriti*, 72% patients belonged to the age group of 15-20 years, 62%patients were female, 92% patients were Hindu, 53% patients were from middle class family, 57% patients were doing graduation, all most all patients were students, 62% patients were on mixed diet. 20 patients (50%) had a chronicity of <1 year, 12 patients (30%) had the chronicity between 1 to 3 years of age. All the patients had blurring of vision, 90% patient had headache and 40% Patient had eyestrain. 37% Patients got BCVA (Best Corrected Visual Acuity) with -0.25D to -0.75D.

While doing *Tarpana Karma* patients of Group B, complains moderate to severe degree of irritation/burning sensation in eye (Table No. 12). In group A 18 (90%) and 2 (10%) patients had mild and moderate degree of irritation while in group B, 1 (5%), 7 (35%) and 12 (60%) patients had mild, moderate and severe degree of irritation during *Tarpana karma* respectively.

Table 12: Showing the Degree of Irritation during *Tarpana* in-group A and B

Degree of Irritation	Group A	%	Group B		Total	
Mild	18	90%	1	5%	19	47%
Moderate	2	10%	7	35%	9	23%
Severe	0	0%	12	60%	12	30%

Fourteen patients (Group A-9, Group B-5) were having dark circle around eye, which disappeared completely after first sitting of *Tarpana*.

DISCUSSION

Effect of therapy on Visual Acuity for distant
Groups A and B shows statistically highly significant result ($p<0.001$) in treatment of Visual Acuity for distant. It was observed that after first sitting of *Tarpana* there was better result as compared to the second sitting. There was improvement in Visual acuity and visual acuity within 6/18, were turned normal after treatment**.**

Effect of therapy on Optical Correction readings
Both the groups shown statistically highly significant result ($P<0.001$) in treatment of Visual Acuity for distant. It was observed that after first sitting of *Tarpana* there is better result as compared to the second sitting and both the group had shown good result but, while comparing the mean values, the Group B (TG) is little better than the Group A (GG). There were reduction in accepted optical correction after treatment and accepted optical correction within -0.75D, were turned to normal through *Tarpana karma*. In addition, the accepted optical

power within -1.0D to -1.50D eyes turned normal after treatment and there was no reoccurrence until FU 2 (day88).

Effect of therapy on A-Scan Readings (A-P diameter): Both the groups shown statistically highly significant result (P<0.001) on A-P diameter. After the first sitting of *Tarpana*, there was slight increase in A-P diameter reading in most of the cases. This might be because of the increasing in the thickness of cornea. It was observed that both the groups had shown good result but, while comparing the mean values, the Group B (TG) shows little better result than the Group A (GG) on reducing the Antero-Posterior diameter of Eyeball.

Discussion on Mode of Action of Drugs and Procedure

The process of Drug Absorption

The human cell membrane is biphospolipid layer. (Fig. 15, 16). The Lipid soluble drugs are absorbed through passive diffusion [14] and the aqueous soluble drugs through filtration process by the Para-cellular space or Aqueous pore of the cell membrane [15].

The mode of drug penetration to the cytoplasm is through following methods [14].

a. Passive diffusion
b. Filtration
c. Specialized transportation

The ocular drug absorption in *Tarpana* depends on:

▪ *Abhyanga* and *Swedana* as *Poorva karma* of *Tarpana*
▪ Nature of the Corneal surface
▪ Nature of the drug
  o Temperature of the Drug used
  o Solubility of the Drug used
  o Content of the Drug used
▪ Area of Surface Contact
▪ Time of Surface Contact
▪ Viscosity of the drug
▪ Molecular size of the drug

Discussion on Mode of Action of Drugs used

Axial-myopia is a structural abnormality, which is caused by *Vata Dosha*. The eye is the seat of *Pitta Dosha*. *Go-Ghrita* and *Triphala-Ghrita* are *Chakshushya*, *Tridoshahara* and *Rasayana*. So, the *Go-Ghrita* and *Triphala-Ghrita* are appropriate *Dravya* to break the pathology (*Samprapti Vighatana*) caused by the *Dosha* in Axial-myopia.

Property of the drug used

The base of *Tarpana Dravya* is usually ghee, which is a lipid and the nature of corneal epithelium is lipophilic [16]. So, this property favors the drug *penetration* to the cytoplasm and ultimately to the anterior chamber. Ghee is a lipid, which contains Vit. A, Vit.E, Beta Carotene. Those are essential for ocular tissue and can easily penetrate the corneal epithelium. Ghee is a *Rasayana* that means, it can rejuvenate the damaged tissue or cell, hence restores their function. *Triphala* is the best medicine for disease *Timira*. It has the property of *Rasayana*, *Chakshushya*, *Indriya Prasadaka*, and *Sarva Roga Hara* along with *Tridosha Shamaka*.

During the preparation of this ghee, *Triphala* was added to the processed ghee as medicated decoction and paste. Then this solution was boiled until it reduced to 1/4th. By this procedure, the ghee is enriched by the active principle like *Chakshushya*, *Rasayana*, *Tridosha hara, Indriya Prasadaka* property of *Triphala*.

Each cell membrane of human body consists of biphospolipid layer. The lipid soluble drugs are absorbed through passive diffusion process [14]. The epithelium and endothelium of human cornea are Lipophilic [16]. So the Lipid or lipid Soluble Drugs like *Go Ghrita* and *Triphala Ghrita* can be easily absorbed in to the cell cytoplasm or organelle of Cornea.

One of the causes of myopia is nutritional deficiency and the word *Chakshushya* can be considered as, the drugs providing nutrition to ocular structures. Therefore, the *Triphala* and plain *Go-Ghrita* provides nutrition to the ocular surface.

The *Netra Tarpana* directly provides nutrition to the structures of eye. It soothes and nourish the glands and tissues of the eyeball through the *Chakshushya Dravya* present in the medicine. Therefore, the lipid secreting glands of lid restores its normal secretion and prevents evaporation of the under lying aqueous layer of Tearfilm, which adds in better refraction.

Therefore, the ocular tissue are nourished by the property of *Triphala Ghrita*, helping in restoring the normal function like proper accommodation (restoring the smooth muscle tonicity), visual perception, ocular movement, lid movement, corneal and lid sensation.

Discussion on Mode of Action of Procedure

Effects of *Abhyanga* and *Swedana* as *Poorva Karma* of *Tarpana*

Sthanika Abhyanga and Mrudu Swedana was administered to the patients as *Poorva Karma* of *Tarpana*. *Abhyanga* or Rubbing the lid-skin with ghee promotes the drug absorption [16]. The eyelid contains many glands and their ducts. Those ducts and glands are supplied with many capillaries. While doing *Abhyanga* the ducts and glands are squeezed and this process of rubbing cleans the glands and ducts, which prepares these structures for better space for absorption of the *Tarpana Dravya* through the capillaries.

Effect of *Pradhana karma*

Nature of the Cornea surface (epithelium): The epithelium and endothelium of cornea are lipophilic [16] whereas, the Stroma is hydrophilic. So the lipid soluble particles infiltrate through cell membrane and the water soluble through the Para-cellular space as those Para-cellular spaces are exists between the cells of epithelium and endothelium[14]. Hence the tissues of and around cornea are activated and receives nutrition from the *Tarpana Dravya*. Therefore, the corneal layers along with the ciliary muscle of iris and ciliary body get nutrition. So, the tonicity of the ciliary muscle is restored and performs its normal accommodation. This reduces the eyestrain and headache, which is caused by myopia or by the muscular rigidity.

Temperature of the Drug used: The temperature of the *Tarpana Dravya* should be *Sukhoshna* that is body temperature. The temperature generated by *Poorva karma* and *Sukhoshna Tarpana Dravya* favors vasodilatation of the capillaries and ultimately helps in better absorption through the contact surface of the drug.

Surface Contact & Contact time: In *Tarpana*, the medicated ghee (Lipid) is made to stay over the eye until a specified period (Maximum 1000 *Vak matra kala* ~ 25 min, as 100 *Vak matra kala* ~ 2.5 min.) [17, 18] that achieves more surface contact time and the viscosity of the medicated ghee is more, as compared to the aqueous solution. This results more absorption of the drug than the aqueous solution as drop.

The medicine gets absorbed by the *Netra Kosha* that is through the vessels (of lid skin, Orbital Skin), *Srotas* (*Indriya vaha Srotas*) and *Shringataka Marma* (the 4 *Sira* from *Netra*, *Karna*, *Nasa* and *Mukha*). Then the vitiated *Dosha* are expelled through *Nasa*, *Netra* and *Mukha* [19].

The medicine is absorbed by the *Srotas*, which are related to *Netra Sandhi* (Junctions of the eye), *Sirah* (through head), *Nasa* (nose) and expel out the vitiated *Dosha* from the *Netra* [20]. *Shringataka Marma* is involved in the *Karmukata* of *Netra-Kriyakalpa*. The *Shringataka Marma* present inside the junctional point of four *Sira* that are providing *Santarpana karma* (nutrition) to the *Netra*, *Nasa*, *Karna* and *Jihwa* [21]. However, there is no junctional point of nutriating - *Sira* (veins or blood vessel) from eye, nose, ear and tongue in human body.

Indriya Santarpana means proper perception of the respective subjects. So instead of comparing the *Sira* with blood vessels, if we consider the sensory nerves of the sense organs than the thalamus will be the *Shringataka Marma*, as it is the relay center of all the sense organs. Therefore, the *Santarpana* of *Netra vaha Sira* through *Tarpana Karma* provides nutrition to the thalamus, which ultimately promotes better Visual perception.

Effect of Eye blinking: In *Tarpana Karma,* the patients were asked to blink repeatedly, that favours the effective absorption of the ghee by the corneal tissue.

More surface contact time, more viscosity, lipid property, *Chakshushya* property of the medicated ghee facilitate the drug to cross the epithelium and endothelium, strengthen the extra ocular muscle, ciliary muscle, sensory and motor nerves of the eyeball. This restores the normal function of the eye and its appendages.

Effect of *Ghrita Tarpana* on axial length of eyeball: Axial-myopia is a structural defect of Eyeball and *Vata Dosha* is mostly responsible for the structural abnormality. So, Axial-Myopia is *Vata* predominance. The eye is the seat of *Alochaka-Pitta*. *Go-Ghrita* and *Triphala-Ghrita* are *Chakshushya*, *Tridoshahara* and *Rasayana*. Therefore, the *Go-Ghrita* and *Triphala-Ghrita* are appropriate *Dravya* to break the *Samprapti Vighatana* (pathology) caused by the *Dosha* in Axial-myopia.

The elongated A-P diameter of the eyeball in axial-myopia is reduced because of the pressure exerted by the *Tarpana* over the eye during *Netra Tarpana*. I have used *Tarpana* Goggles for *Tarpana* karma. It prevents lateralization of ghee and increases drug surface contact. In addition, warmth of the ghee was retained for a long period, which favors better absorption. However, few patients complained of pain and tightness around orbit during procedure. Hence, there is scope for developing comfortable *Tarpana* goggle.

Effect of *Paschyatkarma*: After *Tarpana karma* mild massage (mild rubbing) done over the closed eyes of the patient, this also favours the absorption of the *Tarpana Dravya*. The patient inhales *Trikatu-adi Dhoomapana* and *Kavala* with lukewarm water. It eliminates excess *Kapha* caused by the *Tarpana* karma. There is tearing generated by *Dhoomapana*, this helps in eliminating the blurring caused by the *Tarpana Ghrita*.

CONCLUSION

Axial-myopia is one among the variety of myopia caused by the increase in antero-posterior diameter of eyeball. Progression of the disease may cause high myopia, which may even lead to blindness. *Tarpana Karma* is effective in correcting refractive error of the eye in patients with axial myopia by correcting anterior posterior diameter of eyeball. The study revealed that both *Go-Ghrita Tarpana* and *Triphala-Ghrita Tarpana* statistically have same effect on the visual acuity, optical correction and Antero-posterior diameter of eyeball. Whereas, patients

treated with *Go-Ghrita Tarpana* had less irritation during procedure in comparison with patients treated with *Triphala-Ghrita Tarpana*. Therefore using plain *Ghrita* for *Tarpana* will reduce the treatment cost and irritation during *Netra Tarpana*. This will increase acceptability of *Tarpana* by large number of patients.

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