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ANTI-CATARACT ACTIVITY FOR *NAGARJUNA VARTI* EYE OINTMENT AND MODIFIED FORM OF *NAGARJUNA VARTI*

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ABSTRACT

Introduction: Ocular therapeutics are of prime focus in the present era as the amount of cases with ocular ailments have increased. Thus it is the duty of medical science to deal with situation. *Ayurveda* also suggests therapeutics for preventive, curative and promotive health of eyes. One such ocular medicament is *Nagarjuna Varti*. **Material and Methods:** A study was carried out to assess the anti-cataract activity of *Nagarjuna Varti* and its modified form in rabbits. **Results:** It showed significant delay in the onset and progression of cataract in vivo. The Modified form of *Nagarjuna Varti* ointment shown better anti-cataract activity compared to *Nagarjuna Varti* eye ointment. **Discussion:** The drugs in the formulation mainly helps in *Lekhana, Chedana, Rakta Prasadaka, Netra Shodhaka* and *Sukshma Strotogami*, which help in deep penetration of ocular tissues. The *Kaphapittaghna* action of *Yoga* results in delaying the progression of condition.

KEYWORDS: *Lekhana, Chedana, Rakta Prasadaka, Netra Shodhaka* and *Sukshma Strotogami.*

INTRODUCTION

Varti Kalpana are the most commonly used dosage forms for the treatment of *Netrarogas* not only as a curative but also preventive mode of medicament for preventing the progression of a disease. Various Varti have been quoted in classics among which *Nagarjuna Varti/ Anjana* has been stated as an ocular therapeutic in Timiraroga. The ingredients of *Nagarjuna Varti* are *Haritaki, Vibhitaki, Amalaki, Saindhava Lavana, Shunti, Maricha, Pippali, Yashtimadhu, Suddha Tutta, Rasanjana, Prapoundarika, Vidanga, Lodhra, Tamra Bhasma* and *Bhavana* of *Nabho Jala.* Various treatment modalities are available for the Cataract in modern science which primarily includes surgery. Hence an attempt for understanding the classical approach of Nagarjuna Varti prayoga and its anti-cataract effect in animals was made.

MATERIALS AND METHODS

The study was carried out on anti-cataract activity of *Nagarjuna Varti* eye ointment and Modified form of *Nagarjuna Varti* topically administered in rabbits. Cataract was induced in rabbits by feeding 300g/L galactose diet for 21 days. Rabbits with *Nagarjuna Varti* eye ointment and Modified form of *Nagarjuna Varti* treatment drug significant delayed the onset and progression of cataract in vivo. In addition to the delay in reaching various stages of development of cataract compared to control group.

Table 1: Test Conditions.

A	**Animal species**	**Albino rabbits**
B	**Strain :**	New zeland (NZW)
C	**Source:**	Animal house attached to ABMRCP, Bengaluru
D	**Selection :**	A total of healthy female of body weight 1.5-2.0 kg rabbits were selected per group
E	**Acclimatization period**	All the selected animals were kept under acclimatization for 5 days before dosing.
F	**Numbering and identification**	The animals were marked with saturated 1% picric acid solution in water for proper identification. The marking within the cages is as follows.

Animal number	Marking
1	Head
2	Body
3	Tail

Housing and feeding conditions

Animals kept individually housed. The temperature of the experimental animal room was 20°C (± 3°C) for rabbits. Although the relative humidity was 30% and preferably not exceeded 70%, other than during room cleaning, the aim was 50-60%. Lighting was sequence being 12 hours light, 12 hours dark. Excessive light intensity was avoided. For feeding, conventional laboratory diets (Amruth Feed, Bangalore) was used with an unrestricted supply of drinking water *ad libitum*. The protocol was approved by IAEC of SDMCA, Udupi.

Drug preparation: **Eye ointment**

The equal portion (1:1:1) of ointment bases like beeswax, paraffin and carnauba wax melted on water bath is equal to 1 gm to which Modified form of *Nagarjuna Varti* was added slowly and mix thoroughly followed by sterilized ointment as specified in the standard protocol, stored in tube and used for topical application.

Application of the test substance

The test substance as *Nagarjuna Varti* eye ointment and Modified form of *Nagarjuna Varti* was placed in the conjunctival sac of one eye of each animal after gently pulling the lower lid away from the eyeball. The lids were then gently held together for about one second in order to prevent loss of the material.

In vivo Galactose induced cataract in rabbit model

Method: The rabbits were randomized into 3 groups such as control and treated groups (n=3) with weight range of 1.5 kg to 2.0 kg. The 300g/L galactose was fed to all group's *ad libitum* induced cataract. Seven days prior to start of galactose diet, dose of drug (100 mg) was applied topically once a day to the treated group and continued till the end of the experiment (21 days). In control group only ointment base and the galactose diet was given. Eyes was examined through a slit lamp after dilating the rabbit pupil with 10g/L tropicamide. The stages of cataract was graded according to Sippel's classification.[1]

Statistical analysis: All data were expressed as mean±SEM. The groups were compared by one-way ANOVA using Dunnet test, with a $p<0.05$ considered as significant.

Table 2: Treatment schedule.

Group	Treatment	End point
I	Disease control (Ointment Base)	Opacity index and stages of cataract
II	Nagarjuna Varti ointment (100 mg per day)	
III	*Nagarjuna Varti modified* form (100 mg per day)	

n=3, per group 3 rabbits.

RESULTS

Table 3: Effect of test substance on Body weight.

Treatment group	Body weight (Kg) at weekly interval			
	Day 1	Day 7	Day 14	Day 21
Disease control	1.82±2.76	1.88±2.02	1.93±3.12	1.96±3.28
***Nagarjuna Varti* ointment**	1.88±.3.27	1.92±3.06	1.95±4.24	2.00±3.73
***Nagarjuna Varti modified* form**	1.80±3.66	1.82±3.55	1.85±3.77	1.93±3.54

Values are mentioned in Mean±SEM

The data of body weight was represented in table 3, before the initiation of experiment and weekly body weight of rabbits was measured for disease control & treatment group and values are calculated in terms of mean. The statistically the non-significant in the body weight of disease control and treatment group.

Table 4: Effect of test substance on opacity index in rabbits.

Body weight (Kg)	Day 1	Day 7	Day 14	Day 21
Disease control	0±0.0	0.7±0.02	1.3±0.04	2.0±0.03
***Nagarjuna Varti* ointment**	0±0.0	0.5±0.03	0.7±0.01*	0.8±0.02*
***Nagarjuna Varti modified* form**	0±0.0	0.4±0.02*	0.5±0.03**	0.5±0.04**

All data were expressed as mean±SEM. The groups were compared by one-way ANOVA using Dunnet test, with a $p<0.05$ considered as significant vs. disease control.

The data of opacity index was represented in table 4. The opacity index on first day was nil score for all groups. On 7th day, opacity index of *Nagarjuna Varti modified form* significant ($p<0.05$) decrease than disease control.

On 14th day, opacity index of *Nagarjuna Varti* ointment significant ($p<0.05$) decrease whereas opacity index of *Nagarjuna Varti modified form* more significant ($p<0.01$) decrease than disease control. Similarly on 21st day, opacity index of *Nagarjuna Varti* ointment significant ($p<0.05$) decrease. However, opacity index of *Nagarjuna Varti modified form* more significant ($p<0.01$) decrease than disease control.

Different stages of cataract

Stage I: The Early Stage

The lens remains clear but the ability to focus at distance and then refocus on near objects is slowly lost.

Stage II: The immature stage

Lens capacity is enough to noticeably obstruct vision. If the eyes is illuminated from the side, the edge of the pupil casts shadow on the lens.

Stage III: The mature stage

A mature cataract causes the lens to become completely white or deep amber in color. The iris edge no longer casts a shadow.

Stage IV: The hypermature stage

The lens becomes shrunken with white spots and occasionally may partially dislocate or suffer from secondary glaucoma.

Table 5: Effect of test substance on different stages of cataract in rabbits at day 1.

Body weight (Kg)	Stage I	Stage II	Stage III	Stage IV
Disease control	-	-	-	-
***Nagarjuna Varti* ointment**	-	-	-	-
***Nagarjuna Varti modified* form**	-	-	-	-

(-): Cataract nil

The results of effect of *Nagarjuna Varti* ointment and *Nagarjuna Varti modified* form are displayed in table 5. On day 1, all the group was fed with 300g/L galactose there is no presence of cataract. There is no such difference between the control and treatment groups.

Table 6: Effect of test substance on different stages of cataract in rabbits at day 7.

Body weight (Kg)	Stage I	Stage II	Stage III	Stage IV
Disease control	+	+	-	-
***Nagarjuna Varti* ointment**	+	-	-	-
***Nagarjuna Varti modified* form**	+	-	-	-

(+): Cataract present and (-): Cataract nil

The results of effect of *Nagarjuna Varti* ointment and *Nagarjuna Varti modified* form are displayed in table 6. On day 7, all the groups was continuously fed with 300g/L galactose, the stage I and stage II cataract developed in disease control whereas *Nagarjuna Varti* ointment and *Nagarjuna Varti modified* form treatment group shows only stage I cataract

Table 7: Effect of test substance on different stages of cataract in rabbits at day 14.

Body weight (Kg)	Stage I	Stage II	Stage III	Stage IV
Disease control	+	+	+	-
***Nagarjuna Varti* ointment**	+	+	-	-
***Nagarjuna Varti modified* form**	+	-	-	-

(+): Cataract present and (-): Cataract nil

The results of effect of *Nagarjuna Varti* ointment and *Nagarjuna Varti modified* form are displayed in table 7. On day 14, all the groups was continuously fed with 300g/L galactose, the stage I, stage II and stage III cataract developed in disease control. Whereas *Nagarjuna Varti* ointment shows stage I & II. The treatment group *Nagarjuna Varti modified* form shows only stage I cataract.

Table 8: Effect of test substance on different stages of cataract in rabbits at day 21.

Body weight (Kg)	Stage I	Stage II	Stage III	Stage IV
Disease control	+	+	+	+
***Nagarjuna Varti* ointment**	+	+	-	-
***Nagarjuna Varti modified* form**	+	-	-	-

(+): Cataract present and (-): Cataract nil

The results of effect of *Nagarjuna Varti* ointment and *Nagarjuna Varti modified* form are displayed in table 8. On day 21, all the groups was continuously fed with 300g/L galactose, the stage I, stage II, stage III and stage IV cataract developed in disease control. Whereas *Nagarjuna Varti* ointment shows stage I & II. The treatment group *Nagarjuna Varti modified* form shows only stage I cataract.

DISCUSSION

The study was carried out on anti-cataract activity of *Nagarjuna Varti* eye ointment and Modified form of *Nagarjuna Varti* topically administered in rabbits. Cataract was induced in rabbits by feeding 300g/L galactose diet for 21 days. Rabbits with *Nagarjuna Varti* eye ointment and Modified form of *Nagarjuna Varti* treatment drug significant delayed the onset and progression of cataract in vivo. In addition to the delay in reaching various stages of development of cataract compared to control group.

CONCLUSION

Study indicated that *Nagarjuna Varti* eye ointment and Modified form of *Nagarjuna Varti* topically administered in rabbits shows no significant changes in mean body weight. Based on the observation of cataract stage and recorded for 21 days, it concluded that the *Nagarjuna Varti* eye ointment and Modified form of *Nagarjuna Varti* topically delayed the onset and progression of cataract in vivo. In addition to the delay in reaching various stages of development of cataract compared to control group.

The Modified form of *Nagarjuna Varti* ointment shown better anti-cataract activity compared to *Nagarjuna Varti* eye ointment.

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