

A COMPARATIVE CLINICAL STUDY ON THE EFFICACY OF JALAUKAVACHARANA WITH OR WITHOUT MAHATRIHALADYA GHRITA IN ADHIMANTHA (GLAUCOMA)

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ABSTRACT

Glaucoma is a neurodegenerative disease of optic nerve with various stages characterized by accelerated ganglion cell death, subsequent axonal loss, optic nerve damage and eventual visual field loss. Glaucoma is third main cause for blindness after cataract. Glaucoma causes loss of vision gradually that nobody notices it until the disease is at advanced stage and that too diagnosed accidentally that can permanently damage vision in the affected eye(s) and leads to irreversible blindness by total glaucomatic optic atrophy (TGOA) if left untreated. Based on the site of pathology, clinical features and the sequel of the disease it can be well correlated with the Sarvagata netra roga - 'Adhimantha'. *Raktamokshanam* and *Ghritha pana* are main treatment modalities explained for the treatment of *Adhimantha* in the classics. Present trend of treating glaucoma is with prostaglandin analogues, meiotic therapy, carbonic anhydrase inhibitors and hyper osmotic agents. In most cases these treatments are followed by surgical treatment. In spite of all these, treatment modalities have very little effect, unsatisfactory treatment and too costly. So an observational study has been conducted on patients (n=30) of *Shalakya tantra* OPD of Dr.B.R.K.R.GAC, Hyderabad to evaluate the efficacy of *Jalaukavacharana* and *Mahatriphaladya ghritha* in the management of *Adhimantha*. The present study has come out with promising results in the reduction of signs and symptoms of glaucoma. Thus, Group B which is treated with *Jalaukavacharana* and *Mahatriphaladya ghritha* is more effective than Group A which is treated only with *Jalaukavacharana* with significant result at $p < 0.05$. Satisfactory results were obtained in prevention of recurrence.

Keywords: Glaucoma, *Adhimantha*, *Jalaukavacharana* and *Mahatriphaladya ghritha*

INTRODUCTION

Glaucoma is a neurodegenerative disease of optic nerve (which carries information from eye to brain) with various stages characterized by accelerated ganglion cell death, subsequent axonal loss, optic nerve damage and eventual visual field loss. Glaucoma is mainly divided into two types Congenital and Acquired. Acquired is again divided into open angle and angle closure glaucoma based on mechanism by which aqueous outflow is impaired.

Glaucoma is third main cause for blindness after cataract. In India about 12 million people are affected and contribute to 12.8% of total blindness. Glaucoma however presents an even greater public health challenge than cataract.¹

Glaucoma causes loss of vision gradually that nobody notices it until the disease is at advanced stage and that too diagnosed accidentally. This can permanently damage vision in the affected eye(s) and leads to irreversible blindness if left untreated.

Complete disease elimination is rarely achieved with the modern line of management which include topical beta blockers, prostaglandin analogues, adrenergic drugs and pilocarpin etc. The progressive nature of glaucoma and its growing incidence make its therapy an important target for research.

Based on the site of pathology, clinical features and the sequel of the disease it can be well correlated with the *Sarvagata netra roga* - '*Adhimantha*'. Almost all the affections of *netra* originate from "*Abhisyanda*" as the root cause.² when it is become aggravated due to lack of treatment, leads to *Adhimantha*.³ *Raktamokshanam* and *Ghrita pana* are main among the treatment modalities explained for the treatment of *Adhimantha* in the classics.

As per Ayurveda, *Jalaukavacharanam* is one of the types of *Raktamokshana* and Sushruta has

described Leech as one of *Anushastra* (parasurgical procedures). It is considered as very effective method of *Raktamokshana* because here the vitiated '*Doshas*' are removed without using any *Shastra* (cutting instrument).

Mahatriphaladya ghrita pana used for all *netra rogas* especially *sarvagata netra roga*, ingredients in *ghrita* are *Tridoshagna*, *Chakshushya*, *Shothahara*, *Shulahara* and *Raktapittahara*⁴ which are beneficial in Glaucoma. It nourishes *akshipatalas* and their *Triphalas* are mentioned specially as *Chakshushya dravyas* which nourishes the total eye.

Thus an observational study has been conducted on patients (n=30) of Shalakyata Tantra OPD of Dr.B.R.K.R.GAC, Hyderabad to evaluate the efficacy of *Jalaukavacharanam* and *Mahatriphaladya ghrita pana* in the management of *Adhimantha*. The present study has come out with promising results in the reduction of signs and symptoms of glaucoma.

AIM AND OBJECTIVES:

- To evaluate the effect of *MAHATHRIPHALADYA GHRITAM* in the management of *Adhimantha* (Glaucoma mainly POAG).
- To evaluate the effect of *JALAUKAVACARANAM* in the management of *Adhimantha*.
- To evaluate the combined effect of *MAHATHRIPHALADYA GHRITAM* and *JALAUKAVACARANAM* in the management of *Adhimantha*.

MATERIALS AND METHODS:

This clinical study has been approved by the institutional ethical committee of Dr.B.R.K.R.GAC, Hyderabad. Before the starting of the study, written consent has been taken from each patient about willing to participate.

Patients were free to withdraw their participation from the study at any time without giving for any reason.

The diagnosis of 'Adhimantha (Glaucoma) was done on both the Ayurvedic and modern basis. For this study a special research proforma was prepared as per the Ayurvedic and modern methods. The documentation has been made regarding history of the present illness, past ocular illnesses, present and past drug history. The detailed eye examination has been performed using slit lamp biomicroscopy. Visual fields tests and visual acuity is also measured before during and after the course of study.

ABOUT JALAUKA:

Raktamokshana, a Para surgical procedure gaining popularity around the globe, is being widely practiced. Among all the raktamokshopayas, the commonest one is *JALUKAVACHARANA* due to its easy applicability, painlessness and lack of serious complications. It is one among *Anusastra*⁵. In Susrutha samhita it is mentioned that *jalauka* dwells in cold water, are sweet in taste and are born in water, hence it is ideal to remove the blood vitiated by *pitta*.⁶ Vagbhata Acharya also interpreted the use of *jalauka* in removing *pitta* vitiated blood. In Susrutha samhita, 6 types of *Savisha* [poisonous] *jaloukas* and 6 types of *Nirvisha* [non-poisonous] *jaloukas* are mentioned. The leech saliva contains (Hirudo- substances): Hirudin (anti-coagulant by binding with thrombin), Calin (Inhibits blood coagulation by blocking the binding of Von Willbrand factor to collagen and collagen mediated platelet aggregation), Destabilase (monomerizing activity and has thrombolytic effects), Hirustasin (Inhibits kallikrein, trypsin, chymotrypsin and neutrophilic cathepsin G), Bdelins (Anti-inflammatory), Hyaluronidase (Increases inter-

stitial viscosity, antibiotic activity and spreading factor) Cholestrol esterase Chloromycetyn (Antibiotic), Tryptase inhibitor (Inhibits proteolytic enzyme of host mast cells), Eglins (Anti-inflammatory, inhibits the activity of alpha-chymotrypsin, chymase, substilisin, elastase, cathepsin G), Factor Xa Inhibitor (Inhibits the activity of coagulation factor Xa by forming equimolar complexes), Carboxypeptidase-A inhibitors (increases the inflow of blood), Histamine (vasodilator, increases the inflow of blood at the bite site), Acetylcholine (vasodilator) and Anesthetic substance also.⁷

PROCEDURE:⁸

Poorva karma: The patient was advised to lie down in supine position on the table. Do *sthanika swedanam* with gauze piece soaked in warm water by covering the eyes of the patient. Then the area near the eye was cleaned with a sterile gauze piece. The *jalauka* were made hungry by putting them in *Haridra jalam*.

Pradhana karma: Sterile latex gloves were used during the procedure. The eye of the patient was covered with a gauze piece. The *jalauka* was taken in a hand and its mouth was taken near and around the eye until it bites. After *jalauka* took a bite, a wet sterile gauze piece was placed over its body during the whole procedure. When the patients complaints of pain and itching at the site, *jalauka* should be taken off. The time for application was between 10 – 20 minutes. The time of application was different for different patients according to the condition of patient and dosha prakopa.

Paschat karma: The *jalauka* was separated from the wound by putting *Haridra churna* over the mouth of *jalauka*. The wound was washed well with sterile water and if still bleeding persists pressure can apply with the help of gauze piece. The *jalauka* was made to vomit by touch-

ing its mouth to *Haridra churna*. Rest of the blood sucked by the *jalauka* was removed by squeezing the *jalauka* gently from posterior to anterior. The wound was padded with sterile gauze piece. Patients were advised to change the gauze piece every day for 3 days and remove it after fourth day.

Ingredients of Mahatriphaladya ghrita:

Dravadravyas- (one *prastha* (640ml) each)- *Tripahala kashaya*, *Bhringaraja swarasa*, *Vasa swarasa*, *Shathavari swarasa*, *Guduchi swarasa*, *Amalaki swarasa*, *Aja kshira* and *Go ghrita*.

Kalka dravyas- (15gm each) - *Pippali*, *Sarkara*, *Draksha*, *Triphala*, *Nilotpala*, *Madhuka*, *Kshirakakoli* (*Aswagandha*), *Guduchi* and *Kantakari*.

Method of preparation- Prepare the paste of *Kalka dravyas* and mixed with *go ghrita* followed by rest of the liquids and subjected to heat till it remains the quantity of *ghee*. After cooling, it should be filtered and stored in glass bottles.⁹

Study design: A comparative clinical trial was conducted on 30 patients under two groups 15 each (Group-A is *Jalaukavacharana* and Group-B is *Jalaukavacharana* with *Mahatriphaladya ghrita*) fulfilling the criteria for the diagnosis of the disease *Adhimantha*-glaucoma. Patients attending the OPD and IPD of PG Dept of Shalakyata of Dr B.R.K.R. GOVT. AYURVEDA COLLEGE with the history of clinical signs & symptoms of glaucoma were screened as per the inclusion & exclusion criteria's and registered for this study. All the details about the disease conditions and treatments taken for glaucoma before and after the treatment were recorded in case proforma as per the protocol.

Parameters:

Objective:

- Intra ocular pressure.
- Visual acuity.

Subjective:

- Ocular pain.
- Headache.
- Redness.
- Lacrimation.
- Photophobia.

Selection of patients: 30 patients were selected based on the inclusion and exclusion criteria.

Inclusive Criteria:

- Age between 20 to 60 years.
- Patients having symptoms mentioned under *Adhimantha* (glaucoma).
- Patients with elevated intra ocular pressure not more than 50 mm of Hg.

Exclusive Criteria:

- Patients aged below 20 years and above 60 years.
- Patients associated with systematic illness.
- All the Patients with congenital glaucoma.
- Patients with marked visual loss and *Hatadhimantha* (absolute glaucoma).
- Patients with history of trauma or injury.
- Patients who are undergone any surgical interventions will be excluded.

Diagnosis:

The diagnosis of the disease *Adhimantha* is done on both Ayurvedic and modern basis, from the *lakshanas* and *netraparisha*. Routine blood investigations, clotting time, bleeding time, blood sugar, serum cholesterol and routine urine investigations were done to rule out systemic diseases.

Treatment phase: Once in 15 days for two months of *jalaukavacharana*, 1 leech for each

eye and 5ml of *Mahatriphaladya ghrita* daily BD morning and evening before food.

Follow up phase: Has been conducted after 7 days of completion of one sitting.

Total duration of study: Total duration of the study was 2 months.

Criteria for Assessment:

Assessment of the effect of treatment on signs and symptoms have been done based on subjective and objective parameters based on a grading pattern before and after the treatment as follows:

Table 1: Grading of subjective parameters:

Signs & Symptoms	Absent (0)	Mild (1)	Moderate(2)	Severe(3)
<i>Netra shula</i> (Ocular pain)	No ocular pain at all	Complaint of pain occasionally.	Moderate pain present	Severe pain present continuously.
<i>Shirashula</i> (Headache)	No headache at all	Headache occasionally	Moderate headache	Severe headache present continuously
<i>Raga</i> (Redness)	No redness at all	Pinkish red	Cherry red	Fiery red
<i>Netra srava</i> (watering of eye)	No watering at all	Very less watering	Intermittent watering	Continuous watering
<i>Prakasha Asahishnutha</i> (Photophobia)	No photophobia at all	Occasionally when exposed to bright light.	Photophobia even in less intensity of light.	Severe photophobia that interfere with day today activities.

Grading of objective parameters:

IOP Grading:

IOP	Grade
10 – 21	0
21 – 30	1
31 – 40	2
41 – 50	3

Visual acuity Grading:

Visual acuity	Grade
6/6	0
6/9 to 6/12	1
6/12 to 6/24	2
6/24 to 6/60	3

OBSERVATIONS AND RESULTS:

Out of all 30 subjects enrolled for the present study 60% were female and 40% were male. 50% to higher class, 40% belongs to middle class and 10% to lower class. In terms of chronicity, 50% were having a chronicity of greater than 10 years and 50% with less than 5 years. In terms of symptoms *Netra shula* (100% are hav-

ing), *Shira shula* (80%), *Raga* (80%), *Srava* (90%) and *Prakasha asahshnutva* (100%). In terms of Scotomas (positive in 60%), Haloes (positive in 70%) and hemorrhages (positive in 50%). In terms of Cup: Disc ratio 60% is around 0.3 to 0.5 and remaining are more than that. In terms of C/D asymmetry, positive (>0.2) in 60% of patients.

Table 2: Incidence of Range Of IOP before and after treatment:

Range of IOP	No.of pt. B.T.				Percentage B.T.	No.of pt. A.T.				Percentage A.T.
	GpA		GpB			GpA		GpB		
	RE	LE	RE	LE		RE	LE	RE	LE	
10 – 21	4	5	5	5	31.66	12	13	14	12	85
22 – 30	6	7	5	7	41.66	5	0	2	2	15
31 – 40	4	3	5	3	25	0	0	0	0	0
41 – 50	1	0	0	0	0.04	0	0	0	0	0

Table 3: Incidence of Range Of Visual Acuity after treatment

Range of VA	No. of pt. B.T.				Percentage B.T.	No. of pt. A.T.				Percentage A.T.
	GpA		GpB			GpA		GpB		
	RE	LE	RE	LE		RE	LE	RE	LE	
6\6	4	1	5	6	26.66	8	7	15	13	71.66
6\9	2	4	3	5	23.33	7	7	0	2	26.33
6\12	2	4	4	2	20	0	1	0	0	1.66
6\18	2	3	0	1	10	0	0	0	0	0
6\24	3	2	3	1	15	0	0	0	0	0
6\36	1	1	0	0	3.33	0	0	0	0	0
6\60	1	0	0	0	1.66	0	0	0	0	0

Table 4: Results over Visual acuity: (Wilcoxon signed ranks test Z)

VISUAL ACUITY	Mean diff	SD	Wilcoxon signed ranks test Z	% of relief	P
Group- A	2.17	12.75	3.0594	64	0.00222
Group- B	0.23	14.31	3.1798	84.88	0.00148

Table 5: Results in IOP in Group A and Group B: (Unpaired T test):

Obs		Mean		Diff in mean	SD		SED	T Value	DF	P value	Remarks
		Grp.A	Grp.B		Grp.A	Grp.B					
IOP	RE	8.73	7.03	1.70	5.59	5.65	2.053	0.832	28	0.0097	Significant
	LE	8.47	7.20	1.27	4.94	4.98	1.776	0.713	28	0.0048	Significant

Table 6: Results in IOP before and after Rx: (Paired T test):

Observations		Mean		Diff in mean	SD		SE	T Value	DF	P value	Remarks
		BT	AT		BT	AT					
IOP in Group A	RE	27.40	18.47	8.93	9.79	4.97	1.399	6.386	14	0.00017	Extremely Significant
	LE	24.47	15.33	9.13	6.30	3.37	1.390	6.57	14	0.00012	Extremely Significant
IOP in	RE	25	16.20	8.80	9.29	4.69	1.461	6.022	14	0.00031	Extremely

Group B											Significant
	LE	24.47	17.47	7.00	7.11	4.72	1.134	6.17	14	0.00024	Extremely Significant

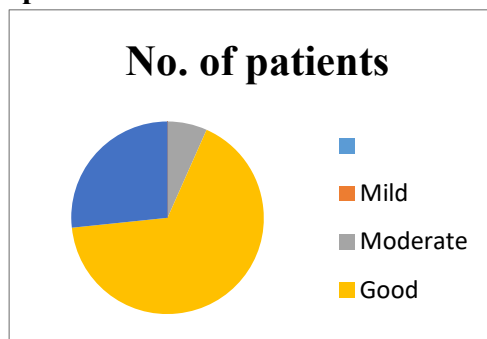
Table 7: Results over Subjective parameters: (Wilcoxon signed ranks test Z- W.S.R.T)

Lakshanas	Mean diff		SD		W.S.R.T		% of relief		P value	
	Gr.A	Gr.B	Gr.A	Gr.B	Gr.A	Gr.B	Gr.A	Gr.B	Gr.A	Gr.B
NETRA SHULA	1.87	1.33	17.61	17.61	3.4078	3.4078	67.44	67.64	0.00064	0.00064
SHIRA SHULA	0.9	1.46	9.81	14.31	2.8031	3.1798	62.55	78.95	0.00512	0.00148
RAGA	0.54	1.36	14.31	15.93	3.1798	3.2958	63.63	71.42	0.00148	0.00096
SRAVA.	1.50	1.29	15.93	17.61	3.2958	3.4078	57.14	88.88	0.00098	0.00064
PHOTO PHOBIA	1.31	1.50	14.31	15.93	3.1798	3.2958	71.42	66.66	0.00148	0.00096

Table 8: Overall Result:

Result / Response	No. of patients		Percentage
	Group A	Group B	
Mild	0	0	0
Moderate	1	0	10
Good	10	8	50
Excellent	4	7	40

Graph 27: Presentation of Overall Result



DISCUSSION

Symptoms with Severity and relief: Maximum i.e., 60% Patients had very severe *netra shula*, 40% Patients had moderate *netra shula*. Maximum i.e. 73.33 % Patients had very severe lacrimation and 23 % Patients had moderate lacrimation and 3.33% Patients had mild lacrimation. Maximum i.e. 33.5% Patients had severe

raga, 3.33% Patients had very severe *raga* and 18.60 % Patients had mild *raga*. Maximum i.e. 40% Patients had moderate *shirashula*, 36.66 % Patients had severe *shirashula* and 10 % Patients had mild *shirashula*. Maximum i.e. 73.33 % Patients had mild Photophobia, 26.66 % Patients had moderate Photophobia & no Patients had very severe Photophobia. It shows that max-

imum patients having severe congestion, lacrimation and photophobia, followed by very severe *netra shula* and *shirashula*.

The reliefs in the symptoms of Glaucoma at different intervals were observed as follows: In most of the patient ocular pain, headache and redness was relieved in second sitting. Lacrima-tion, photophobia and intra ocular pressure were relieved in fourth sitting. Visual acuity and Fundoscopy changes are relieved in final sitting. Mostly i.e. 80% of cases are POAG and 20% are PACG and that too *jalaukavacharana* is more effective in POAG than in PACG.

All the obtained data was subjected to proper statistical tests and the results of the study was obtained accordingly. For subjective parameters like ocular pain, headache, redness, lacrimation, photophobia & Visual acuity did **Wilcoxon rank test** and for objective parameters like intra ocular pressure did **Paired t-test** in between before and after treatment of group A and group B and **Unpaired t-test** between group A and group B.

Effect of treatment on signs and symptoms:

Netra shula:

Leech saliva contains analgesic substances, which deaden the pain at the site of bite and also anti inflammatory agents (Bdellins, Eglins) in the saliva of leech helps in reducing the pain. Acetylcholine of leech saliva stimulates vagal or the parasympathetic nerve and antagonistic to those obtained through epinephrine results in reduction in ocular pain. Vasodilators (Acetylcholine) widens the vessel wall when facilitates the proper outflow of aqueous causes reduction in ocular pain. Anti spasmodic effect of LD50 of chebulin (*Haritaki*) act on ciliary muscle reduces the ocular pain¹⁰. Muscle relaxant and anti-inflammatory property of *Guduchi*¹¹ and anti-

inflammatory action of *Triphala*, *Pippali*, and *Aswagandha* etc will act to reduce ocular pain.

Shira shula:

In glaucoma due to increased IOP causes blurring of vision. Due to that the contraction of the muscles occurs for accommodation, through short ciliary nerve which is a branch of parasympathetic postganglionic fibers derived from the oculomotor nerve. Due to the analgesic and anti-inflammatory (Bdellins and Eglins) active principles in leech saliva causes decrease in the stimulation for pain. Vasodilatation properties of hyalurodinase Carboxypeptidase¹² and acetylcholine causes dilatation of vessels in head causes reduction of headache. Vasodilatation property of *kantakari*, *vasa*, *Aja kshira* and *Guduchi* and anti-inflammatory action of *Amlaki*, *Pippali*, and *Aswagandha* will reduce *shira shula*.

Raga:

It is mainly due to the congestion of veins at site of inflammation. Venous congestion is another important complication that threatens the viability of the affected eyes. Leech therapy has two phases, active bleeding and passive bleeding from the leech wound after detachment, which has lasts for several hours. The small blood volumes removed by medical leech and the augment blood removal during the passive phase results in remarkable decrease in venous congestion. In addition to this a broad number of anticoagulant agents decrease venous congetion such as the thrombin inhibitors Hirudin, Apyrase as well as collagenase, hyaluronidase, factor Xa inhibitor and fibrinase I & II. Vasodilation property of *kantakari*, *vasa*, *Aja kshira* and *Guduchi* will reduce Congestion.

Netra srava:

It may be due to local irritation caused by increased IOP or corneal edema which irritates

corneal nerve, leads to lacrimation. Reflex lacrimation is not influenced significantly by glaucoma. The decreased steady state TTO (tear turnover) after reflex stimulation may be caused by exhaustion of the lacrimal glands after excessive reflex lacrimation, indicating that normal lacrimation probably also contains reflex tears. Leech therapy causes proper AH outflow and there by cause's reduction in IOP, so lacrimation decreases. *Stroto vishodhana* properties of *Pippali*, *Triphala*, *Bhringaraja* and *Madhuka* will reduce *Netra srava*.

Prakasha Asahishnutha:

In Glaucoma the inflammation inside the eye, keratitis, narrow field vision causes Photophobia which constricts the entering of light. Inflammation which irritates the eye causes photophobia mainly and damage to optic nerve in glaucoma caused due to increased IOP may be a cause. So by leech therapy, due to anticoagulation, vasodilatation and anti inflammatory principles one can get increased blood supply and reduction of inflammation of eye and get rid of photophobia. Anti-inflammatory property of *Guduchi*, *Pippali*, *Aswagandha* and *Triphala* will reduce photophobia.

Vasodilator action of Histamine and Carboxypeptidase-like substances increases the inflow of blood at the bite site and also bacteriostatic activity and antibiotic activities of Chloromycetyne reduces lacrimation, congestion and Burning sensation.

Visual acuity:

In Glaucoma the visual acuity will decrease due to increases IOP which will cause mechanical pressure over lamina cribrosa, hemorrhages at & around disc, Scotomas and atrophy of retinal nerve fibers. In leech therapy the properties like anticoagulation, vasodilatation, anti-inflammatory action improves vision by de-

creasing hemorrhage, macular edema and widens the blood vessels. *Mahatriphaladya ghrita* which is having ingredients acts like *Chakshushya*, *tridoshahara*, *rasayana*, *vrushya*, *vayasthapana* antispasmodic, anti inflammatory and *raktapitta hara* improves visual acuity.¹³

Effect on Intra Ocular Pressure by Jalaukavacharana:

- **Hirudin** which is an active principle in the salivary glands secretion of leech, acts as a potent anticoagulant (blood thinner). It inhibits blood coagulation by binding to thrombin. Thrombin catalyses the formation of fibrin from fibrinogen at the end of the coagulation cascade. **Calin** inhibits by blocking the binding of von willbrand factor to collagen. It inhibits collagen-mediated platelet aggregation. **Destabilase** has monomerizing activity. It dissolves fibrin and has thrombolytic effect. **Hirustasin** inhibits kallikrein, trypsin, chymotrypsin and neutrophilic cathepsin G. By the above action hemorrhagic complications will be minimized.
- Leech saliva which contains **Acetylcholine** (miotics) act as cholinesterase inhibitor which stimulating parasympathetic receptors at neuromuscular junction constricts sphincter papillae or contraction of longitudinal muscles of ciliary body results in tightening of iris. It will decrease the volume of iris tissue in the angle and pulls the peripheral iris away from trabecular meshwork or pulls the Scleral spur. It reduced IOP by allowing AH reaching the outflow channels. If IOP is quiet elevated the pupillary sphincter may be ischemic and may not respond to the Acetylcholine.

- Hirudin with 65 aminoacids, cysteine rich polypeptide having acidic property causes decrease in whole blood viscosity and density that might formed due to obstruction.
- **Hyalurodinase** (spreading factor) increases tissue permeability and facilitates the free movement of intracellular fluid through hydrolysis of endoglucuronidic linkage of hyaluronic acid. In human tissues it binds water in interstitial spaces and hold cell together in a jelly like matrix which obstruction diffusion. It depolymerises and hydrolyzes hyaluronic acid, a mucopolysaccharide acid, which causes rapid dispersion of fluid which causes reduction in viscosity and removes the barrier for diffusion of AH and facilitates the outflow. It facilitates the penetration and diffusion of pharmacologically active substances like anesthetic agents and more effective akinesia of the orbicularis and extra ocular muscles.

Effect on Intra Ocular Pressure by Mahatriphaladya ghritam:

- Remove obstructions of trabecular meshwork by pigments, RBC, glycosaminoglycans, amorphous materials, extra cellular lysosomes, plaque like materials and proteins etc. and removes the deposition of amorphous material in the juxtra canalicular spaces by its *srotovishodhana* property.
- It improves pore density and size in the inner wall endothelium of schlemm's canal by its *rasayana* property.
- *Ghrita* will reduce thickening, sclerosis of trabecular meshwork with faulty collagen tissues and Widening of intra trabecular spaces by its *srotovishodhana* property.
- Avoiding in collapse of schlemm's canal & absence of gaint vacuoles in cell lining it ,

by all the above properties *Mahatriphaladya ghrita* reduces the IOP there by improves vision.

CONCLUSION

Jalaukavacharana helps in reducing IOP directly by improving micro-circulation, reducing venous stasis and indirectly by reducing the factors which hamper vision by its chemical effect and mechanical effect, where as *Jalaukavacharana* along with *Mahatriphaladya ghrita* helps in reducing the fundal complications also. Thus, Group B which is treated with *Jalaukavacharana* and *Mahatriphaladya ghrita* is more effective than Group A which is treated only with *Jalaukavacharana*. Satisfactory results were obtained in prevention of recurrence. Also it is statistically proved significant result at $p < 0.05$ in decreasing symptoms of Adhimantha (Glaucoma) like Ocular pain, Headache, lacrimation, Redness, and photophobia, Intra ocular pressure and increasing Visual Acuity. Finally it can be concluded that, *Jalukavacharana* and *Mahatriphaladya ghritam* helps in the prevention of the recurrence of the *Adhimantha*, helping to avoid the surgical management.

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