



Acupuncture as Additional Therapy for Modulation of Intraocular Pressure in Patient with Open Angle Glaucoma

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ABSTRACT

Objective: Primary open-angle glaucoma (POAG) is the most common type of glaucoma. It is usually insidious in onset, slowly progressive and painless. It is generally bilateral and often asymmetrical. Because the central vision is relatively unaffected until late of the disease, visual loss generally progresses without symptoms¹. Therefore this study was necessary to face this problem by applying the recommended additional therapy form to reduce IOP and improve visual field SO this study aimed to evaluate the therapeutic efficacy of acupuncture therapy in managing primary open angle glaucoma

Methods: This study dealt with the eye as a separate subject. Fifty one eyes with primary open angle glaucoma treated for at least 3 months with standard topical antiglaucoma medications with high IOP, their intra ocular pressure (20 -45mmHg) were enrolled in this randomized clinical trial. Those eyes were classified randomly into 2 groups. Therapeutic intervention was started after at least 3 months of standard medical treatment. Patients were randomized to either group: Group (A) Acupuncture with medical treatment and Group (B) Control medical treatment only. Intra ocular pressure IOP; measured by Goldman Tonometry; for the two study groups was performed at The pretreatment and post 6 sessions (2 weeks), 12 sessions (4 weeks), 18 sessions (6 weeks), 24 sessions (8 weeks and end of acupuncture treatment), three months, four months, five months and six months. The study was conducted in Kobri El-Koba Military Hospital from June-2012 to Mars-2014.

Results: showed significant improvement in the study group compared to control group regarding the IOP.

Conclusion: Acupuncture therapy decreased IOP and stabilized visual field with stopping apoptosis of optic nerves for eyes with primary open angle glaucoma.

Keywords: Acupuncture; Glaucoma; intraocular pressure; Ocular perfusion pressure; Primary open angle glaucoma.

INTRODUCTION

The glaucoma is a group of complex and heterogeneous ocular diseases almost 75 million people are affected worldwide². The prevalence of glaucoma increases with age being a major issue for public health³.

The worldwide prevalence of glaucoma is increasing, Glaucoma is defined as a disturbance of the structural or functional integrity of the optic

nerve that can usually be arrested or diminished by adequate lowering of Intra Ocular Pressure (IOP)⁴.

Glaucoma is a multi-factorial ocular disease/syndrome which is characterized by progressive damage or degeneration to optic nerve and visual field loss. Although increased intraocular pressure is usually present, patients with normal range IOP can also develop glaucoma⁵.

Primary open angle glaucoma (POAG) is defined as a chronic optic neuropathy with characteristic changes in the optic disc and visual field (Despite the fact that IOP is the most important risk factor of glaucoma and that control for IOP, either by pharmacological agents or by the surgery, remains the only effective glaucoma treatment, our mechanistic understanding of IOP regulation in the eye is limited. Proper functioning of the outflow pathways plays an important role in the regulation of IOP⁶ .

Raised intraocular pressure (above 21 mmHg) is the most important and only modifiable risk factor for glaucoma. However, some may have high eye pressure for years and never develop damage, while others can develop nerve damage at a relatively low pressure⁵ .

This elevation in IOP is thought to be due to resistance within the trabecular meshwork which may be attributable to acceleration and exaggeration of normal aging changes in the anterior chamber angle, iris, and ciliary body tissues of the eye. These changes include loss of trabecular endothelial cells, increased pigment accumulation within these endothelial cells, thickening or fusion of the trabecular lamellae, thickening of the scleral spur, increased extra cellular plaque material in the anterior chamber angle, and loss of ability of the endothelial cells lining Schlemm's canal to form giant vacuoles⁷ .

Topical ocular hypotensive medication was effective in delaying or preventing the onset of POAG in individuals with elevated IOP^{8,9}. Recent medications as prostaglandin analogues significantly reduce IOP and increase OPP by increasing velocity of retrobulbar blood flow in patients with POAG¹⁰. These medications may cause ocular irritation and affect pupil size or accommodation¹¹ .

For patients who do not respond to antiglaucoma medications, laser trabeculoplasty and incisional surgery as trabeculectomy are further methods that can be used to lower intraocular pressure and maintain visual acuity^{12,13} .

Acupuncture has been clinically used to treat patients suffering from myopia, glaucoma, and

retinitis pigmentosa in the field of ophthalmology^{14,15} .

SUBJECTS AND METHODS

Patients

Patients were with primary open angle glaucoma (POAG), of both sexes with age from 40 to 80 years, as glaucoma is more common to begin after forty, with Controlled blood glucose level for the patients and their Intra ocular pressure is ranged from 20 to 45mmHg. Patient excluded if they had psychological disorders, diabetes, had an expert of laser trabeculoplasty, experiences of ocular surgery and inflammation on the eye within the past year which may affect the results.

All patients were on the same protocol of medical treatment program. Patients were randomly allocated into 2 Group A : (Acupuncture group), This group was composed of 26 eyes (for 14 patients) and represented the group that received acupuncture therapy (14 acupuncture points). Group B: (Control group); this group was composed of 25 eyes (for 20 patients) and represented the group that did not receive any kind of acupuncture therapy. Both groups received standard topical antiglaucoma medications. Intra ocular pressure IOP; measured by Goldman Tonometry; for the two study was performed at The pretreatment and post 6 sessions (2 weeks), 12 sessions (4 weeks), 18 sessions (6 weeks), 24 sessions (8 weeks and end of acupuncture treatment), three months, four months, five months and six months.

Data collection tool:

Measurement of IOP by Tonometry (Goldmann Applanation Tonometry):

It measures the intra ocular pressure and is considered to be the gold standard test and is the most widely accepted method. The measurement of intraocular pressure should be part of any eye examination¹⁶. The Goldman tonometer is probably the most widely used tonometer and is the international standard for measuring intraocular pressure¹⁷ .

All measurements were recorded by the ophthalmologist at same time of the day between 12 pm and 2 pm. to minimize the effects of diurnal variation. Intra ocular pressure IOP; measured by Goldman Tonometry; for the two study groups was performed at The pretreatment and post 6 sessions (2 weeks), 12 sessions (4 weeks), 18 sessions (6 weeks), 24 sessions (8 weeks and end of acupuncture treatment), three months, four months, five months and six months.

Acupuncture needles as Therapeutic tools:

In this study acupuncture needles were utilized as a source of therapeutic approaches. The advantages of using acupuncture are in the significant effects due to increase endorphin levels in the aqueous humor which could account for part of the ocular hypotension¹⁸. The tools were used in this study are disposable sterilized stainless steel acupuncture needles size 0.25mm diameter × 30mm length (Suzhou Medical Appliance Factory, China) . **Fig 1**



Fig.1. Acupuncture needle

Procedures

The actual study maneuver started by baseline data assessment in the two groups (pre) using the designed study tool. Treatment procedure then applied; both groups received the same equivalent medical traditional medical treatment program. All the patients in the acupuncture group The needles were sterilized in firm plastic sheet. The needles were without any bends or erosion. The tip of the needle should be neither too dull nor too sharp, nor should be hooked. The acupuncturist cleaned his hands with soap and water then put on gloves.

Selection and compatibility of acupoints:

There are 14 acupoints were selected for the affected side listed in the following table:

*** Table 1:** Local points:

<u>Points</u>	<u>Effect</u>
Bahui(GV 20), Jingming(BL1), Cuanzhu(BL2), Yuyao(EX-HN4), Taiyang(EX-HN5), Yangbai(GB14) Sibai(ST2)	Nourish local qi to the eyes and soothe stagnation on local eye meridians (Zhaomin et al.,2000).

The following important points were taken into account before applying treatment:

- The patient was in a comfortable sitting or long sitting positions that allow full exposure of the points selected.
- Removing eyeglass if found and patients were per skin from the knee till the foot in the treated eye side of the body.
- Covering the other lower leg as much as possible
- Cleaned the acupuncture points (BL1-BL2-ST2- GB14-TAIYANG-YUYAO-DU20-GB20-LI4-KI3-LIV3-GB37-ST36-ST44) with cotton ball sterilized by alcohol.
- Ask patient to don't move during the session.

Application phase:Handle of the needles:

- The needle was held with the right hand of the acupuncturist, with the thumb and index finger holding the handle and the

middle finger backing the index finger near the needle root (**Fig.2**).



Fig.2 Handle of the needle

Manipulation of each needle till the arrival of **Qifig 3**, Rotate the needle back and forth to reinforce Qi in the meridian every 5 minute during the session. The time of the session is 30 minute. Withdrawal of the needle: Hold a small cotton ball sterilized by alcohol on the right hand. Withdraw the needle smoothly and quickly by the left hand. Press the puncture site with the cotton ball.

ETHICAL CONSIDERATION

This study was approved by the Institutional Review Board of the faculty of physical therapy, Cairo University. All patients were informed about the purpose, tools, procedures, and duration of the study and signed a written consent.

STATISTICAL ANALYSIS

Data entry and statistical analysis were done using SPSS 16.0 statistical software package. Data are not normally distributed, so non parametric statistical methods were applied. Results are expressed as median (minimum-maximum) or number (%). Comparison between median values of (IOP) at different time of measurements in the two groups was performed using Mann-Whitney U test. Comparison between pre-assessment and different time of assessments (pair-wise comparison) within the same group was performed using Wilcoxon Signed Ranks test. P

value less than or equal to 0.05 was considered significant and < 0.01 was considered highly significant.

RESULTS

Physical characteristics of eyes in the two study groups

The demographic characteristics of the participants at baseline (pre) were shown in Table 1. There were no significant differences between the two groups relevant to independent variabl

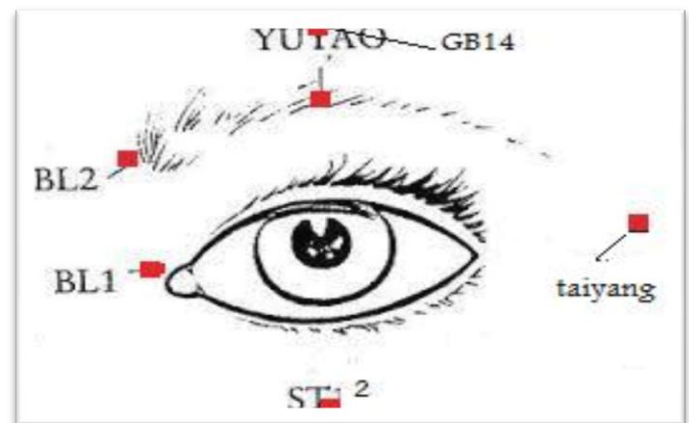


Fig 3 . Location of local points around the eye (Red spots).

Table (2): Physical characteristics of eyes in the two study groups.

	Group A	Group B	S
No. of eyes	26	25	NS
Poor Vision	5	6	NS
Uncontrolled blood glucose level	8	7	NS
Previous surgery or Laser	8	9	NS
Associated cataract	5	3	NS
Age (mean SD)	61.8±10.87	57.1±7.58	

*SD: standard deviation, P: probability, S: significance, NS: non-significant.

Results of Intraocular Pressure in The Two Groups

Table 3 demonstrates that there were no statistical differences in IOP in the two groups before the intervention (pre).

Table (3): Comparison between values of median difference in IOP in the two studied groups

	Acupuncture group (n= 26)	Control group (n= 25)	Z value	p value
P2w	6.0 (-3.0 - 17.0)	2.0 (-7.0 - 10.0)	-2.752	0.006**
P4w	4.0 (-9.0 - 16.0)	0.0 (-9.0 - 16.0)	-3.337	0.001**
P6w	5.0 (-13.0 - 13.0)	1.0 (-9.0 - 15.0)	-1.862	0.063 (NS)
P8w	4.0 (-6.0 - 13.0)	2.0 (-9.0 - 12.0)	-2.723	0.006**
P3m	5.0 (-9.0 - 12.0)	-1.0 (-14.0-11.0)	-3.647	0.001**
P4m	5.0 (-11.0 - 12.0)	-5.0 (-14.0 - 3.0)	-4.971	0.001**
P5m	4.0 (-6.0 - 12.0)	-3.0 (-20.0 - 6.0)	-4.202	0.001**
P6m	4.0 (-9.0 - 12.0)	-5.0 (-18.0 - 3.0)	-5.259	0.001**

Data are expressed as median (minimum-maximum). **p< 0.01= highly significant.

Percentage of improvement between group A and group B presented in Table (4-15) **Figure (4)**

Maximum improvement was 27.248% in acupuncture group post 6 sessions in comparison with the control group at same time was 8.2%, the percentage of improvement decrease with long duration after stopping sessions but within the

significant value from 19.9% to 16.1% in comparison with the same time in control group were from -8.4% to -23.1%.

Table (4):Percentage of improvement in group A and group B:

% improvement	Acupuncture	Control
P2w	27.25	8.20
P4w	23.50	-0.67
P6w	22.92	5.73
P8w	22.46	3.30
P3m	19.90	-8.41
P4m	20.65	-17.58
P5m	18.6	-16.57
P6m	16.1	-23.12

$\% \text{ improvement} = \frac{(\text{pre} - \text{post})}{\text{pre}} \times 100$

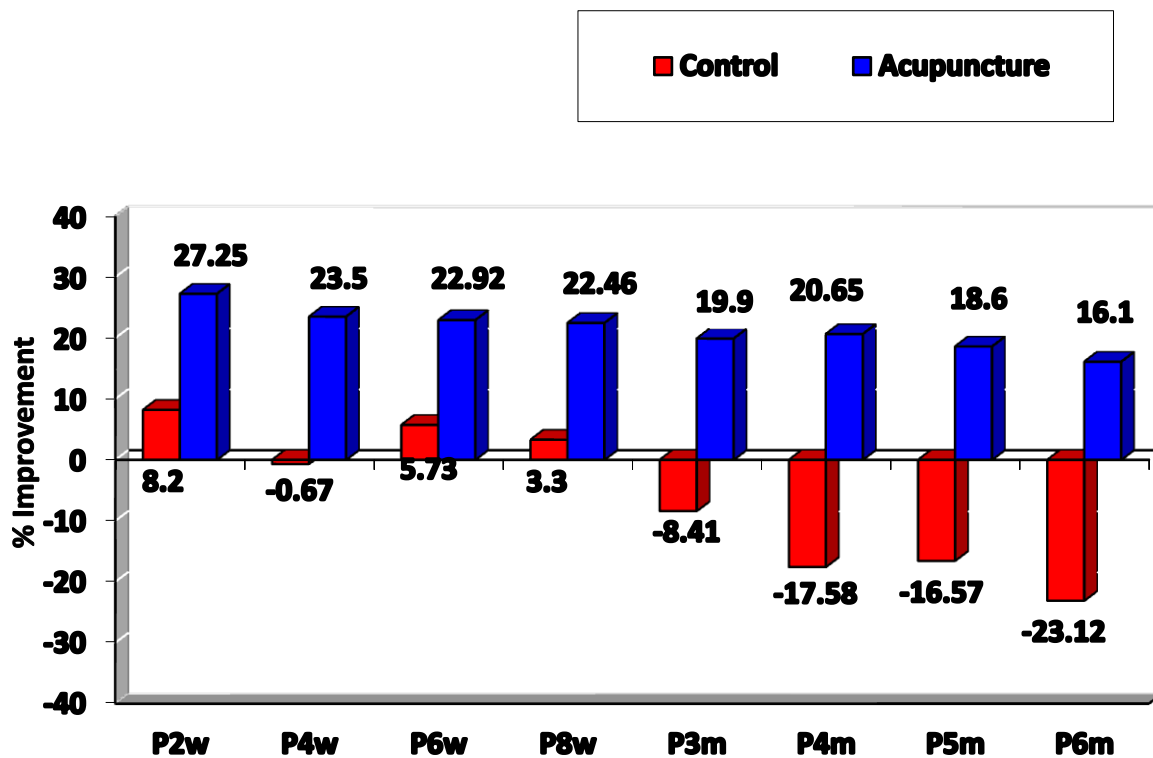


Fig.4.Percentage of improvement in group A and group B

DISCUSSION

The pathology of glaucoma has been described as mechanical or vascular. The mechanical process involves compression of the axons due to elevated IOP. The vascular process includes events in which reduced blood flow to the posterior pole leads to damage. Whether mechanical or vascular, or both, compromise of the ganglion cell axons at the level of the lamina cribrosa leads to apoptosis or genetically programmed cell death^{7,18}.

At least two stimuli appear to activate the process of ganglion cell apoptosis in glaucoma: neurotrophin deprivation and glutamate toxicity. Blockage of retrograde axonal transport prevents the normal movement of neurotrophic factors from the brain to the ganglion cell body. These peptides normally bind to the cell surface receptors of the ganglion cells and stimulate molecular events that affect essential functions of cell metabolism. Disruption of axonal transport compromises the ganglion cell and stimulates apoptosis at normal IOP; elevated IOP increases this response¹⁹.

Although lowering IOP may remove the primary mechanical or vascular insult to the ganglion cell axons of the retina, destruction of the surrounding tissue (secondary axonal degeneration) proceeds because of the creation of an excitotoxic environment, and the result is continuing apoptosis. This excitotoxicity may help explain why some glaucoma patients continue to show damage even after reduction of IOP to a level expected to control the disease process^{19,20}.

Acupuncture has been widely applied to treat several conditions such as neck pain, shoulder pain, lumbar pain, headache, and hypertension in Asian and Western countries, and it has also been found to be effective for many conditions in several randomized trials²¹⁻²³.

This controlled randomized study was conducted to determine the therapeutic efficacy of acupuncture in managing primary open angle glaucoma through assessment of IOP and visual field for fifty one eyes randomly divided into twenty six eyes in acupuncture group and twenty

five eyes in the control group, all patients were treated with maximum dose of antiglaucoma medications with elevated IOP more than 20mmHg for at least three months.

Acupuncture has also been used for the treatment of ocular diseases, including glaucoma, in traditional Chinese medicine. Acupuncture therapy added to the standard medication could affect the IOP level in eyes with normal-tension glaucoma, and several other studies have demonstrated that acupuncture improves choroidal blood flow in the eye²⁴⁻²⁶.

Takayama et al.,²⁷ reported that the hemodynamic changes in the ophthalmic artery by acupuncture may be related to somatoautonomic reflex mechanisms in the choroidal blood flow of the eyeball.

The intraocular pressure (IOP) is the hydrostatic pressure exerted by the AH. The mean normal IOP in man is about 15mmHg with the highest and lowest accepted values of 21 mmHg and 10.5 mmHg respectively. IOP can vary between species, individual and even between eyes of the same individual. The mean IOP in Egypt above the age of forty is 15.4 mmHg in males and 15.9 mmHg in females. This increases to 16.1 mmHg in the 61-70 years age group³.

Her et al.,²⁸ the longest duration study investigated the effect of auricular acupuncture for 33 patients with glaucoma. The IOP and visual field were assessed before and after the treatment in the first 4 weeks and follow up, up to 8 weeks. Result showed that the most significant IOP lowering effect was seen at about 3-4 weeks also significant improvement of the uncorrected visual field was noted at about 2-4 weeks after auricular acupuncture.

This study was the first study investigated the effect of acupuncture in management of POAG for six months; in first two months all eyes in acupuncture group were under direct acupuncture effect and later four months were for follow up. Maximum improvement was after six acupuncture session's 28.076 ± 16.89 reduction of IOP, keeping IOP reduction ranged from 24.73 ± 13.28 to 27.76 ± 12.12 till the end of the fourth month then

decrease 22.26 ± 11.32 at the end of the sixth month.

CONCLUSION

Acupuncture therapy decreased IOP and stabilized visual field with stopping apoptosis of optic nerves for eyes with primary open angle glaucoma.

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