

Laser Trabeculolysis for Primary Open Angle Glaucoma

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ABSTRACT

Aim: The aim of the study has been to evaluate the safety and efficacy of treating Primary Open Angle Glaucoma with Nd YAG Laser.

Setting redo: Eye Hospital Rawalpindi Pakistan.

Methods: A total of 35 patients were enrolled for this study after detailed anterior and posterior segment examination including baseline evaluation for Primary open Angle Glaucoma. ND YAG laser (VISULASE YAG III) was used.

Results: A six months follow up showed a favorable outcome in terms of intraocular pressure control and other visual functions.

Conclusion: The technique and procedure appears to be safe and effective and deserve a trial before proceeding to more invasive treatment options.

Keywords: Trabeculolysis; Laser; Glaucoma; Patients; POAG

INTRODUCTION

As an eye care professional we understand that the POAG causes irreversible loss of vision and has very serious social and economic implications for the patient, family, society and the country in terms of care of a blind person and his loss of productivity. Glaucoma is a life-long condition without any cure but with early diagnosis and treatment, useful vision can be enjoyed for the rest of life [1].

As a result of growing ageing population all around the globe the number of patients suffering from POAG are increasing leading to an increase in the burden of glaucoma blindness. I personally believe we must explore more and clinically viable treatment options, available to an eye care professional [2].

Laser Trabeculolysis is a simple technique of treating the patients with Primary Open Angle Glaucoma with Nd YAG laser, a technique which probably was never mentioned in the medical literature. I personally believe that as an ophthalmologist, we must be able to understand where the best treatment option fits for a particular patient (Figure 1).



Figure 1: Basic pathology-high intraocular pressure causes damage to the optic nerve in POAG.

HISTORY OF LASER TREATMENT FOR POAG

Different types of lasers and techniques (ALT-Argon Laser Trabeculoplasty since 1979, Selective Laser Trabeculoplasty since 1998) are being used for the management of Primary Open

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Angle Glaucoma. This trend is increasing all over the world. Each modality of laser treatment for POAG has its own set of indications, advantages, limitations and risk of complications. New lasers like Micropulse Diode Laser (MLT), Titanium Sapphire Laser (TSLT) and Excimer Easer Trabeculostomy (ELT) are also on their way to treat POAG [3].

BASIS OF MY TECHNIQUE

The main channel for aqueous drainage from the anterior chamber is through the trabecular meshwork in the angle of anterior chamber into the Schlemm canal and then to the collector channels in the Episcleral blood vessels around and behind the limbus. It is the pigmented part of the trabecular meshwork under which lies this canal of Schlemm. Once the pigmented part of the trabecular meshwork is lysed with the help of Nd YAG laser, it facilitates the drainage of aqueous from the angle of anterior chamber into the canal of Schlemm and hence lowers the intraocular pressure in patients having POAG. The most important aspect of this technique is the consistent lowering of the IOP (Figure 2).



Figure 2: Aqueous drainage through the trabecular meshwork to the canal of Schlemm.

It is the trabecular meshwork which offers resistance to aqueous outflow and hence intraocular pressure rises in POAG, causing damage to the optic nerve and visual functions. Laser Trabeculolysis is aimed at this part of the trabecular meshwork with the aim to causephotodisruption and hence to ease the aqueous drainage from the angle of anterior chamber to the canal of Schlemm. Effective creation of the micro perforations in the pigmented part of the trabecular meshwork with the help of Nd YAG laser is aimed to facilitate the aqueous outflow. Juxta canalicular trabecular meshwork is the site which offers maximum resistance to aqueous drainage and laser trabeculolysis causes a laser induced shunting of the aqueous drainage channel [4].

INDICATIONS

Primary open angle glaucoma is the main indication of this treatment option as we need to have clear visible details of the angle of the anterior chamber structures. Sometime we may come across a patient with POAG who is either unable to afford the long term cost of medical treatment along with compliance issue as well or is unable to undergo an invasive procedure like trabeculectomy. In such a situation, I think this treatment option can be given a due consideration to help out a patient of POAG to avoid the long term cost of topical medication along with the risk of potential local and systemic side effects [5].

Pigmentary and pseudo-exfoliation associated glaucoma are other possible indications for this treatment option.

Since the loss of vision in POAG is painless and slowly progressive with tendency to retain the central vision till last, the tendency to follow the strict compliance regarding topical use of IOP lowering eye drops is usually very poor and patient is not willing to take risks associated with other potentially invasive surgical procedures. In such situations probably this procedure holds a valid ground to be offered to patients with POAG. Patients of POAG with deteriorating visual functions and clinically progressive damage to the optic nerve can be also be offered this treatment option.

The most common indication in my opinion is deterioration of visual functions like decreasing vision, deteriorating visual field, uncontrolled IOP and in some cases apparently well controlled IOP with deteriorating visual functions with false sense of protection of the vision, fluctuating IOP control with spike of high IOP as the effect of the eye drops wears off with the passage of time and inability to instill the drops as per advise.

SELECTION OF PATIENTS

Timely decision and precision in delivering the appropriate treatment is of paramount importance in the care of patients with POAG. Proper selection and diagnosis is of foremost importance in the management of POAG, as most patients have no idea about their disease since it is a painless condition. Cornea needs to be clear and angle of anterior chamber open.

Old patients with systemic and ocular comorbid conditions who are not suitable for surgery and or do not want the invasive procedure are also candidates for this option.

Base line intraocular pressure is recorded over a period of time along with detailed ocular examination including visual acuity testing, OCT recording, CD ratio and perimetry. Risks and benefits are discussed with patient followed by a written informed consent [6].

Laser Trabeculolysis, is an outpatient procedure which is performed under topical anesthesia. Detailed pre laser evaluation regarding the IOP, angle anatomy and visual functions, is carried out along with peripheral retinal examination to rule out any retinal detachment predisposing degeneration. Clear communication to the patient and setting realistic expectations out of this procedure is very important [7].

CONTRAINDICATIONS

Poorly visible angle of the anterior chamber, angle recession, shallow anterior chamber, narrow angle of the anterior chamber and an eye with extensive peripheral anterior synechia are not suitable candidates for this procedure.

TECHNIQUE

I usually advise oral Acetazolamide 500 mg 1 hour before laser to reduce the aqueous secretion, one drop of Apraclonidine is instilled followed by the Pilocarpine 1% eye drops to cause pupillary miosis about 45 minutes before the procedure. A drop of Topical anesthesia eye drops were instilled about 2-3 minutes before proceeding for the laser treatment to ease the application of the Goniolens on the corneal surface. A clear gel is used as a coupling viscous fluid.

Once pupillary miosis is achieved, then patient is taken to a Nd YAG laser slit lamp delivery system. Pre-laser counselling regarding the likely events during the procedure along with expected cooperation are discussed with the patient (Figure 3).



Angle details are clearly visualized and land marks are defined well. A mineral glass Goniolens is used for efficient laser delivery at the target site as it has better optical properties (Figure 4). Slit lamp magnification is adjusted to 12X. Nd YAG Laser aiming beam intensity is set to 15 to make easy visualization of the laser aiming beam on the pigmented trabecular meshwork, this can be facilitated by using red free green filter on the slit lamp delivery system. (I am using VISULAS YAG II of Zeiss for this procedure) (Figure 5).



The laser power, I usually use is 7-9 mJ and with single pulse. Six to 12 well focused, evenly spaced laser shots are applied on the pigmented part of the trabecular meshwork and response (cavitation, lysis, gas bubble formation, microscopic hyphema) at the target tissue is monitored including dispersion of the pigment in the angle and any evidence of bleeding is noted. Shots of Laser must be clearly focused with posterior defocus at the pigmented part of the trabecular meshwork at 11,1,3,5,7,9 Clock position are applied if there is a need the it is done at 12,2,4,6,8,10 O clock positions at 4-6 months. Here one must keep in mind a fact that the accurate focusing of the laser aiming beam on the pigmented trabecular meshwork is of critical importance which translates into the successful outcome of the procedure (Figure 6).



Figure 6: Laser trabeculolysis shunting.

POST LASER ADVICE

After this laser treatment, I advise steroid eye drops 6 hourly for one week to control the laser induced Iritis, oral analgesic as needed to deal with pain and IOP lowering eye drops which patient was using before this treatment. I check for IOP next morning and then weekly followed by 3 weeks. I reduce the IOP lowering eye drops gradually depending upon the response and IOP. Topical antibiotic eye drops are advised in case if and when there is a corneal abrasion due to contact lens [8].

COMPLICATIONS

Although there is no risk of any serious complication but as we understand there is no perfect solution for every situation and risk of complicatons including failure of the procedure to achieve the desired results is always there. During the laser trabeculolysis, pigment dispersion can take place from the pigmented trabecular meshwork, bleeding from the angle of antereior chamber mostly innocuous and insignificant can also take place. In immediate post laser period spikes of raised intraocular pressure, peripheral anterior synechia, in case if and when the laser shots hits on the peripheral iris, and gradual loss of the efficacy of the IOP lowering effect of this procedure.

Red eye can be there due to use of eye drops or post-laser reaction in the anterior chamber (uveitis) and kerato-conjunctivitis due to the contact lens induced corneal abrasion. Post laser blurring of vision is also reported and is a logical result of the pigment dispersion and reaction in the anterior chamber and will cause a hazy vision for 2-3 days in many cases.

Photophobia lasts for a few hours due to pupil dilating eye drops and kerato-uveitis as well Pain during and after the procedure can be there in some cases. It can be due to the inflammation in the anterior chamber. Another reason in some cases is due to spike of post-laser IOP rise. Corneal abrasion due to the contact lens can also be the reason for some other case. Other potential complication which are quite unlikely but can be a possibility may include choroidal effusion, cystoid macular edema, retinal detachment and corneal endothelial damage in case the laser is shot in front of the Schwalbes line. Risk of complications and treatment failures reduces remarkable as the technical skill of performing this procedure increases (Figure 7).



Figure 7: Microscopic hyphema.

AVOIDING COMPLICATIONS

Proper selection of the patient is most important aspect of avoiding the complications along with use of proper technique and technology. Accurate focusing of the laser aiming beam on the pigmented trabecular meshwork with proper laser parameters is of paramount importance and must be kept in mind to avoid the potential but avoidable risks associated with this technique.

Avoid shooting laser towards the Schwalbe line as it can lead to corneal edema and in case if the laser is shot towards the root of the iris, it will increase the chances of developing the uveitis in the post laser period along with risk of post-laser synecia formation in the angle of anterior chamber. Do not press the laser gonio lens too hard around the limbus as will increase the risk of microscopic hyphema.

FOLLOW UP

Patients are usually followed up after one week, then after one month and after this regular follow up after every three months for IOP monitoring and evaluation as a Glaucoma patient. Treatment is tailored according to the response to this procedure. After one month if gonioscopy is performed, grey white crater like laser trabeculolysis marks can be seen on the pigmented part of the trabecular meshwork.

USUAL OUTCOME

Patients with less baseline IOP can be completely off the topical medications while those using multiple topical IOP lowering eye drops, a reduction in the number and frequency of using eye drops can be achieved. Patients with higher baseline IOP responds better in terms of IOP control.

EFFECT ON MEDICAL AND SURGICAL TREATMENT OPTIONS

Usually no adverse effect on the likely outcome of surgery is observed and at the same time there appears to be no loss of effect of topical IOP lowering medications following this treatment.

Options in cases of failure

Retreatment: Since laser trabeculolysis do not cause any scarring in the trabecular meshwork, as a result retreatment appears a viable option which we repeat at least once.

Surgery: As a last resort to effectively lower the IOP, surgery like trabeculectomy is still a viable-gold-standard of surgical management of POAG.

ADVANTAGES

IThe procedure is easy to perform. It appears to be safe, having high safety profile and ease to repeat the procedure. To my experience, it is effective and do not need any complicated equipment. The procedure can be tailored to the individual needs of the patient and can be repeated safely at least once. Poor compliance with topical medications makes the topical treatment less effective compared to laser and or the surgical option in the long run. Technically it is not dependent upon the pigmentation in the angle of anterior chamber.

We can repeat it safely and in case of failure the door to surgery is always an option with usual success rate, learning curve is short, procedure is less painful than ALT. There is no risk of any serious post laser complications. Decrease in IOP appears to be sustained for at least 2 years. Most of the Ophthalmic clinics are already well equipped with NdYA Glaser, so there is no need of any new equipment for this procedure. Sustained IOP lowering, cost effective, least invasive, cost effective, easy to perform office based procedure requiring no post op care and wound healing issues. Usually medical treatment in the form of topical eye drops is considered safe and simple without much risk but its limitations in terms of compliance are usually underestimated.

DISCUSSION

The procedure of Nd YAG Laser trabeculolysis appears to be effective in a reasonably large number of patients with Primary Open Angle Glaucoma. Some of the patient may still need topical IOP pressure lowering eye drops. However long term benefits of this procedure needs further clinical studies. Higher pre laser IOP responds better. Dependency on eye drops is reduced. Decrease in IOP is steady. No long term complications were seen in 6 months post laser follow up in my practice. Laser trabeculolysis is usually quite effective to delay the need of more aggressive and invasive surgical treatment options. Before considering surgical treatment one may try a repeat laser trabeculolysis once.

I personally believe that Laser Trabeculolysis should be offered as a primary option in treating Primary Open Angle Glaucoma as it appears to be equally effective compared to the medical treatment, with very few risks and is cost effective and should be given the due consideration in the therapeutic choice for a patient with POAG with a procedure of 5-10 minutes.

CONCLUSION

Eyelid disorders that disturb homeostasis of lacrimal functional unit, may result into chronic course that warrants long term management. This, in turn may affect quality of life and the ability to carry out normal daily tasks.

In everyday life, various factors that include air pollution, eye cosmetics, contact lens use, preservative containing eye drops etc. put eyes at stress, leading to conditions like blepharitis, MGD, dry eye, allergic conjunctivitis etc. These conditions may require long term management aimed at to not only reduce symptoms, improve ocular comfort but also to prevent, delay early dependence on antibiotics and serious sequelae.

Several studies have shown that ocular comfort is a critical driver of these conditions, satisfaction with post-surgical outcomes, and success with DED management. Role of eyelid hygiene, is well established and accepted in prevention and control of many of these conditions, is yet oftentimes overlooked. Today, with the availability of several eyelid cleansing preparations, lid cleansing has become easier and more effective. Therefore, advocating for a healthy ocular surface and counseling on the importance of incorporating regular eyelid hygiene on daily basis is crucial, both in patients receiving treatment and in healthy people because proper eyelid cleansing is essential to ensure eye health.

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