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Research Article

A Preliminary Study on Assessment of Patient's Discomfort Intensity from their Symptomatic Floaters after Nd:YAG Laser Vitreolysis Treatment in a Tertiary Hospital

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Abstract

Introduction: Vitreous is composed primarily of water (98%) combined with structural protein Type II collagen and hyaluronic acid that forms a clear vitreous gel. Common age-related process occurring in the vitreous is posterior vitreous detachment and vitreous liquefaction. Dissociation of collagen fibrils from hyaluronic acid results to cross-linking and aggregation of collagen in the vitreous cavity resulting to formation of floaters. Many people are experiencing floaters but each individual react differently to these. Some may be accustomed to the visual discomfort but some will be immensely disturbed, obsessed and anxious. Mostly are managed conservatively with reassurance or observation. However, in some countries, Nd:YAG laser vitreolysis is commonly used to treat these patients. Compared to other treatment for floaters, laser vitreolysis is less invasive and has a low risk profile. The availability of this laser treatment currently at our setting is a potential discovery for managing our patients with symptomatic floaters. The study aims to evaluate patient's discomfort intensity from their symptomatic vitreous floaters after Nd:YAG laser vitreolysis treatment and to suggest an alternative option for treatment of symptomatic vitreous floaters at our local setting.

Methodology: An international review board approval at University of Santo Tomas Hospital was obtained before initiation of the study. A preliminary study of 16 subjects ages 33 - 72 years old with symptomatic floaters from a private clinic had Nd:YAG laser vitreolysis treatment. The following inclusion criteria were those with symptomatic floaters, persistently present for at least 3 months and stable in behavior, either phakic or pseudophakic, a solitary weiss ring or centrally located suspended floater evidenced on ophthalmologic examination, direct or indirect ophthalmoscopy. Those who were severely disturbed by their floaters and with discomfort intensity of 6 or more using a floater severity scoring were included in the study. Nd:YAG laser vitreolysis used was the Ellex Ultra Q Reflex. Laser treatment were all done by retina specialists. Statistical analysis using paired t-test for evaluating the pre-treatment and post-treatment discomfort intensity floater severity score results was used.

Results: A total of 16 eyes of 16 patients were treated using Nd:YAG laser vitreolysis. The types of floaters treated were divided in to solitary weiss rings and amorphous, ill defined, diffuse floaters (Table 1). There are more power, number of shots and retreatments observed in amorphous type of floater than weiss rings. Ten (62.5%) out of 16 patients had a significant improvement or completely resolved floaters on fundus examination after initial treatment. There were 6 patients (37.5%) having an amorphous type of floater who still had residual floater on fundus examination and complained of persistence of their floaters. They had re-treatment that resolved their floaters and eventually improved their symptoms. One patient (6.3%) had micro-hemorrhage nasal to the disc during treatment. Resulting p-value showed that there was statistically significant ($p \leq 0.05$) difference between the pre-treatment and post-treatment floater severity scores in patients with solitary weiss ring type of floater (Table 2) and in patients with amorphous, ill-defined diffuse floaters (Table 3).

Conclusion: Our patients with visual discomfort from their symptomatic floaters generally had subjective improvement after Nd:YAG laser vitreolysis. Objective improvement of appearance of floaters after treatment greatly depend on one's skill and experience. It is also important that expectations should be addressed properly to achieve patient's satisfaction for their symptomatic floaters. Nd:YAG laser vitreolysis as an alternative option for floater treatment still depend on one's experience and knowledge of the treatment. Risks and possible complications should be explained to all patients.

Keywords: *Floaters; Nd:YAG Laser; Vitreolysis; Posterior Vitreous Detachment*

Introduction

Vitreous is composed primarily of water (98%) combined with structural protein Type II collagen and hyaluronic acid that forms a clear vitreous gel. Hyaluronic acid retain water molecules which is important in maintaining the gel consistency of the vitreous. Common age-related process occurring in the vitreous is posterior vitreous detachment and vitreous liquefaction. Dissociation of collagen fibrils from hyaluronic acid results to cross-linking and aggregation of collagen in the vitreous cavity resulting to formation of floaters.

Vitreous floater is perceived as linear gray shadows, dark spots and web-like structures. These are most noticeable when situated parallel to the visual axis and while looking at a bright background. With its increase in size, number and chronicity, it can be very symptomatic causing functional visual discomfort affecting quality of vision and quality of life.

Many people are experiencing floaters but each individual react differently to these. Some may be accustomed to the visual discomfort but some will be immensely disturbed, obsessed and anxious. They usually seek for immediate consult to get rid of their symptoms. Mostly are managed conservatively with reassurance or observation. However in some countries, Nd:YAG laser vitreolysis is commonly used to treat these patients. Compared to other treatment for floaters such as pars plana vitrectomy, laser vitreolysis is less invasive and has a low risk profile. The availability of this laser treatment currently at our setting is a potential discovery for managing our patients with symptomatic floaters.

Aim of the Study

The study aims to evaluate patient's discomfort intensity from their symptomatic vitreous floaters after Nd:YAG laser vitreolysis treatment and to suggest an alternative option for treatment of symptomatic vitreous floaters at our local setting.

Methodology

An international review board approval at University of Santo Tomas Hospital was obtained before initiation of the study. A preliminary study of 16 subjects ages 33 - 72 years old with symptomatic floaters from a private clinic had Nd:YAG laser vitreolysis treatment. The following inclusion criteria were those with symptomatic floaters (described as persistent moving shadows, black dots or lines, spider web-like object), persistently present for at least 3 months duration and stable in behavior, either phakic or pseudophakic, a solitary weiss ring or centrally located suspended floater evidenced on ophthalmologic examination, direct or indirect ophthalmoscopy. Those who were severely disturbed by their floaters and with discomfort intensity of 6 or more using a floater severity scoring were included in the study. Those with photopsias or flashes of light suggesting incomplete posterior vitreous detachment, had lattice degeneration, retinal tears, had previous retinal surgery or vitrectomy for retinal detachment, vitreous hemorrhage, diagnosed with other eye diseases such as glaucoma, retinal detachment, diabetic retinopathy, vaso-occlusive diseases and age-related macular degeneration, significant corneal opacity or cataract that will hinder visualization of floaters, strong lenticular astigmatism and with multifocal lenses were all excluded from the study.

Pretreatment

Complete ophthalmologic examination that includes visual acuity testing (BCVA), refraction and slitlamp examination were done. A dilated fundus examination (indirect or direct ophthalmoscopy) with careful attention to the retinal periphery were done for each patient. Slitlamp indirect biomicroscopy photo/video and B-scan ultrasound were used to localize and document the appearance of the vitreous floater. The morphology of the floater were also described. Informed consent was obtained for each subject. Appropriate expectations and risks of the procedure were discussed. Dilation with both Phenylephrine 2.5% and Tropicamide 1% eye drops 1 drop every 15 minutes for 2 - 3 doses were instilled on the eye to be examined. Topical proparacaine with 2 - 3 instillations few minutes apart was used as anesthesia. A floater severity score was used to evaluate the visual discomfort intensity of each subject from their floaters. Patient were asked from the scale of 1 to 10 from 1 as mild discomfort up to 10 as severe discomfort according to how floater functionally affects their everyday life, professional and psychological aspects. Those with floater severity score of 6 or more underwent treatment.

Treatment

A Singh mid-vitreous lens, Karickhoff 21 mm WF and Peyman 18mm WF lenses were all available that can be used during vitreolysis. The contact lens with carbomer ophthalmic gel was gently placed on subject's eye. Before starting the treatment, a sound of a shutter opening with each laser shot was explained to the subject. An adequate distance was maintained of more than 2 - 4 mm from the lens and more than mm from the retina. The aiming beam and treatment beam was clearly focused on the immobile vitreous opacity before starting the treatment. Using the Nd:YAG laser vitreolysis, treatment began initially with a single burst mode per shot and power was set at minimum level of 2 - 2.5 mJ. The power and burst mode was titrated until an optical breakdown or lysis of the floater was visible. The treatment spot size was 8 microns and pulse width was 4 ns. Laser parameters used for each treatment were recorded on the laser vitreolysis form. In case the floater strand becomes mobile during treatment, the retina specialist will wait for it to settle into a stable position before treating the opacity. The aim was to vaporize any centrally located, visually significant vitreous floater. Laser treatment were all done by retina specialists (R.U., J.S. and J.B.).

Nd:YAG laser vitreolysis used was the Ellex Ultra Q Reflex (Figure 1). It has an elevated illuminating light source that is positioned on the same vertical optical axis as to oculars and laser beam in contrast to most YAG lasers used for anterior segment. It has a coaxial illumination tower, light source, green observation beams and infrared treatment beam on the same axis.

Figure 1: *Ellex Ultra Q Reflex laser vitreolysis.*

Post-treatment

No post-procedure medication was required. There were also no restrictions on patient's activities. Post-treatment complete ophthalmologic examination, visual acuity testing (BCVA), slitlamp examination with indirect biomicroscopy and dilated fundus examination were done on Day 1 and 1 month follow-up. Slitlamp indirect biomicroscopy photo/video was used to visualize objective change in appearance of the vitreous floaters. Additional laser sessions were done as needed if there was still disturbance and persistence of floater. Discomfort intensity after 1 month of treatment was evaluated using the floater severity score 1 as mild discomfort up to 10 as severe discomfort, according to how it functionally affects their everyday life, professional and psychological aspects. Complications were also noted. Statistical analysis using paired t-test for evaluating the pre-treatment and post-treatment discomfort intensity floater severity score results was used.

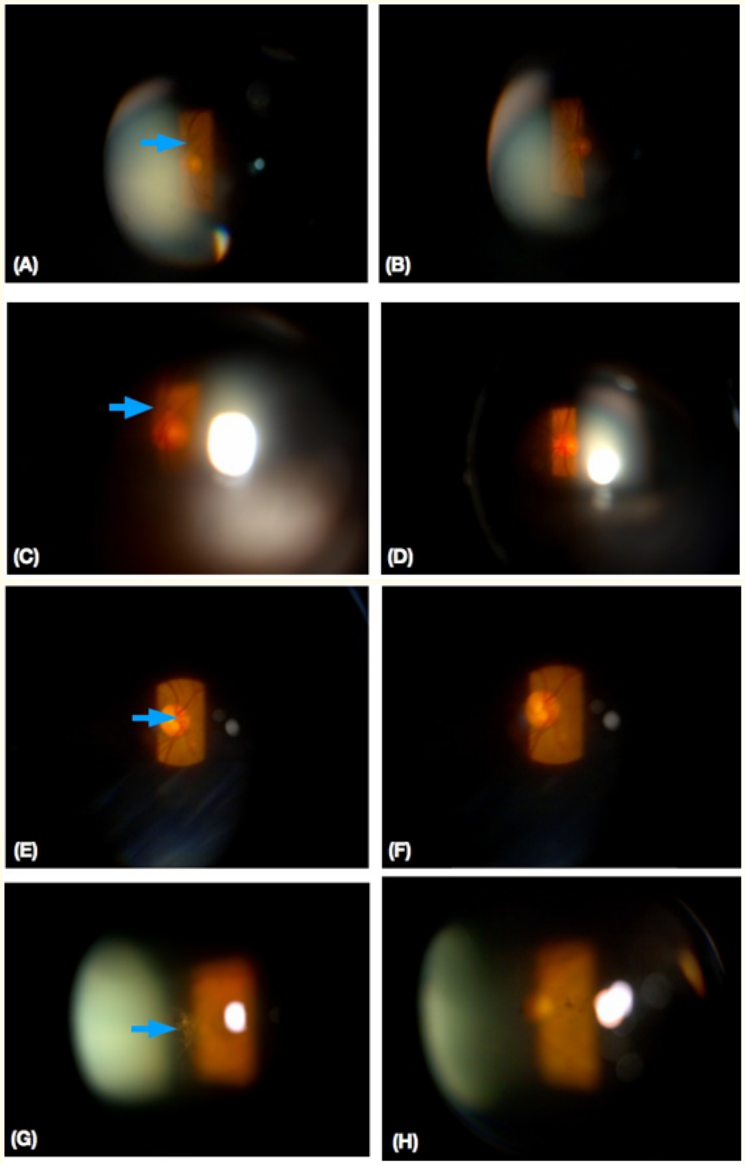

Figure 2: *(A, C, E) Pre-treatment slitlamp indirect biomicroscopy photo with visible weiss ring floater and (G) an ill-defined, amorphous, diffuse floater. (B, D, F) Post- treatment slitlamp indirect biomicroscopy photo of resolved weiss ring floater. (H) Post-treatment of an ill-defined amorphous floater.*

Results

A total of 16 eyes of 16 patients were treated using Nd:YAG laser vitreolysis. Average patient age was 60 (33-72 years old). Eight (50%) were male and 8 were female (50%). Twelve (75%) of them were phakic and 4 (25%) of them were pseudophakic. Treated eyes presented with good visual acuity of 20/20 to 20/60. Five (35.7%) patients were noted to be myopic (-1.00 to -5.00). Mean duration of symptoms is 8.4 months (3 months to 2 years).

The types of floaters treated were divided in to solitary weiss rings and amorphous, ill defined, diffuse floaters (Table 1). There are more power, number of shots and re-treatments observed in amorphous type of floater than weiss rings.

	Solitary weiss ring floaters	Amorphous, ill-defined floaters
No. of patients	9	7
Mean No. of treatment	1	2.14
Mean YAG power	3.2	5.5
Mean No. of shots	344	828

Table 1: *Treatment parameters of each floater type.*

Ten (62.5%) out of 16 patients had a significant improvement or completely resolved floaters on fundus examination after initial treatment. There were 6 patients (37.5%) having an amorphous type of floater who still had residual floater on fundus examination and complained of persistence of their floaters. They had re-treatment that resolved their floaters and eventually improved their symptoms. One patient (6.3%) had micro-hemorrhage nasal to the disc during treatment.

Resulting p-value (Table 2) showed that there was statistically significant ($p \leq 0.05$) difference between the pre-treatment and post-treatment floater severity scores in patients with solitary weiss ring type of floater. Their mean discomfort intensity had significantly decrease during post-treatment in terms of everyday life ($p = 0.0019$), professional life ($p = 0.0167$) and psychological ($p = 0.0242$).

	Pre-treatment		Post-treatment		Difference	p value
	Mean	SD	Mean	SD		
Everyday	6.89	2.09	4.89	1.69	2.00	0.0019
Professional	6.78	2.22	5.11	1.36	1.67	0.0167
Psychological	6.56	2.30	4.89	1.36	1.67	0.0242

Table 2: *Discomfort intensity from solitary weiss ring floaters.*

Resulting p-value (Table 3) showed that there was statistically significant ($p \leq 0.05$) difference between the pre-treatment and post-treatment floater severity scores in patients with amorphous, ill-defined diffuse floaters. Specifically, mean discomfort intensity had significantly decrease during post-treatment in terms of everyday life ($p = 0.0002$), professional life ($p = 0.0046$) and psychological ($p = 0.0014$).

	Pre-treatment		Post-treatment		Difference	p value
	Mean	SD	Mean	SD		
Everyday	7.57	1.62	4.71	0.76	2.86	0.0002
Professional	7.43	1.62	4.14	0.69	3.29	0.0046
Psychological	7.86	1.46	4.43	0.79	3.43	0.0014

Table 3: *Discomfort intensity from amorphous, ill-defined, diffuse floaters.*

Discussion

Our study showed subjective improvement of patient's symptomatic floaters after Nd:YAG laser vitreolysis. They had significant improvement of floater-related visual disturbance on both solitary weiss ring and amorphous floaters using a self-rated floater severity scoring [1,2].

Treatment success usually depends on the type, size and location of the floater. A small solitary weiss ring is easier to vaporize compared to an amorphous, ill-defined diffuse floater. Vandorselaer., *et al*. [3] described 2 types of floaters: a well suspended floater having well-defined strands under tension and an ill-suspended floater that is not suspended but loosely located on the vitreous. There is greater

success of treatment in well-suspended floater than in ill-suspended. For a solitary weiss ring or a well- suspended floater, our study showed average power of 3.2 mJ and average shots of 344 which is lesser compared to treating an amorphous floater with an average power of 5.5 mJ and average 828 shots. We also had more treatment sessions (average 2.14) for amorphous floaters compared to 1 treatment session for weiss ring floaters. We had difficulty in completely vaporizing an amorphous diffuse type of floater on initial treatment resulting to persistence of floaters on 6 of our patients. However, the decreased volume of these amorphous floater compared to their initial size observed on fundus examination still resulted to subjective improvement on our patients' symptoms. Treating amorphous floaters also require greater surgical skill than a solitary weiss ring. Although our treatment were performed by retina specialists skilled on lasers, there may still be differences in their competence and experience on vitreolysis. Study done by Shah et. al revealed greater subjective improvement in symptoms and objective improvement of appearance on weiss ring type of floater after vitreolysis. A preliminary study limited on treating only to a solitary weiss ring type of floater will have a better outcome.

Regardless of the type of floater and other factors such as surgical skill and patient's satisfaction differences influencing the treatment, there was still noted improvement of our patients' discomfort intensity using our floater severity scoring. This can also be attributed to addressing patient's realistic expectations effectively to majority of our patients. An effective communication and a clear explanation is essential in patient's overall satisfaction. But a more validated subjective outcome measure like the NEI VQ5 is necessary to clearly identify and qualify the concept of patient satisfaction. Our study used a self-rated floater severity scoring scale similar to ESCRS floater study and 10-point visual disturbance scoring used by Singh which may be very subjective for each individual.

Unlike in other countries where patients readily seek for laser treatment for their symptomatic floaters, many patients at are local setting are not aware or are reluctant to undergo this treatment resulting to a small sample size in our study. These patients may also readily adapt to their floaters and will not decide immediately for treatment unless it become very visually disabling to them [4].

Although there are few reported complications, safety of laser vitreolysis still need to be validated through many controlled studies. Randomized controlled study done by Shah., *et al.* [5] reported low rate of complications. ASRS Safety and Therapeutics committee recently collected reports of laser vitreolysis related complications and included the following: elevated intraocular pressure, cataracts, posterior capsule defects, retinal tear, retinal detachment, retinal hemorrhages, scotomas and increase number of floaters. We had 1 patient who had microhemorrhage nasal to the disc during treatment but eventually resolved after a month. Although the estimated safe distance of 2 - 4 mm between structures are considered, accompanying risks is always a possibility in this type of procedure because it also rely on one's surgical skill and experience to accurately focus on different types of floater. Generated shock waves during treatment may also cause retinal damage. Energy of the laser should be started to a minimum energy and titrated until an optical breakdown is already seen to minimize complications [6-18].

Conclusion

Our patients with visual discomfort from their symptomatic floaters generally had subjective improvement after Nd:YAG laser vitreolysis. Objective improvement of appearance of floaters after treatment greatly depend on one's skill and experience. It is also important that expectations should be addressed properly to achieve patient's satisfaction for their symptomatic floaters.

Our preliminary study at our setting has many limitations and a more prospective controlled studies with larger sample size, extended follow-up period are necessary to confirm its efficacy, safety and patient's overall satisfaction. In addition, accepting Nd:YAG laser vitreolysis as an alternative option for floater treatment still depend on one's experience and knowledge of the treatment. Risks and possible complications should be explained to all patients.

Appendix

Laser vitreolysis

Patient Status

Name:_____Age:_____Sex:_____ Occupation: _____

Visual acuity: OD_____OS_____

Ametropia (Refraction): OD_____OS_____

Lens status: (Phakic / aphakic / pseudophakic)

Duration of symptoms:_____/ months

Discomfort intensity *(Floater severity score: 1mild symptoms -10 very severe)*

Everyday life:

Professional:

Psychological:

Clinical Findings

Floaters:

Describe: (number, size etc.)

YAG Treatment

Number of treatments: _____

Date:_____

Machine: *Ellex Ultra Q Laser*

Type of Lens used: _____

Settings:

single/burst mode _____	_____	_____
spot size _____	_____	_____
pulse width _____	_____	_____
power _____	_____	_____
total # of shots _____	_____	_____

Complications: (e.g. increase in floaters, flashes of light, scotoma etc.): _____

Follow-up

Follow-up delay:_____/ months

Post-treatment complications (describe): _____

Complication delay:_____/ months

If post op phaco (delay in months):_____/ months

Post-treatment discomfort intensity *(Floater severity score: 1mild symptoms -10 very severe)*

Everyday life:

Professional:

Psychological:

Source: 2016 EVRS Floaters Study

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