

EFFECT OF Nd-YAG LASER HYALOIDOTOMY FOR PRE-MACULAR HEMORRHAGE IN TERMS OF SUCCESS AND VISUAL OUTCOME

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ABSTRACT

Objective: To find out the effect of Nd-YAG laser hyaloidotomy for pre-macular hemorrhage in terms of success and visual outcome.

Methodology: This case series study was performed at Saidu Teaching Hospital, Swat and Lady Reading Hospital, Peshawar, from January 2016 to December 2017. Patients with pre-macular hemorrhage of any etiology who could sit comfortably on slit lamp were included in the study. Nd YAG laser posterior hyaloidotomy was performed. Patients with creation of an opening and bleeding into vitreous cavity after applying laser were termed successful. Follow-up was done at 1, 3 and 6 weeks intervals. On each visit, visual acuity was checked. Data were entered into SPSS version 20 and analyzed for descriptive statistics.

Results: Total 37 patients were included in this study. The most common causes of pre-macular hemorrhage were proliferative diabetic retinopathy in 20 (54.05%) cases, ocular trauma in 6 (16.21%) cases and Valsalva retinopathy in 5 (13.51%) cases. The procedure was successful in 33 (89.18%) patients; however, 2 of them had persistent vitreous hemorrhage. After laser treatment, visual acuity improved in 32 (86.48%) patients. No complications of the procedure were seen in any of the patient.

Conclusion: Nd-YAG laser hyaloidotomy was found to be effective procedure as it was successful with improved visual acuity in most of the patients.

Key Words: Pre-macular hemorrhage, Nd YAG laser, Hyaloidotomy, Visual acuity

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INTRODUCTION

Pre-macular hemorrhage causes decrease in visual acuity¹. It is typically well circumscribed and round shaped hemorrhage at the macular area. There are many different causes of pre-macular hemorrhage which include diabetic retinopathy, retinal vein occlusion, macroaneurysm of the retinal artery, bleeding disorders, choroidal neovascularization, high suction applied to stabilize the globe in some refractive surgeries, Valsalva retinopathy, Terson's syndrome and sudden chest compression²⁻⁹.

Spontaneous resolution may take 2 to 3 months on average and sometimes may take even a year, depending on the extent of hemorrhage, to get absorbed¹⁰. Contact of blood over the macula for prolonged duration due to its delayed absorption may lead to permanent damage. This may be because of toxicity of the

constituents of blood and membrane formation over the macula which may cause traction and can lead to tractional detachment⁹. Because of the very slow spontaneous resolution, it is important to treat the pre-macular hemorrhage as soon as possible. Different treatment options are available for the management of pre-macular hemorrhage. These include Nd: YAG laser hyaloidotomy^{2,5,8,10}, pneumatic displacement of hemorrhage by intravitreal injection of gas and tissue plasminogen activator (tPA)¹¹ and pars plana vitrectomy (PPV) with or without internal limiting membrane (ILM) peeling¹². The trapped blood is released in vitreous cavity after creation of opening by laser application from where it is absorbed in due course of time¹³. Another treatment modality is intravitreal injection of tissue plasminogen activator with C3F8 followed by paracentesis to lower the intraocular pressure which may increase during the procedure. The disadvantages of this procedure include

risk of retinal detachment, endophthalmitis, vitreous hemorrhage associated with intravitreal injection, intraocular pressure elevation, cataract formation, difficult posturing and delayed visual recovery due to gas injection¹³. Pars plana vitrectomy followed by drainage of blood which may require ILM peel¹², though may cause faster visual recovery and prevent complication of long standing entrapment of blood but it may be associated with the adverse effects such as formation of cataract, retinal detachment and endophthalmitis. Some authors have reported that pars plana vitrectomy resulted in faster and very good visual recovery and high success rate but it is an invasive and lengthy procedure³. On the other hand, Nd: YAG laser¹⁴ is a minimally invasive procedure and its effectiveness needs to be studied.

The objective of the present study was to find out the visual outcome and success of Nd: YAG laser hyaloidotomy in pre-macular hemorrhage.

METHODOLOGY

It was a case series study which was carried out at Saidu Teaching Hospital, Swat and Lady Reading Hospital, Peshawar, from January 2016 to December 2017. Approval was taken from hospital ethics committee. Total 37 patients were enrolled in the study after informed consent. Patients with pre-macular hemorrhage of any etiology and age who could sit comfortably on slit lamp were included in the study. Detailed history from the patients including demographic data and co morbidities were recorded on proforma. History of trauma, previous ocular surgery, bleeding disorders, factors causing Valsalva retinopathy were also recorded on proforma. Slit lamp examination of both anterior and posterior segments of each patients was carried out and photographs of the fundus were taken.

Before doing the procedure, patients were made to sit comfortably and the procedure was explained. Pupil was dilated with one drop of 0.5% proparacaine (alcaïne) in the lower conjunctival fornix to achieve topical anesthesia. After putting viscoelastic as coupling agent, 3 mirror contact lens was applied on the cornea of the patient. Using the central part of the 3 mirror contact lens and aiming the inferior margin of the hemorrhage, the laser was applied. We used the energy level starting from 7 mJ and increasing gradually upto 12 mJ or until the opening was formed and the blood was seen coming into the vitreous. After attempted hitting at the energy level of 12 mJ 2 times when no opening was made and hence no blood was seen coming to the vitreous cavity, the procedure was termed as not successful. For pain relief and control of inflammation, non-steroidal anti-inflammatory topical drops were prescribed to be used for a week. Patients were called at the interval of one, three and six weeks duration and visual acuity was recorded at each follow up visit. Similarly, complete ocular examination of both anterior and posterior segments was carried out and its findings were recorded on proforma. Data were entered into SPSS version 20 and analyzed for descriptive statistics (frequencies and percentages).

RESULTS

Total 37 patients participated in the study; 20 (54.05%) were male and 17 (45.95%) were female. Age range was 18 to 60 years (Table1). Proliferative diabetic retinopathy was the commonest cause found in 54.05% cases.

The procedure was successful in 33 (89.18%) patients, as shown in Table 2. It took 7-21 days for the absorption of the hemorrhage from the vitreous cavity. Four patients with failed procedure & 2 patients with persistent

Table 1: Age-wise distribution of patients (n=37)

Age Range (years)	Frequency	Percentage
18-35 Years	9	24.32%
36-50 Years	14	37.83%
51-60 Years	14	37.83%
Total	37	100%

Table 2: Success rate of Nd: YAG laser hyaloidotomy

Success	Frequency	Percentage
Successful Laser	33	89.19%
Failed Laser	04	10.81%
Total	37	100

Table 3: Post laser visual outcome

Visual acuity	Frequency	Percentage
Hand Movement	2	5.40%
Counting Fingers	4	10.81%
6/60-6/24	5	31.51%
6/18-6/9	17	45.94%
6/6	9	24.32%

vitreous hemorrhage after a successful procedure subsequently required pars plana vitrectomy (PPV).

Visual acuity before the procedure was in the range of counting finger (close to the eyes to 1 meter) in 27 (72.97%) patients and hand movement in 10 (27.02%) patients. After the laser, visual acuity improved in 32 (86.48%) patients, as shown in Table 3.

DISCUSSION

Pre-macular hemorrhage takes months for spontaneous reabsorption and prolonged contact of blood with the macula may lead to permanent damage to the macula. Therefore, it is essential to treat these patients early to prevent the permanent visual loss. Different treatment modalities have been tried for pre-macular hemorrhage, each with its own advantages & disadvantages. Laser hyaloidotomy was performed for the first time in diabetic patients by Faulborn¹⁵ and later by other investigators¹⁶. They successfully performed this procedure with a single attempt and without any complication and reported significant improvement in visual acuity which was achieved very early¹⁶. In this study, Nd: YAG laser hyaloidotomy was performed in patients with pre-macular hemorrhage of various causes. The procedure was successful in 33 (89.18%) patients. No complications of the procedure were seen in any of the patient. PPV was required for 4 patients with failed procedure & 2 patients with persistent vitreous hemorrhage after a successful procedure.

In another study, 21 eyes with pre-macular subhyaloid hemorrhage were treated with Nd: YAG laser hyaloidotomy¹⁷. Successful drainage in vitreous cavity and absorption occurred in 19 (86.4%) eyes while it was unsuccessful in two patients in whom PPV was done. In one eye with successful procedure, PPV was done later for non-resolving vitreous hemorrhage. Comparing these results with our study, we can say that our success rate is comparable with slight difference. This difference may be because of the difference in sample size (37 vs. 21). The visual outcome in their study was higher than ours, as their visual improvement was almost 100%

while in our study it was 86.48%. This difference can be attributed to many factors. Final visual acuity depends on the degree of visual loss already occurred due to the underlying causes. As most of the patients in their study were having Valsava retinopathy with no macular damage as the underlying cause of pre-macular hemorrhage i.e. 22%; compared to 13% in our study. We had more patients of diabetic retinopathy as the underlying cause of pre-macular hemorrhage i.e. 54% in our study as compared to 18% in their study. In patients with diabetic retinopathy having pre-macular hemorrhage, there are high chances of macular edema and photoreceptor damage as a result of ongoing retinopathy. In another study conducted by Ulbig et al¹⁸, laser posterior hyaloidotomy was applied in 16 cases, starting with low energy (2 mJ) and gradually increased to 9 mJ. Initial success rate was 93.75% in 15 eyes, however 4 of these eyes had persistent vitreous hemorrhage requiring PPV. One patient developed macular hole & RD due to retinal break in a myopic patient.

In the study conducted by Murtaza et al¹⁹, the success rate of the procedure was 93.33%. In their study, one patient (3.33%) had persistent vitreous hemorrhage and one patient had metamorphosis after the procedure. The success rate of the procedure in our study was comparable to this study. None of the patients developed any complications (other than persistent vitreous hemorrhage in 2 patients) and in majority of patients good improvement in visual acuity was achieved after successful procedure. Similarly, the visual outcome in our study was almost comparable to this study which might be because of the similar etiologies of pre-macular hemorrhages in both patients. The ideal treatment for pre-macular hemorrhage should have rapid recovery of vision, low cost, safety and should be more conservative and easily accessible²⁰. Nd: YAG laser posterior hyaloidotomy seems to have almost all these characteristics. It is minimally invasive and cheap, visual recovery is rapid and complications are uncommon. However, it requires co-operative patient & good pupil dilatation with adequate fundus view.

LIMITATIONS

we studied the success rate and visual outcome of Nd-YAG posterior hyaloidotomy only and did not compare it with other treatment modalities. So Randomized control trials are needed to compare it with other treatment modalities.

CONCLUSION

Nd-YAG laser hyaloidotomy was found to be effective procedure as it was successful with improved visual acuity in most of the patients.

REFERENCES

- Al-Mujaini AS, Montana CC. Valsalva retinopathy in pregnancy: A case report. *J Med Case Reports* 2008; 2:101.
- Raymond LA. Neodymium:YAG Laser treatment for hemorrhages under the internal limiting membrane and posterior hyaloid face in the macula. *Ophthalmology* 1995; 102:406-11.
- Mennel S. Subhyaloidal and macular hemorrhage: localization and treatment strategies. *Br J Ophthalmol* 2007; 91:850-2.
- Vedantham V, Agrawal D, Ramasamy K. Premacular hemorrhage associated with arteriovenous communications of the retina induced by a Valsalva-like mechanism: An observational case report. *Indian J Ophthalmol* 2005; 53:128-30.
- Khadka D, Sharma AK, Shrestha JK, Pant B, Pant S, Shrestha A. Nd:Yag laser treatment for sub-hyaloid hemorrhage in childhood acute leukemia. *Nepal J Ophthalmol* 2012; 4:102-7.
- Mansour AM, Ojeimi GK. Premacular subhyaloid hemorrhage following laser in situ keratomileusis. *J Refract Surg* 2000; 16:371-2.
- Ahmadabadi MN, Karkhaneh R, Mirshahi A, Lashay A, Harandi ZA, Roohipoor R et al. Premacular hemorrhage in Valsalva retinopathy: A study of 21 cases. *Iran J Ophthalmol* 2009; 21:11-6.
- Nili-Ahmadabadi M, Lashay AR, Karkhaneh R, Manaviat MR, Amini A, Razaghi A et al. Nd-YAG laser application in premacular subhyaloid hemorrhage. *Arch Iranian Med* 2004; 7:206-9.
- Chandra P, Azad R, Pal N, Sharma Y, Chhabra MS. Valsalva and Purtscher's retinopathy with optic neuropathy in compressive thoracic injury. *Eye (Lond)* 2005; 19:914-5.
- Sabella P, Bottoni F, Staurengi G. Spectral-domain OCT evaluation of Nd:YAG laser treatment for Valsalva retinopathy. *Graefes Arch Clin Exp Ophthalmol* 2010; 248:599-601.
- Conway MD, Peyman GA, Recasens M. Intravitreal tPA and SF6 promote clearing of premacular subhyaloid hemorrhages in shaken and battered baby syndrome. *Ophthalmic Surg Lasers* 1999; 30:435-41.
- Ramsay RC, Knobloch WH, Cantrill HL. Timing of vitrectomy for active proliferative diabetic retinopathy. *Ophthalmology* 1986; 93:283-9.
- O'Hanley GP, Canny CLB. Diabetic dense premacular hemorrhage: A possible indication for prompt vitrectomy. *Ophthalmology* 1985; 92:507-11.
- Karagiannis D, Kontadakis GA, Flanagan D. ND:YAG laser for preretinal hemorrhage in diabetic retinopathy. *Am J Ophthalmol Case Rep* 2018; 10:8-9.
- Faulborn J. Behandlung einer diabetischen pramacularen Blutung mit dem Oswitched Neo-dym Yag laser. *Spektrum Augenheilkd* 1988; 2:33-5.
- Gabel VP, Birngruber R, Gunther-Koszka H, Puliafito CA. Nd:YAG laser photodisruption of hemorrhagic detachment of the internal limiting membrane. *Am J Ophthalmol* 1989; 107:33-7.
- Khadka D, Bhandari S, Bajimaya S, Thapa R, Paudyal G, Pradhan E. Nd:YAG laser hyaloidotomy in the management of premacular subhyaloid hemorrhage. *BMC Ophthalmol* 2016; 16:41.
- Ulbig MW, Mangouritsas G, Rothbacher HH, Hamilton AM, McHugh JD. Long-term results after drainage of premacular subhyaloid hemorrhage into the vitreous with a pulsed Nd:YAG laser. *Arch Ophthalmol* 1998; 116:1465-9.
- Murtaza F, Rizvi SF, Bokhari SA, Kamil Z. Management of macular pre-retinal subhyaloid hemorrhage by Nd:Yag laser hyaloidotomy. *Pak J Med Sci* 2014; 30:339-42.
- Chan KC, Tsang MK, Raymond KK. Photodisruption of dense subhyaloid premacular hemorrhage with neodymium:YAG laser. *HKJ Ophthalmol* 2004; 8:36-7.

CONTRIBUTORS

SAK conceived the idea, made study design and collected data. MA carried out literature search, calculated sample size and compiled references. JS carried out the procedure as per protocol and followed up the patients for outcome keeping in view the baseline data. MA and AA carried out statistical analysis as per original protocol and wrote the manuscript. MH helped in designing the study, went through the components of protocol and supervised all stages of the project. All authors contributed significantly to the submitted manuscript.