

A Retrospective Study on Efficacy of Transpupillary Diode Laser Retinal Photocoagulation for Treatment of Retinal Tears

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ABSTRACT

Objective: To evaluate the efficacy and safety of trans pupillary diode laser retinopexy for the management of retinal tears as an outpatient ophthalmic procedure.

Study Design: Retrospective study

Place and Duration of Study: This study was conducted at the Multan Medical and Dental College and Bodla Eye Care, Multan from January 2018 to June 2018.

Materials and Methods: The long wave 810nm diode laser retinopexy was done instead of conventional argon laser retinopexy as an outpatient procedure. A moderate spot size between 300 to 400 microns with diode laser (810) was used to treat patients with breaks in attached retina. Powers between 400 and 800 mW produced an adequate burn in all cases. Pre and post laser anterior and posterior segment examination was done for any signs of inflammation, and PVR. Follow up was conducted, for over a period of six months, to ascertain for adequate chorio-retinal adhesions.

Results: A total of 13 patients were recruited in the study starting from February 2018 till July 2018. There were 13 eyes in total with the mean age of 57.8 years. Pre laser VA of 7 eyes was between 6/6 to 6/12 and 6 eyes had a visual acuity of 6/18 to 6/60. Post laser VA, improved to 6/6 to 6/12 in 10 eyes as associated vitreous haemorrhage resolved, and remained between 6/18 to 6/60 in 3 eyes. Out of 13 eyes, none of the eyes, developed anterior segment inflammation while mild posterior segment inflammation, was noticed in one eye. None of the eyes developed PVR. Excellent chorio-retinal adhesion was achieved in 12 out of 13 eyes. One eye with failure needed, scleral buckling procedure, this was with pre clinical rhegmatogenous retinal detachment having U shaped retinal tear.

Conclusion: Our study looked at the efficacy and safety of transpupillary diode laser which had been the main stay treatment for retinal tears prior to introduction of Argon laser primarily used for the mentioned procedure now a days. Excellent chorio-retinal adhesion was achieved in 12 out of 13 eyes. There was no element of proliferative vitreo retinopathy noticed in either eye as a result of the procedure. Results of diode laser were found to be at par with Argon and definitely superior to trans sclera cryopexy. Cryopexy is known to cause scleral thinning, proliferative vitreo retinopathy, tissue necrosis along with breakdown of blood aqueous barrier and none of these complications are associated with diode laser.

Key Words: Diode laser, Retinopexy, Retinal Tears.

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INTRODUCTION

Photocoagulation for the treatment of retinal conditions has been used for over 40 years.^{1,2} Meyer-Schwickerath initially used focused sunlight to produce retinal lesion, but this method was superseded by a modified Beck arc.^{3,4}

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The development of the xenon arc photocoagulator provided a source of broadband optical radiation, which was effective in producing full-thickness chorioretinal lesions.^{2,5} Xenon arcs devices were of proven effectiveness in the treatment of proliferative diabetic retinopathy and were commonly used for retinal therapeutic procedures. Continuous-wave argon and Krypton broadly used, were similar in terms of both efficacy and safety, though they had several inherent disadvantages. Laser energy was generated within relatively bulky gas-filled tubes, electrical energy consumption was high, and the efficiency of electric-optical conversion is low.

Advances in semi-conductor technology have allowed the development of infrared diode lasers (750-950nm) measuring a few millimeters in size.^{6,7} These are used

in compact disc players and have important applications in the fields of optical printing and communications.⁸

The recent availability of laser diode with an output power of 1-3 W has stimulated interest in their potential applications in ophthalmic surgery. They are compact (9 x 2mm) and easily portable, they may be powered by either a standard 13A power supply or a 6 V battery, and no ancillary cooling facilities, are needed. Microscopical analysis of diode laser retinal lesion, demonstrated them to be similar to those produced by conventional clinical photocoagulators and, in particular, to those induced by argon lasers. The physical parameters of the exposures, such as power levels, exposure durations and spot sizes, were also similar.⁹

Pilot clinical studies in the past, in which a number of retinal vascular conditions, were treated with diode lasers have demonstrated comparable results to the most frequently used Argon.^{9,10}

Transpupillary diode laser photocoagulation, is an alternate to broadly used argon laser retinopexy as well as cryopexy. Over a period of last few years there has been a consistent decrease in the use of Diode but Authors believe that even to this day it can be used effectively and safely as an alternate to Argon Laser for the treatment of retinal tears.

MATERIALS AND METHODS

A study of patients that had diode laser retinal laser photocoagulation between January 2018 to June 2018 with the semiconductor infrared diode laser was performed. These patients presented with identified retinal tears with or without associated vitreous haemorrhage. Inclusion criteria was patients presenting with atrophic retinal breaks associated with visible vitreous traction of flashing lights, horse shoe retinal tears with posterior vitreous detachment, symptomatic patients with retinal breaks present in the areas of lattice degeneration, retinal tears with or without posterior vitreous detachment with areas of sub retinal fluid around it.

Study proforma included age, sex, demographic area, pre and post laser visual acuity, presence or absence of vitreous haemorrhage as well as size, shape and location of retinal tears. A detailed account was noted of any associated sub retinal fluid around the break. Post treatment findings were presence or absence of adequate chorioretinal adhesion. Presence of any secondary retinal inflammation especially proliferative vitreoretinopathy. Patients with vitreous haemorrhage underwent an Oculus B-Scan using 12 MHz probe to identify for any other areas of retinal elevation.

Diode laser photocoagulation system used is manufactured by Nidek Inc ,Japan. A transpupillary approach was used for the treatment with patient's eye to be treated well dilated using topical phenylephrine 2.5% or Tropicamide 0.5% or both. Alcaine, Alcon

topical anaesthetic drops were used with the Volk Mainster Wide Field Lens 160 degrees couple with preservative free Viscotears. Following the treatment patients were prescribed guttae Flouromethalone FML (Allergan Inc) Eye Drops four times a day for a week along with guttae Diclofenac Sodium (Ocufer Allergan Inc) three times a day for the same period.

Authors used a spot size between 300 to 400 microns in the form of confluent burns in three rows on the attached retina 360 degrees around breaks. It was made sure that appropriate blanching of retina was observed during the procedure. Follow up was for a period ranging from one to six months with dilated fundus examination and a close observation of the treated area. Post op examination proforma was meticulously filled for post laser visual acuity, degree of anterior and posterior segments inflammation, any presence of proliferative vitreoretinopathy in and around treated area and extent of chorioretinal adhesion.

RESULTS

A total of 13 eyes of 13 patients underwent transpupillary diode laser retinopexy for the treatment of retinal tears. Patients had a variable follow up ranging between one to six months. All patients were recruited as per mentioned inclusion criteria. There were 8 (61.5%) males and 5(38.4%) female patients. The mean age at presentation was 57.8±9.3 years (range 36-69 years). The indication of treatment was retinal tear with or without an area of subretinal fluid. 3 (23.0%) out of 13 patients had an area of less than one disc diameter of subretinal fluid along with the retinal tear margin and 1 (7.6%) had an area of approximately three disc diameters of subretinal fluid. This particular patient, subsequently turned out to be a treatment failure and required sclera buckling. Slight discomfort was mentioned by majority of the patients following on the day of treatment. Only three out of thirteen patients complained of severe pain and subsequently required oral NSAID. 7 (53.8%) patients had an associated posterior vitreous detachment at the time of presentation, and 5 (38.4%) were pseudophakic. Refractive correction revealed an overwhelming majority of low to high myopes as expected i.e. 9 (69.2%). 8(61.5%) had breaks in the superior while 5 patients had breaks in the inferior quadrants. 5(38.4%) patients had mild to moderate amount of vitreous haemorrhage and all of them had a posterior vitreous detachment at the time of presentations. All these patients underwent an ophthalmic B-scan. Patients were seen on day 1 and 7 following the procedure to determine for any possible complication as well as progression to retinal detachment. Post laser VA, improved to 6/6 to 6/12 in 10 eyes due to resolution of vitreous haemorrhage, and remained between 6/18 to 6/60 in 3 eyes. The reason of reduced vision was preexisting retinal atrophy, mild amblyopia and

epiretinal membranes. 1 (6.7%) out of 13 eyes developed moderate vitritis post laser which resolved with the use of topical steroids. Post laser proliferative vitreoretinopathy was not identified in any patient. One eye progressed to development of retinal detachment on account of significant pre existing subretinal fluid and subsequently required sclera buckling. Rest of 12 eyes preceded to have excellent chorioretinal adhesions with flat retina and did not required any subsequent intervention. Statistical analysis was not applied to the nature of study and number of patients enrolled.

DISCUSSION

Argon laser is the mainstay of treatment when it comes to retinal photocoagulation.¹² Authors believe that Diode laser can still be used as an alternate to Argon in order to achieve similar results. Diode laser is relatively inexpensive with less maintenance issues.^{11,13} In pure socioeconomic areas as where we practice i.e. Southern Punjab , it still holds its importance as an alternate to relatively expensive Argon laser. Due to increased spectrum of absorption in the retinal tissue it potentially can be associated with side effects as foveal burns, visual field defects and retinal fibrosis leading to proliferative vitreoretinopathy but these complications can be avoided with adequate choice of power settings.^{14,15}

This study includes, the post laser analysis of 13 eyes who underwent transpupillary diode laser retinopexy, for the treatment of retinal tears presenting to outpatient departments at Multan Medical and Dental College and Bodla Eye Care, Multan. Transpupillary diode laser proved to be an effective and safe option, compareable by all standards to Argon for the adequate treatment of mentioned pathology. It certainly holds clinical advantage on trans scleral diode laser retinopexy and cryopexy. Cryotherapy is known to be associated with an increase in the breakdown of the blood- retinal barrier, one of the contributors to PVR, the major cause of surgical failure after scleral buckling surgery.^{16,17} Cryopexy has its drawbacks including development of postoperative cystoid macular edema, dispersion of retinal pigment epithelial cells, and breakdown of the blood-retinal barrier, resulting in an increase in the potential for stimulation of proliferative vitreoretinopathy (PVR).¹⁸

Authors propose that transpupillary diode laser is still a valid alternative to Argon and cryotherapy.¹⁹ Some of the old data suggests that for transscleral photocoagulation with the diode laser, emitting light in the near infrared range (810 to 840nm) and its ability to penetrate the retinal pigment epithelium can have practical and theoretical advantages in terms of formation of adequate chorioretinal adhesions.^{19,20}

In their study, Benner et al performed transpupillary retinopexy in the rabbit eye with the three laser-indirect Ophthalmoscopic delivery systems (argon, krypton, and

diode), as well as with the transscleral diode laser.^{9,21} They found the lesions to be clinically and histologically comparable. Higher power settings and longer burn duration were required for more lightly pigmented eyes, for burns without scleral depression, and for burns created with either the diode laser-indirect ophthalmoscopic or the transscleral diode delivery system. Some retinal hole formation and scleral thinning were observed histologically.⁹ These iatrogenic breaks were similar to those encountered in transpupillary laser delivery and were attributed to delivering higher pulses of energy at a high a power settings and at relatively shorter durations. This is something which can always be avoided in clinical settings and hence subsequent side effects. Careful attention must be used when treating over areas of pigmentation variation to avoid a Bruch's membrane rupture.²²

Keeping in view the above study authors performed transpupillary diode laser photocoagulation at a mild to moderate settings in 13 eyes, which were followed over a period of 1 to 6 months. In our study group with all being highly pigmented eyes, it was in fact easier to produce adequate retinal burns at lower power settings. Follow up results were found to be satisfactory in all possible aspects. Apart from one case, none others required further intervention. All other cases showed excellent chorio-retinal adhesion, with closure of the retinal tears. No signs of persisting anterior and or posterior segment inflammation were noted, and none of the eyes, developed proliferative vitreoretinopathy.

Authors have found this treatment modality to be inexpensive ,less time consuming, precise, effective, and reliable. In conclusion, we believe though obsolete in the modern world, it continues to have its pivotal role in rural and developing economies where Argon laser is not assessable for every patient.

CONCLUSION

Our study looked at the efficacy and safety of transpupillary diode laser which had been the main stay treatment for retinal tears prior to introduction of Argon laser primarily used for the mentioned procedure now a days. Excellent chorio-retinal adhesion was achieved in 12 out of 13 eyes. There was no element of proliferative vitreo retinopathy noticed in either eye as a result of the procedure. Results of diode laser were found to be at par with Argon and definitely superior to trans sclera cryopexy. Cryopexy is known to cause scleral thinning, proliferative vitreo retinopathy, tissue necrosis along with breakdown of blood aqueous barrier and none of these complications are associated with diode laser.

Author's Contribution:

Concept & Design of Study: Ali Afzal Bodla

Drafting: Muhammad Afzal Bodla

Data Analysis: Ali Afzal Bodla
 Revisiting Critically: Ali Afzal Bodla,
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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