

IS 360° INTRAOPERATIVE LASER RETINOPEXY AFTER PRIMARY PARS PLANA VITRECTOMY WORTHWHILE TO PREVENT RECURRENT RETINAL DETACHMENT?

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Abstract

Introduction: To determine if performing 360° laser retinopexy anterior to the equator during surgery is a viable option to prevent recurrent retinal detachment following a primary pars plana vitrectomy for rhegmatogenous retinal detachment

Methods: A consecutive case series of 142 patients with retinal detachment who underwent vitrectomy by a single surgeon in Mohammed VI university hospital Marrakech hospital between January 2020 and December 2021. A comparison was made between a group of consecutive patients who underwent 360° laser retinopexy and a control group of patients who did not receive the treatment (39). Patient demographic and clinical information was gathered from medical records. Both groups were analyzed and compared in terms of baseline characteristics and the risk of recurrent retinal detachment over time.

Result: Prophylactic intraoperative 360° laser treatment was performed on 103 RRD cases (52 years) and compared to a control group of 39 RRD cases (56.8 years). The rate of the incidence of recurrent retinal detachment at six months after surgery was 12.6% (13/103 eyes) in the 360° laser group and 28.2% (11/39 eyes) in the control group.

Conclusion: Intraoperative 360° laser retinopexy performed after primary pars plana vitrectomy led to a substantial decrease in the rate of recurrent retinal detachment post-surgery.

Keywords: 360° Laser ; Rhegmatogenous ; retinal detachment ; prevention ; recurrence

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INTRODUCTION

Rhegmatogenous retinal detachment (RRD) repair is a common vitreoretinal surgical procedure. Despite good surgical techniques and less-invasive technologies, up to 10% of cases may still require additional interventions to repair an eventual recurrent retinal detachment. This may be due to surgical technique and the presence of remaining peripheral vitreous, which can lead to traction on the peripheral retina and retinal detachment.

To prevent this, careful peripheral retinal examination, proper treatment of retinal breaks, and prophylactic scleral buckling or cryopexy have been used^[1,2,3]. However, there is a need for a less-invasive alternative. We hypothesize that 360°intraoperative laser retinopexy anterior to the equator can reduce the incidence of retinal breaks and detachment by creating strong chorioretinal adhesion and preventing the progression of retinal detachment, similar to demarcation laser treatment. This study aims to evaluate the effect of intraoperative 360° prophylactic laser retinopexy on the incidence of retinal detachment after vitrectomy in RRD cases using a case-control design.

METHODS

This study retrospectively reviewed the medical records of patients who underwent primary pars plana vitrectomy for rhegmatogenous retinal detachment (RRD) by two surgeons at Mohammed VI University Hospital in Marrakech between January 2020 and December 2021. The patients were part of a consecutive case series cohort and were divided into two groups based on whether or not they received intraoperative prophylactic 360° laser retinopexy. The study was approved by the institutional review board and all patients provided informed consent. The preoperative evaluation included a detailed examination and the collection of patient information such as age, gender, systemic disease, previous ocular surgery, and associated eye diseases. Postoperative evaluations were conducted at various intervals up to six months after surgery. Patients with previous ocular surgery, giant tears, retinal dialysis, trauma, proliferative vitreoretinopathy grade C or higher, retinal detachment with macular hole, or round hole detachment without associated PVD were excluded from the study.

Surgical technique

After local or general Anesthesia, phakic

patients underwent cataract surgeries. Sclerotomies were created 3.5 mm from the limbus and the posterior cortical vitreous was removed up to the vortex vein. The eyes underwent 360° scleral depression to trim the vitreous base [Conventional 23-gauge PPV done]. After fluid-air exchange, the causal retinal breaks were treated with a focal endo-laser.

In the treatment group, 360° laser retinopexy was performed by placing three rows of white burns anteriorly to the vortex vein level, towards and beyond the equator with burns approximately one burn width apart using the endo-laser system. Sutures of the sclerotomies were made with 8.0 Vicryl. Retinal detachment patients with superior breaks were positioned upright, while those with nasal, temporal, or inferior breaks were positioned on the contralateral cheek.

Statistical analysis

Additionally, multivariate regression analysis was performed to determine the independent effect of prophylactic 360° intraoperative laser on the rate of retinal detachment after vitrectomy, while controlling for other baseline and intra-operative factors that could impact the rate of re-detachment. The odds ratio and 95% confidence interval were calculated to determine the effect size of prophylactic 360° intraoperative laser on the rate of re-detachment. The results of the statistical analysis were used to evaluate the efficacy and safety of prophylactic 360° intraoperative laser in reducing the rate of retinal detachment after vitrectomy in patients with RRD.

RESULTS

Baseline characteristics of the study cohort

142 RRD cases were included. Demographics and clinical data are summarized in Table 1. Intraoperative circumferential laser was performed on 142 RRD cases (72.5%) and compared to a control group of 39 RRD cases (27.5%).

Table 1: Patients characteristics

	Retinal Detachment		P
	360° Laser Group	Control Group	
Number	103	39	-
Age(year)	52 ±10	56.8 ± 9.5	0.756
Gender(M/F)	75/28	12/27	0.434
Lens status (Phakic, Pseudophakic)	71/32	27/12	
Macula Status(On/Off)	21/82	9/30	0.346
Axial Length	24.4 ± 2.4	24.7 ± 2.8	0.688
Preop VA	20/86	20/75	0.297
Retinal Break(Single/Multiple)	31/72	8/31	0.523
Localization of Breaks (N: Nasal, Sup: Superior, Inf: Inferior, T: Temporal)	N: 11 T:32 Sup:36 Inf:24	N: 2 T:17 Sup:12 Inf:8	
Breaks size (clock hours) (GRT excluded)	<1:84 1≤BS<2: 17 ≥2:2	<1:32 1≤BS<2: 5 ≥2:2	
Preop PVR (C or higher excluded)	A:16 B:87	A:7 B:32	
Lattice Degeneration(+/-)	91/12	32/7	0.784
Tamponade(SF6/C2F8/C3F8)	5/81/17	3/35/1	0.972

Incidence of retinal detachment

In the study, the rate of retinal re-detachment in the control group (28.2%) was significantly higher ($p=0.045$) compared to the 360° laser group (12.6%) (Table 2). This suggests that the use of prophylactic 360° intraoperative laser leads to a reduction in the incidence of retinal re-detachment in patients treated with PPV for RRD. The results demonstrate that prophylactic 360° intraoperative laser is an effective method for reducing the risk of retinal re-detachment in patients with RRD.

Other complications

The results of the study showed that there was a significant reduction in the rate of retinal

redetachment in the 360° laser group compared to the control group. However, the proportions of ERM, macular hole, cystoid macular edema, and vitreous hemorrhage did not show a statistically significant difference between the two groups. The postoperative ERM occurred in 6.8% of the eyes from the 360° laser group and 5% from the control group, and there was no statistically significant difference between the groups. No patient developed a macular hole, and the incidence of CME and vitreous hemorrhage was low and comparable in both groups. Overall, the results indicate that the prophylactic 360° laser did not increase the risk of postoperative ERM or other complications in RRD cases.

Table 2: Complications

	Retinal Detachment		P
	360° Laser Group Total n=103	Control Group Total n=39	
Retinal Re-Detachment	13(12.6%)	11(28.2%)	0.092
New breaks (Peripheral / Posterior)	3/0	5/1	
Opening of older breaks	4	2	
PVR	6	3	
Epiretinal Membrane	7(6.8%)	2(5%)	0.230
Macular Hole	0 (0%)	0 (0%)	0.274
Cystoid Macular Edema	1(1%)	1(2.5%)	0.669
Vitreous Hemorrhage	1(1%)	0(0%)	0.885

Visual acuity

Between the 360° laser group and the control group. Both groups showed a similar level of improvement in visual acuity after surgery (log MAR; the 360° laser group: 0.10 ± 0.25 compared to the control group: 0.06 ± 0.28 , $P = 0.193$) (Table 3).

Table 3 Visual acuity

	Retinal Detachment		P
	360° Laser Group	Control Group	
Preoperative VA	20/86	20/75	
(Log Mar)	0.61 ± 0.84	0.58 ± 0.90	0.688
Postoperative VA	20/28	20/24	
(Log Mar)	0.10 ± 0.25	0.06 ± 0.28	0.193

DISCUSSION

Vitreoretinal traction caused by vitreous adhesion is a significant element in the occurrence of RRD, as it can form retinal breaks and create a tractional force that allows vitreous fluid to enter the subretinal space^[4,5]. Therefore, surgical interventions such as PPV (pars plana vitrectomy), scleral buckling (SB), or a combination of these techniques are typically performed to relieve vitreoretinal traction, seal retinal breaks, and drain subretinal fluid.^[6] Scleral buckling is an effective technique for relieving vitreous traction, as it indents the eye wall and enhances proximity between the retinal pigment epithelium and detached retina by displacing subretinal fluid and closing retinal breaks.^[7,8] However, there are postoperative complications

associated with scleral buckling that may lead some surgeons to choose PPV over SB (refractive changes, globe ischemia, buckle extrusion, strabismus, and diplopia, serous choroidal detachment)^[9,10] On the other hand, the PPV technique also has limitations, including difficulties in overcoming vitreoretinal tractional forces at the vitreous base, particularly in phakic patients which limits access to the peripheral vitreous. Shaving the peripheral vitreous is a controversial issue, with some surgeons recommending it and others suggesting that it is not necessary for success.^[11,12] Proliferative vitreoretinopathy, locating all retinal breaks failure, and occurrence of new breaks secondary to vitreous base traction forces are important causes of retinal detachment recurrence.

Peripheral retinopexy is proposed as a solution to these issues by creating a "second" ora serrata, but the effectiveness of 360° prophylactic laser retinopexy in patients with RRD remains a topic of controversy. [11,13]

Performing 360° endo laser as an extra procedure during PPV for RRD treatment has not been extensively studied. Some reports exist about its use for reducing the retinal detachment rate, but these are mostly related to the treatment of macular diseases [14, 15, 16], or before silicon oil removal [17]. However, there are not many studies about the efficiency of 360 laser in PPV for RRD.

In terms of demographics, initial retinal detachment characteristics, and clinical data, there were no significant differences between the two groups.

This study is a retrospective cohort study of 142 cases of RRD treated with primary PPV. The baseline demographic data, including age, sex, duration of symptoms, and lens and refractive status, was not significantly different between the 360° laser group and the control group. Both groups were well-balanced regarding the retinal detachment characteristics

The results of the study showed that the rate of re-detachment in the total population was 16%. This falls within the range reported in the current literature (4 to 20%). [18,19]. The rate of re-detachment in the 360° laser group was 12.6%, while it was 28.2% in the control group. The use of 360° laser as an extra procedure was associated with a 55% decrease in the odds of recurrent RD compared to focal retinopexy.

Previous studies have shown the use of 360° laser photocoagulation in patients undergoing vitrectomy

for macular or vitreal diseases, such as epiretinal membrane (ERM) and macular hole (MH). These studies have shown a reduction in the incidence of retinal detachment, with Koh et al. reporting a three-fold reduction in incidence, from 13.3% to 3.5%, in a case series of 220 patients undergoing PPV. Yang et al. showed a significant reduction in the re-detachment rate in the 360° laser group, from 2.6% to 0%, in a cohort of 618 patients undergoing PPV for a non-RD indication [16]. However, a study by Garg et al. found no advantage for RRD prevention in a 176 patients cohort undergoing 360° laser. [20].

The study by Iwase about prophylactic 360° laser after phaco vitrectomy in patients with macular holes (MH) and retinal detachment (RD) [15], compared this modality to focal retinopexy. In the cohort of patients with MH, the 360° ILR group showed a significant decrease in the rate of detachment at 12 months (0% vs. 5.7%). However, no statistically significant decrease in the rate of re-detachment was noted in RD's cases.

Another study by Bilgin et al., (prospective randomized) included 50 patients with RD. 25 in the experimental group (360° laser), and 25 in the control group. [1] The rate of re-detachment was 4% in the exp group compared to 12% in the control group, but the results were not statistically significant. The incidence of Epiretinal membrane was 16% in both groups.

In a similar way, Barrada et al. studied 80 patients with RD treated with primary PPV. The re-detachment rate decreased from 32.5% to 25% with the use of a prophylactic 360° laser, but the results were not statistically significant [21]. It is important to note that retinal detachment characteristics in these studies may differ from the current study, such as the presence of macula ON detachments and the duration of symptoms/detachment.

Previous studies have shown that 360° laser as an additional procedure after silicone oil removal, has been associated with a reduction in the rate of retinal re-detachment. (58% in Avitabile et al's clinical trial) [17].

The incidence of ERM formation after 360° laser retinopexy was reported in the study by Chaturvedi et al. as 3.2%, suggesting that the procedure may increase the risk of ERM formation^[22,23]. However, the results of our study did not show a significant increase in ERM formation after 360° ILR, with an incidence of 6.8% in the laser group and 5% in the control group. This is in accordance with the current papers on post RD surgery ERM formation, as reported by Katira et al. which showed an incidence of 12.8% in eyes undergoing PPV for retinal detachment with laser or cryo [11].

The limitations of the study are:

- The groups are different in the number of macula off cases and the number of pseudophakic patients, which could add up to the differences between the groups.
 - The sample size was not large enough to analyze additional co-factors in a multivariate regression model.
 - The study did not control for all baseline and intra-operative characteristics, which could affect the results.

CONCLUSION

In summary, the study suggests that prophylactic 360° intraoperative laser during primary PPV for RRD can lead to an important decrease in post-operative re-detachment rate and does not enhance the ERM formation risk . The results suggest the performing of 360° laser in patients with RRD treated with PPV

and call for a larger randomized controlled trial to further confirm these findings.

Conflict of Interest: None

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