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PROPHYLACTIC LASER TREATMENT TO DECREASE THE INCIDENCE OF RETINAL DETACHMENT IN FELLOW EYES OF IDIOPATHIC GIANT RETINAL TEARS

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Purpose: To evaluate the effectiveness of prophylactic 360° laser treatment in the fellow eye of patients with unilateral idiopathic giant retinal tear (GRT) to prevent the occurrence of a (macula-off) retinal detachment.

Methods: We conducted a retrospective, nonrandomized case–control study. Clinical data of consecutive patients, undergoing surgery for idiopathic GRT, between 2003 and 2015 were analyzed. The data collected included GRT, retinal detachment, and RTs in the fellow eye.

Results: We included 129 patients who underwent surgery for an idiopathic GRT, with a mean follow-up period of 107 months. In the observation group, a retinal detachment developed in the fellow eye in 22/51 patients (43.1%), leading to a macula-off detachment in 9/51 patients (17.6%). By contrast, in the prophylactic 360° laser group, only 10/78 (12.8%) patients developed a retinal detachment, leading to a macula-off detachment in 1/78 patient (1.3%). This difference was statistically significant.

Conclusion: This study suggests that prophylactic 360° laser treatment in the fellow eye of patients with an idiopathic GRT decreased the incidence of retinal detachment, lowering the high risk of visual loss due to a macula-off retinal detachment.

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Giant retinal tear (GRT) is a full-thickness retinal break extending over 90° or more of the retinal circumference, posterior to the ora serrata in the presence of a posteriorly detached vitreous. The estimated incidence of GRT is 0.094 to 0.114 cases per 100,000 annually in the general U.K. population.[1] Giant retinal tears were mostly idiopathic (55%), affected middle-aged male patients (72%), and had a presenting vision worse than 20/40 in 60% of the cases with 54% achieving final vision worse than 20/40.[1–3]

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The fellow eye of patients with an idiopathic GRT has an increased risk for the development of a GRT and a retinal detachment (RD). Freeman and Soon Ang reported the natural history of fellow eyes and reported a 13% incidence of GRT and 36% incidence of a RD.[1,4] These incidences represent a high risk of visual loss due to an RD in fellow eyes.

This provides a strong argument in favor of 360° prophylactic interventions in fellow eyes of patients who have had a GRT. There is currently no consensus on the need of prophylactic treatment, type of treatment, and location of treatment.[5] The purpose of this study is to further investigate the hypothesis that prophylactic 360° laser treatment (PLT) in the fellow eye of patients with unilateral idiopathic GRT reduces the occurrence rate of an RD.

Methods

We performed a retrospective, nonrandomized case–control study. Clinical data of consecutive

patients, undergoing surgery for idiopathic GRT between 2003 and 2015, were analyzed. Giant retinal tear was defined as a full-thickness retinal break extending for 90 or more degrees of the retinal circumference posterior to the ora serrata. The PLT consisted of 3 to 4 rows of 360° argon laser 200 μm to 400 μm in diameter anterior of the equator, posterior to the presumed vitreous base, until a light gray intensity burn was achieved. The data collected included age, sex, refraction, size of RT, macula-on or macula-off, visual acuity in Snellen, surgeon, surgical procedure, recurrence of detachment, time from diagnosis till prophylactic treatment, GRT in fellow eye, RD in fellow eye, RT in fellow eye, time from diagnosis till retinal event in fellow eye, epiretinal membrane formation, uveitis, and cystoid macular edema. In the absence of a strict institutional protocol, scheduling prophylactic treatment was dependent on the surgeon's preferred practice, but also by the choices of consultants, fellows or residents involved in follow-up.

We excluded patients with a history of trauma, Stickler syndrome or other diagnosis of hereditary syndromes, age at surgery less than 18 years, history of previous retinal surgery (including prophylactic scleral buckle or laser) of first or fellow eye, bilateral presentation of GRT, or a follow-up of less than 3 years.

Patients who had been referred back to their referring ophthalmologist at any time or patients whose last visit to the Rotterdam Eye Hospital was before January 1, 2018, were contacted by telephone in June 2018 to elucidate whether they had undergone laser treatment or RD surgery in either eye in another institution.

Statistical analysis was performed using GraphPad Prism software (GraphPad Software, Inc, La Jolla, CA). Statistical significance ($P < 0.05$) was identified using a chi-square test.

This study was conducted in accordance with the principles of the Declaration of Helsinki (October, 2013), the guideline for Good Clinical Practice (CPMP/ICH/135/95).

Results

We included 135 patients who underwent surgery for GRT between 2003 and 2015. Fifty-seven patients received no prophylactic treatment (observation group), and 78 patients received PLT. Thirty-four patients had visited the Rotterdam Eye Hospital at regular intervals up to 2018 and 97 patients who had not were contacted by telephone, of which four patients were lost to follow-up. Two patients were excluded because the GRT was associated to Stickler syndrome. Table 1 shows no significant difference in high myopia, clock hours GRT, (macula-off) RD, or other baseline characteristics of patients presenting with a GRT in the first eye between the groups. Patients with GRT were predominantly men (77%), on average 52 years, and 23% had high myopia, a refractive error of −6 diopter or more. Follow-up was on average 107 ± 43 (36–186) months. In the observation group, an RD developed in 22/51 (43.1%) patients in the fellow eye, leading to a macula-off detachment in 9/51 (17.6%) patients. In 12/51 (23.5%) patients, the RD was due to a GRT and in 10/51 (19.6%) patients due to a smaller-sized RT (Table 2). By contrast, in the PLT group, only 10/78 (12.8%) patients developed an RD, in three patients stopping at the laser barrage and in only one patient (1.3%) leading to a macula-off detachment. This difference was statistically significant ($P < 0.001$). Smaller-sized RTs without RD developed in the observation group in 4/51 (7.8%) patients and in the PLT group in 6/78 (7.7%) patients, in 2 patients posterior to the laser barrage. Time between diagnosis of a GRT and PLT of the fellow eye was on average 3.8 ± 4.9 (0–18) months. Allocation of prophylactic treatment seemed to be poorly correlated with the surgeon's preferred practice (see **Table 1, Supplemental Digital Content 1**, http://links.lww.com/IAE/A983).

Time from diagnosis to the development of a retinal event in the observation group was on average 39 ± 33 (4–113) months; in the PLT group, this was on average 40 ± 42 (5–147) months, and time from PLT to a retinal event was 34 ± 43 (0–143) months.

In the PLT group, one patient developed an RT within 4 days of laser treatment. Two patients developed an epiretinal membrane, leading to a vitrectomy 15 months and 31 months after the PLT. No patients developed clinically diagnosed uveitis or cystoid macular edema.

Discussion

This study suggests that prophylactic 360° laser treatment decreased the incidence of RDs due to GRTs and smaller RTs, and therefore lowering the high risk of visual loss due to a macula-off RD in fellow eyes. Our data showed, over a mean follow-up period of 107 months, that an RD developed in the fellow eye in the PLT group in 10/78 (12.8%) patients, leading to a macula-off detachment in only 1/78 patient. In stark contrast, in the observation group, 22/51 (43.1%) patients developed an RD, leading to a macula-off detachment in 9/51 patients.

Table 1. Demographics and Background Characteristics

Variable	No Treatment	PLT	*P*-value
Mean age at surgery ± SD (range)	51.9 ± 9.6 (20–74)	52.5 ± 9.9 (26–80)	ns
Total patients	51	78	ns
Male	38	61	
Female	13	17	
Spherical refraction ± SD (range)	−2.3 ± 4.2 (−12 to +1)	−2.1 ± 4.2 (−16 to +3)	ns
High myopia, −6D or more	13/51	16/78	ns
GRT, clock hours ± SD (range)	4.0 ± 1.0 (3–6)	4.0 ± 1.2 (3–7)	ns
RD, quadrants	2.4 ± 0.7 (1–4)	2.3 ± 0.8 (0–4)	ns
Macula-off detachment	19/51	38/78	ns
Baseline visual acuity (BCVA ± SD)	20/80; 0.26 ± 0.35	20/80; 0.23 ± 0.28	ns
Follow-up in months ± SD (range)	103 ± 43 (38–181)	110 ± 44 (36–186)	ns

SD, standard deviation; NS, not significant; D, dioptre; PLT, prophylactic 360-degree laser; GRT, giant retinal tear. RD, retinal detachment BCVA, best corrected visual acuity in Snellen.

Ripandelli et al[6] reported, over a mean follow-up period of 40 months, that in the PLT group, 13/98 (13.3%) patients developed an RD, not leading to a macula-off detachment. In the observation group, 11/62 (17.8%) patients developed an RD, leading to a macula-off detachment in 9/11 patients. Similarly to our study, Ripandelli et al[6] found in the PLT group more preequatorial RDs not leading to a macula-off detachment, suggesting that the PLT prevents a localized RD to progress to a macula-off detachment. In the observation group, we found an RD in 24/51 patients (47.1%), compared with 11/62 (17.8%) patients in the study of Ripandelli et al.[6] Our higher percentage of RDs might be explained by our longer follow-up, 107 months versus 40 months. Furthermore, we observed that an RD developed on average at 39 months.

The advantage of 360-degree laser is that it can be performed as an outpatient procedure, preferably in two sessions reducing discomfort and potential side effects. However, prophylactic interventions may not be without adverse events, such as possibly epiretinal membrane formation, iatrogenic tears, uveitis and cystoid macular edema.[7] Although the formation of an epiretinal membrane after prophylactic interventions has been discussed extensively, there is no convincing evidence yet that it is not primarily related to the treated vitreoretinal disorder.[8] Also, epiretinal membranes are relatively common among the aged population, with a prevalence of 1.4–16.1%.[9] In the prophylactic 360-degree laser treatment group three patients developed an epiretinal membrane (3.8%), leading to a vitrectomy in two patients, and one patient developed a RT within 4 days. By contrast, Ripandelli

Table 2. Retinal Events in Fellow Eyes During Follow-up

Variable	Observation	PLT	*P*-value
Time (months) to PLT ± SD (range)		3.8 ± 4.9 (0–18)	
Time (months) from diagnosis to retinal event ± SD (range)	38 ± 34 (8–113)	40 ± 43 (0–143)	ns
Time (months) from PLT to retinal event ± SD (range)		34 ± 42 (5–147)	
RD due to GRT	12/51 (23.5%)	2/78 (2.6%)	<0.001
Leading to macula-off detachment	5/51 (9.8%)	0/78 (0.0%)	<0.01
RD due to smaller RT	10/51 (19.6%)	8/78 (10.5%)	<0.001 ns
Leading to macula-off detachment	4/51 (7.8%)	1/78 (1.3%)	ns
RD due to GRT and smaller RT combined	22/51 (43.1%)	10/78 (12.8%)	<0.001
Leading to macula-off detachment	9/51 (17.6%)	1/78 (1.3%)	<0.001
Smaller RT, without RD	4/51 (7.8%)	6/78 (7.7%)	ns
All retinal events combined	26/51 (51.0%)	16/78 (20.5%)	<0.001

PLT, prophylactic 360-degree laser; NS, not significant; SD, standard deviation; GRT, giant retinal tear; RD, retinal detachment; RT, retinal tear.

et al[6] reported no epiretinal membrane formation in 98 patients. Although we do not know whether these events were related to the PLT, as they were 15 months and 31 months after PLT, we did not observe these events in the observation group. Follow-up in all cases of patients having PLT is paramount. Nonetheless, in our opinion, the visual consequences of these complications of PLT compare favorably with the incidence and morbidity of RD in the observation group.

Drawbacks of our study are its retrospective nature, the lack of randomization, and the inability to follow-up all patients in our institution. In a retrospective study the composition of the treated and control group are of major concern. One of the best situations would be that different surgeons would have fixed different treatment protocols while they treat the same case-mix of patients. If such a situation is not present, unequal distribution among groups is likely to occur due to bias by diagnosis: i.e. the vitreoretinal surgeons and other doctors involved in postoperative care might not schedule prophylactic treatment when a posterior vitreous detachment is observed, whereas patients with lesions like lattice, traction and white without pressure would be scheduled for PLT. This would typically lead to a treatment group with patients with more potential risk factors, masking a potential treatment effect. It turned out to be different in our Institution: two vitreoretinal surgeons, who treated over 70 patients, professed to schedule all GRT patients for PLT, but now learned that through a variety of logistical reasons treatment had not taken place, suggesting that logistic and organisational factors rather than bias by diagnosis prevented PLT. This assumption is more likely as the groups were found to be comparable in recorded risk factors in treatment.

Although not all follow-up data were recorded in our own Institution, telephonic consultation confirmed that the referral pattern for vitreoretinal events had not changed and that patient follow-up data are likely to be complete.

Strong points of our study are that it concerns a consecutive and large series of patients, a lengthy follow-up, and that the risk characteristics of patients presenting with a GRT in the first eye between the observation group and prophylactic treatment group were equal.

It is well established that the fellow eye of patients with GRT has an increased risk of GRT and RD, and that a GRT and/or an RD represent a high risk of visual loss. Our data, and others, show that a GRT and an RD in the fellow eye occurred statistically and clinically significantly less frequently after prophylactic 360° laser treatment than in the observation group.[6] We therefore would advocate a prophylactic 360° laser treatment in fellow eyes of patients with an idiopathic GRT.

Key words: giant retinal tear, laser, prophylactic treatment, retinal detachment, retinal tear.

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