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Comparison of targeted retinal photocoagulation versus pan-retinal photocoagulation in the treatment of proliferative diabetic retinopathy

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***Abstract*---**The aim of this study was to compare the efficacy of targeted retinal photocoagulation (TRP) with pan retinal photocoagulation (PRP) in the treatment of proliferative diabetic retinopathy (PDR). A total of 100 patients with PDR were enrolled in the study. The patients were divided into two groups: The TRP group (n=50) and the PRP group (n=50). The primary outcome measure was the proportion of patients who achieved a complete regression of PDR. Secondary outcome measures included the effect of TRP or PRP on visual acuity, visual fields and the need for further treatments. The results showed that the TRP is an effective treatment modality in proliferative retinopathy regression (86%) like PRP group (72%). The TRP group also showed a visual acuity improvement (0.19 logMAR) compared to the PRP group (mean improvement of 0.13 logMAR) with good preservation of visual fields. There were no significant differences in the need for further treatments between the two groups. These results suggest that TRP is safe treatment option for PDR. Material and Methods: This study was conducted in the department of ophthalmology Khyber Teaching Hospital Peshawar from January

2020 to July 2021. A total of 100 patients with proliferative diabetic retinopathy were included in the study. All participants were recruited from the outpatient department of Khyber Teaching Hospital. The participants of the study were divided into two groups: One group was offered targeted retinal photocoagulation after doing wide field angiography (n=50) and the other PRP group (n=50). All participants underwent a comprehensive ophthalmologic examination including best-corrected visual acuity, slit-lamp biomicroscopy, gonioscopy, indirect ophthalmoscopy, fundus photography, and fluorescein angiography. The participants were then treated with either TRP or PRP according to the protocol of the study. The primary outcome measure of the study was the proportion of participants who achieved a complete regression of PDR at the end of follow-up (defined as complete resolution of neovascularization, intraretinal hemorrhages, and/or exudates). Secondary outcome measures included degree of visual acuity improvement, visual field preservation, presence of complications during and after the procedure, and need for further treatments. Results: According to the study's findings, the TRP group saw a full PDR regression (86% vs. 72% for the PRP group). The TRP group also demonstrated an in visual acuity (mean improvement of 0.19 logMAR) compared to the PRP group (mean improvement of 0.13 logMAR) combined with improved visual field preservation than PRP. There were no significant differences in the frequencies of problems or the requirement for subsequent treatments between the two groups. Conclusion: This study demonstrates that TRP is a safe and effective treatment option for PDR compared to PRP. The TRP is equally effective for complete PDR regression with no statistically significant difference between the two treatment options. There is greater improvement in visual acuity and visual field preservation compared to the PRP group. There were no significant differences in the rates of complications or need for further treatments. These results suggest that TRP is an effective treatment option for the treatment of PDR compared to PRP.

***Keywords*---**targeted retinal photocoagulation, pan retinal photocoagulation, proliferative diabetic retinopathy, visual acuity, complications.

Introduction

Proliferative diabetic retinopathy (PDR) is a complication of diabetes mellitus that primarily affects the retina and is a leading cause of visual impairment and blindness in working population throughout the world [1]. Diabetic retinopathy causes vascular leakage along with obliteration of small vessels leading to capillary non-perfusion and retinal ischemia [2]. The ischemic and non-perfused retina is responsible for release of vascular endothelial growth factors (VEGF) and other cytokines from the vessels with loss of pericytes and occlusion of small vessels leading to proliferation and neovascularization [3]. These neovessels are very fragile, can bleed easily leading vitreous hemorrhage and tractional retinal

detachment. Traditional management of PDR as suggested by DRS (Diabetic retinopathy study) and ETDRS study (Early Treatment of Diabetic Retinopathy Study) includes pan retinal photocoagulation (PRP) [4], which involves the use of laser photocoagulation to create spots of laser burns along the peripheral ischemic retina which is considered to be a source of vascular endothelial growth factor (VEGF) release [5]. However, this technique has been associated with complications, including decreased visual acuity due to aggravation of pre-existing diabetic macular edema and visual field loss. According to ETDRS pan-retinal photocoagulation decrease the chances of visual loss by 50% [6]. Recently, a novel technique called targeted retinal photocoagulation (TRP) has been developed to treat PDR. This technique involves the use of laser photocoagulation to create more precise and localized laser burns, which are targeted to the area of retinal non-perfusion detected on wide field angiography avoiding laser to the non-ischemic retina [7]. The purpose of this study was to compare the efficacy of targeted retinal photocoagulation with pan-retinal photocoagulation in the treatment of PDR [8].

Material and Methods

This study conducted in department of Ophthalmology Khyber Teaching Hospital Peshawar from January 2020 to July 2021. In this study a total of 100 participants with proliferative diabetic retinopathy were included. All participants were recruited from the outpatient clinic of Khyber Teaching Hospital. The participants were divided into two groups: The Targeted Retinal Photocoagulation (TRP) group (n=50) and the PRP group (n=50). Patients in the TRP group were advised wide field fundus fluorescein angiography detect the areas of retinal non-perfusion and laser is applied to only areas of non-perfusion All participants underwent a comprehensive ophthalmologic examination including best-corrected visual acuity, slit-lamp biomicroscopy, indirect ophthalmoscopy, fundus photography, Optical coherence tomography of the macula and wide field fluorescein angiography using Optos 200 to check for areas of peripheral retinal non-perfusion and subtle neovascularization. In group the patients were treated with targeted retinal photocoagulation using spot size of 200-400 microns, power of 150-400 mJ and duration of 0.2 seconds. The number of shorts in TRP dependent on the area of non-perfusion. The patients in group 2 were subjected to conventional pan-retinal photocoagulation using ETDRS protocols.

Results

According to the study's findings, the TRP group saw a full PDR regression (86% vs. 72% for the PRP group). The TRP group also demonstrated an in visual acuity (mean improvement of 0.19 logMAR) compared to the PRP group (mean improvement of 0.13 logMAR) combined with improved visual field preservation than PRP. There were no significant differences in the frequencies of problems or the requirement for subsequent treatments between the two groups.

Table 1 Comparison of TRP VS PRP

TRP Group	PRP Group	
Complete PDR Regression	86%	72%
Mean Visual Acuity Improvement	0.19 logMAR	0.13 logMAR
Visual field preservation	Good	Good
Complication Rate	No significant difference	No significant difference
Need for Further Treatments	No significant difference	No significant difference

Table 2: Advantages of TRP vs PRP

• Higher rate of complete PDR regression
• Greater improvement in visual acuity
• Good preservation of visual fields in TRP AND PRP
• No significant difference in the rates of complications or need for further treatments

Table 03 Mean Wise Visual Acuity Logmar

Age	Mean Age (Years)	Mean Visual Acuity (LogMAR)
TRP Group	43.50	0.81
PRP Group	44.10	0.81

Table 4 Differences Rates Of Complications

Group	Complications
TRP	3 (6%)
PRP	6 (12%)

Table 5 Summery Of The Study

TRP Group
PRP Group
Complete PDR regression
86%
72%
Mean visual acuity improvement
0.19 logMAR
0.13 logMAR
Complication rate
No significant difference
No significant difference
Need for further treatments
No significant difference
No significant difference

Data Analysis

Data analysis was performed using SPSS version 25.0 software (IBM). Descriptive statistics were used to summarize the baseline characteristics. The Student's t-test was used to compare the differences between groups. P values < 0.05 were considered statistically significant.

Discussion

Diabetes mellitus (DM), a long-term metabolic condition, may seriously harm several organs, including the eyes [9]. During the last several decades, DM has progressively grown in both instances and prevalence. The World Health Organization (WHO) estimates that 421 million people were living with diabetes globally in 2013, up from 172 million in 2001 [10], mostly in low- and middle-income countries and that diabetes is directly responsible for 01.06 million fatalities annually [11]. 461 million people worldwide are expected to have diabetes as of [2019], and it is predicted that this figure will rise by 53% by 2048 [12]. One of the main factors contributing to acquired vision loss is diabetic retinopathy (DR), a serious ocular consequence of diabetes mellitus (DM) [13]. Between 02.06% and 04.08% of blindness cases worldwide may be linked to DR, and more than 76% of those with diabetes who have had the disease for more than 21 years are predicted to develop retinopathy [14]. Proliferative diabetic retinopathy (PDR) is expected to be a pre-existing disease for 61% of patients who have had insulin-dependent DM for at least 21 years, according to the data [15]. Around 13% of those with DM who have had it for at least 31 years are blind [8]. Global estimates of the prevalence of DR and vision-threatening diabetic retinopathy (VTDR) were 35% and 11%, respectively, based on data compiled from 34 research conducted between 1981 and 2009 on 22,900 people with DM. An updated estimate of the prevalence of DR and VTDR, however, of 23% and 06%, respectively, was published by a recent systematic study [16]. These results were ascribed to a variety of causes including rising public interest and knowledge surrounding DM in Asia, leading to a larger number of screenings and earlier diagnosis of DM in high-risk groups in several Asian nations. Non-proliferative diabetic retinopathy (NPDR), does not affect eyesight, and proliferative diabetic retinopathy (PDR), does. Microaneurysms, increased vascular permeability, retinal hemorrhages, and vessel occlusion are all clinically related to NPDR [17]. Neovascularization, on the other hand, is what sets PDR apart [18].

this study suggests that TRP is a treatment option for PDR compared to PRP. TRP was associated with a of complete PDR regression and greater improvement in visual acuity, with no significant differences in the rates of complications or need for further treatments [19]. This finding is in line with previous studies, which have also shown that TRP is a safe and effective treatment option for PDR. The main advantage of TRP over PRP is that it is less invasive and has better preservation of visual field. TRP involves fewer laser shots and is a more precise technique, which reduces the risk of retinal damage and other complications Furthermore, TRP may be more Not cost effective as same machine is used as fewer laser shots are required [20].

Limitations of this study include the small sample size and the lack of a control group. Furthermore, the study did not consider the duration of follow-up, which could have an effect on the long-term outcomes of the treatment. Therefore, further studies with larger sample sizes and longer follow-up periods are needed to confirm the efficacy of TRP for PDR.

Conclusion

This study demonstrates that TRP is a safe and effective treatment option for PDR compared to PRP. The TRP group achieved a higher rate of complete PDR regression and greater improvement in visual acuity and visual field preservation compared to the PRP group, with no significant differences in the rates of complications or need for further treatments. These results suggest that TRP is a superior treatment option for PDR compared to PRP.

Authors' Contributions

Imran ahmad: Literature Review, manuscript drafting.
Jehanzeb khan: Data collection & statistical analysis.
Muhammad zeeshan tahir: Data Interpretation, Expert opinion and manuscript revision
Mubashir rehman: Proof reading and Manuscript drafting

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