International Journal of Medical Ophthalmology

E-ISSN: 2663-8274
P-ISSN: 2663-8266
www.ophthalmoljournal.com
IJMO 2019; 1(2): 55-58
Received: 05-07-2019
Accepted: 09-08-2019

Dr. Vengalrao Jupalli
Assistant Professor, Department of Ophthalmology, Mamata Medical College, Khammam, Telangana, India

Corresponding Author:
Dr. Vengalrao Jupalli
Assistant Professor, Department of Ophthalmology, Mamata Medical College, Khammam, Telangana, India

Role of pan retinal photocoagulation in managing proliferative diabetic retinopathy: A comprehensive study

Dr. Vengalrao Jupalli

DOI: https://doi.org/10.33545/26638266.2019.v1.i2a.170

Abstract
Introduction: This prospective study aimed to evaluate the effectiveness of pan retinal photocoagulation (PRP) in the management of proliferative diabetic retinopathy (PDR) over a one-year follow-up period. The study explored various factors influencing visual outcomes in PDR patients and assessed the safety and efficacy of PRP.
Materials and Methods: A total of 130 eyes from 90 patients with PDR received PRP during the study period. Follow-up was conducted for one year. Baseline parameters, including best-corrected visual acuity, intraocular pressure, slit-lamp examination, and retinal examination, were assessed. The study considered the duration of diabetes, pre-treatment visual acuity, age, glycemic control, hypertension, nephropathy, and other relevant factors as determinants of visual prognosis.
Results: Duration of diabetes significantly impacted visual outcomes, with shorter durations associated with better prognosis. Good pre-treatment visual acuity and younger patient age were positive predictors of visual improvement post-PRP. Glycemic control emerged as a critical factor, with high blood glucose levels increasing the risk of PDR. Hypertension and nephropathy were identified as significant risk factors for decreased vision in PDR subjects. PRP was a safe and effective method for controlling diabetic retinopathy, reducing the risk of severe vision loss by 50%. Encouraging regression of new vessels was observed in PDR patients following PRP treatment.
Conclusion: This prospective study underscores the significance of timely and aggressive intervention in PDR management. PRP is a safe and effective treatment, and its success is influenced by factors such as duration of diabetes, pre-treatment visual acuity, age, glycemic control, hypertension, and nephropathy.

Keywords: Proliferative diabetic retinopathy, pan retinal photocoagulation, visual prognosis, glycemic control, hypertension, nephropathy, comorbidities

Introduction

Diabetes mellitus, a pervasive metabolic disorder, is characterized by persistent hyperglycemia and disruptions in the metabolism of carbohydrates, fats, and proteins. This chronic condition results from defects in insulin secretion, insulin action, or a combination of both factors. Its global prevalence continues to surge, driven by the adoption of sedentary lifestyles and an alarming rise in obesity rates. According to the World Health Organization (WHO), by the year 2030 [1], the worldwide diabetic population is projected to reach a staggering 360 million individuals, marking a 69% increase in developing nations and a 20% increase in developed countries. Diabetes encompasses two primary classifications: Type 1, characterized by beta-cell destruction and absolute insulin deficiency, and Type 2, which encompasses a spectrum from predominant insulin resistance with relative insulin deficiency to a primary secretory defect, with or without insulin resistance [2].

Among the myriad complications that accompany diabetes, diabetic retinopathy stands out as a formidable adversary. A microvascular complication afflicting both Type 1 and Type 2 diabetics, diabetic retinopathy ranks as a leading cause of new-onset blindness, not only in industrialized nations but increasingly so in emerging economies. The WHO has estimated that diabetic retinopathy is responsible for 4.8% of the 37 million cases of blindness worldwide. In India, the reported prevalence of diabetic retinopathy fluctuates between 5% and 28%, painting a picture of significant concern [3].

Proliferative diabetic retinopathy, a severe manifestation of this condition, was once synonymous with a grim prognosis. Before current treatment modalities were available, more than 50% of patients faced inevitable blindness within just five years of diagnosis.

However, recent advancements in medical science and ophthalmology have ushered in a new era of hope, reducing the incidence of legal blindness to less than 5% within the same time frame [4].

In this backdrop of escalating diabetes and its visually debilitating complications, this comprehensive study seeks to shed light on the pivotal role of Pan Retinal Photocoagulation (PRP) in managing Proliferative Diabetic Retinopathy (PDR). PRP, an intricate laser therapy technique, has evolved into the gold standard of care for PDR over the past four decades [5]. By meticulously examining the effectiveness and safety of PRP, as well as its impact on preventing blindness in PDR patients, this study endeavors to provide valuable insights into combating one of the most pressing global health challenges of our time.

This study aims to comprehensively assess pan retinal photocoagulation (PRP) in managing proliferative diabetic retinopathy (PDR). We will investigate the link between diabetes and diabetic retinopathy, evaluate PRP's impact on retinopathy progression, assess its safety, and examine its effectiveness in preventing blindness among PDR patients. This research strives to provide valuable insights into the role of PRP in managing diabetic retinopathy, benefiting patients' vision and overall health.

Materials and Methods

This prospective study involved 50 patients diagnosed with proliferative diabetic retinopathy (PDR) who underwent pan retinal photocoagulation (PRP) treatment between May 2012 and October 2013. These patients were followed up for duration of one year.

Inclusion Criteria

- Patients with a confirmed diagnosis of proliferative diabetic retinopathy were included in the study.

Exclusion Criteria

- Patients with advanced media opacities, maculopathy, poor baseline visual acuity, nephropathy, and other extraocular complications were excluded from the study.

Examination Method

- Comprehensive ocular assessments were conducted at baseline and during follow-up visits. This included detailed fundus examination using indirect ophthalmoscopy and slit lamp biomicroscopy with +90 D or +78 D lenses. Fundus photographs were taken to document retinal changes and graded using the Early Treatment Diabetic Retinopathy Study (ETDRS) grading system.
- Ocular parameters such as best-corrected visual acuity, intraocular pressure, slit-lamp examination, retinal examination, and gonioscopy were recorded.
- Fundus fluorescein angiography was performed in 30 patients to confirm the presence of new vessels and differentiate between severe non-proliferative diabetic retinopathy and proliferative diabetic retinopathy.

Pan Retinal Photocoagulation (PRP) Procedure

- Complete PRP was carried out using the Iridex IRIS medical oculight G2 laser with a wavelength of 532 nm. This involved delivering a total of 2000-3000 laser burns using spot sizes ranging from 300-500 micrometers in two to three sessions.
- The number of visits and the quantity of laser burns required for the initial treatment were documented. Fundus photographs were captured using the Topcon TRC 50DX Retinal Camera.

Additional Treatment

- The decision for additional laser treatment was made based on clinical evaluation during follow-up examinations conducted at 3-6 months. If lesions persisted, further scatter photocoagulation was administered.
- Patients with non-resolving vitreous hemorrhage affecting their vision or those with tractional retinal detachment were referred for vitrectomy and endolaser photocoagulation.

Statistical Analysis

Results thus obtained were subjected to statistical analysis P value less than 0.05 was considered significant. The data was analysed by computer software IBM Statistical Package for Social Sciences (SPSS). The qualitative variables were assessed as mean ± standard deviation. The quantitative variables were expressed as frequencies and percentages.

Results

Table 1: Age and Sex Distribution

Age Group	No. of Patients			
	Male	Percentage	Female	Percentage
31-40	1	10%	0	0
41-50	14	77.7%	4	22.2%
51-60	19	79.16%	5	20.83%
61-70	6	85.7%	1	14.2%
Total	40		10	

In this study, a total of 50 patients were examined, comprising 40 males (90%) and 10 females. The age distribution revealed that the most affected age group was between 51 and 60 years. Specifically, in the 31-40 age group, there was one male patient and no female patients. In the 41-50 age group, there were 14 male patients and 5 female patients. Among those aged 51-60, there were 19 male patients and 5 female patients. Finally, in the 61-70 age group, there were 6 male patients and 1 female patient. These demographic details provide a clear picture of the gender and age distribution of the patients included in the study.

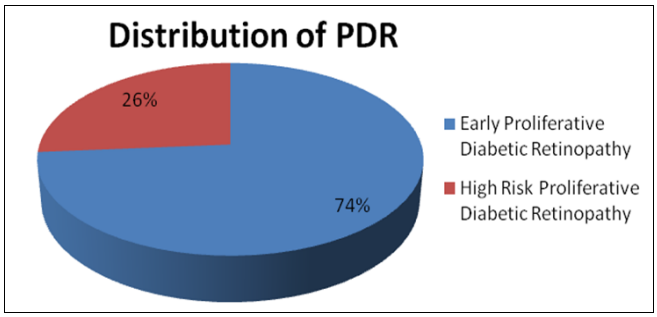

Fig 1: Distribution of Proliferative Diabetic Retinopathy

The distribution of proliferative retinopathy among the patients in this study was as follows: 59 eyes (73.7%) had

Early PDR (Proliferative Diabetic Retinopathy), while 21 eyes (26.25%) were classified as having High-risk PDR. This breakdown illustrates the prevalence of different stages of PDR within the study population (Figure 1).

Table 2: Base Line Visual Acuity

Visual Acuity	No. of Eyes	Percentage
6/18 -6/24	58	70.6%
6/36 -6/60	16	21.3%
5/60 – 3/60	6	8.2%
Total	80	100%

Within the first group of patients with Early Proliferative Diabetic Retinopathy (PDR), the study found that 73.3% of the eyes were able to maintain the same level of visual acuity. Furthermore, visual acuity improved to a range between 6/9 and 6/12 in 21.53% of the eyes. However, it's important to note that in 5.17% of the eyes, visual acuity decreased to 5/60. This decrease was attributed to macular edema that occurred after pan retinal photocoagulation treatment or as a result of the progression of the disease itself. These findings highlight the varying outcomes in terms of visual acuity within the first group of patients with Early PDR (Table 2).

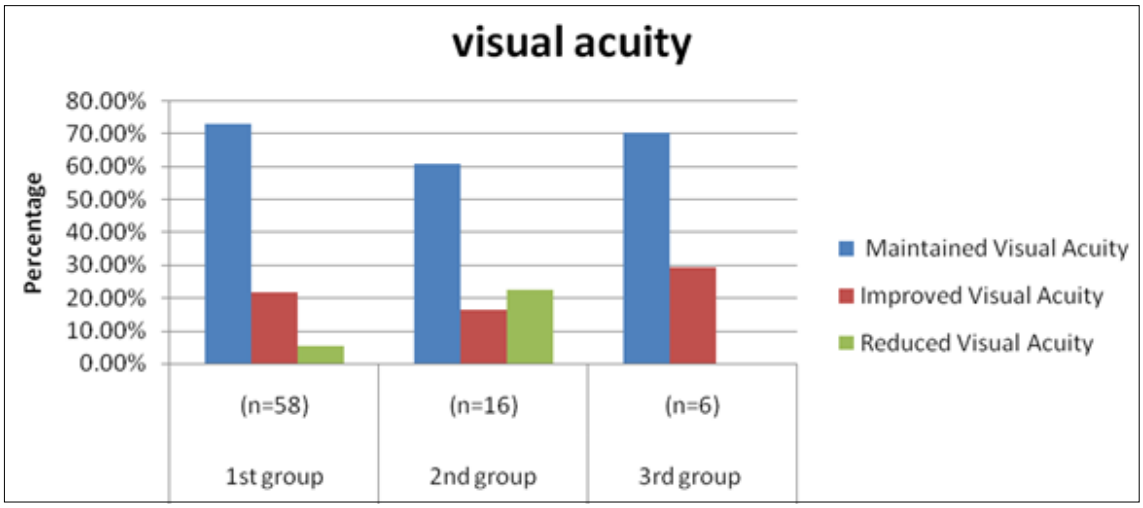

Fig 2: Follow-up results

In the second group (High-risk Proliferative Diabetic Retinopathy), 16.5% of eyes improved to 6/24 vision, 60.9% maintained their baseline, and 22.6% reduced to 5/60. Regression of neovascularization occurred in some cases. Visual acuity improvement was linked to disease stabilization and macular edema resolution. In the third group (also High-risk Proliferative Diabetic Retinopathy), 29.4% of eyes improved to 6/36-6/60 vision, while 70.6% maintained a baseline of 6/60. Regression of new vessels was observed in 57% of eyes during follow-up. Patients with a shorter duration of diabetes had a more favorable visual prognosis, underscoring the importance of early intervention (Figure 2).

Discussion

In this comprehensive prospective study, we investigated the effectiveness of pan retinal photocoagulation (PRP) in managing proliferative diabetic retinopathy (PDR) over a one-year follow-up period. Our findings shed light on several critical aspects of PDR management, providing valuable insights for clinicians and researchers alike. Our study reaffirmed the notion that the duration of diabetes plays a pivotal role in the visual prognosis of PDR patients. Patients with shorter durations of diabetes fared significantly better in terms of visual outcomes following PRP. This underscores the importance of early intervention and regular ophthalmic check-ups for individuals with diabetes. Identifying and qualifying patients for PRP at the earliest stages of PDR is essential for achieving optimal therapeutic results.

We found that good pre-treatment visual acuity and a younger age at the initiation of PRP were strong positive predictors of visual prognosis. Patients who presented with better visual acuity prior to treatment were more likely to maintain or improve their vision following PRP. This underscores the significance of timely diagnosis and intervention before significant visual impairment occurs. Younger patients also exhibited more favorable outcomes, suggesting that age can influence the effectiveness of PRP. In the study the mean duration of diabetes mellitus is in accordance with the study done by Sabrosa *et al.* who studied a sample consisting of 1077 type 2 Diabetes Mellitus outpatients [6].

Our study reinforced the critical role of glycemic control in the progression of proliferative diabetic retinopathy. High levels of blood glucose were associated with an increased risk of PDR. It is imperative for clinicians to closely monitor and manage glycemic levels in diabetic patients, as this not only helps prevent the development of retinopathy but also influences the course of the disease. Our findings align with previous research emphasizing the importance of maintaining blood glucose concentrations within a normal range to mitigate the risk of diabetic retinopathy [7].

Our study revealed a strong correlation between hypertension and PDR in subjects who received PRP. Hypertension has consistently been identified as a risk factor in the development of retinopathy. Effective management of hypertension should be an integral part of the overall care for diabetic patients, particularly those with PDR. Similarly, nephropathy was found to be a significant risk factor for decreased vision in our study. This highlights the need for a comprehensive approach to managing retinopathy while addressing co-existing health conditions [8].

Pan retinal photocoagulation emerged as a safe and effective treatment method for controlling diabetic retinopathy in our study. The results demonstrated that PRP significantly reduced the risk of severe vision loss in PDR patients by up to 50%. This aligns with findings from previous studies, including the Early Treatment Diabetic Retinopathy Study (ETDRS) and Diabetic Retinopathy Study (DRS) control trials. PRP remains a cornerstone of PDR management, and its effectiveness in preserving visual acuity cannot be overstated [9].

Our study reported encouraging results regarding the regression of new vessels following PRP. In the third group of patients with a baseline visual acuity of 5/60-3/60, we observed a regression of new vessels in 57% of the eyes, our observation are accordance with earlier studies [10]. This underscores the importance of PRP in halting the progression of neovascularization, a hallmark of PDR. Timely intervention can lead to significant improvements in the retinal vascular architecture and ultimately contribute to better visual outcomes.

It is worth noting that our study results showed more favorable outcomes in terms of visual acuity maintenance and regression of new vessels compared to certain prior studies. For instance, in patients with baseline visual acuity of 6/18-6/24, 73.3% maintained their visual acuity, 21.53% improved to 6/9-6/12, and only 5.17% experienced a reduction to 5/60 due to macular edema or disease progression. Similarly, in patients with visual acuity of 5/60-3/60, 29.4% improved to 6/36-6/60, while 70.6% maintained the same baseline visual acuity, and 57% saw regression of new vessels after six weeks of follow-up. These findings suggest that timely and aggressive PRP can yield more favorable results compared to some earlier studies [11], potentially due to advancements in treatment techniques and early intervention strategies.

Our study underscores the importance of comprehensive disease management for diabetic patients. PDR is a multifaceted condition influenced by various factors, including glycemic control, blood pressure management, nephropathy, and duration of diabetes. To achieve the best visual outcomes, a holistic approach that integrates retinopathy management with the treatment of comorbidities is essential. Our findings reinforce the need for healthcare providers to address the broader health concerns of diabetic patients while delivering targeted retinopathy treatments. Pan retinal photocoagulation remains the gold standard for managing PDR, as highlighted in our study.

Conflict of Interest
Not available

Financial Support
Not available

References

1. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes care. 2010 Jan 1;33(Supplement_1):S62-9.
2. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. Diabetes research and clinical practice. 2010 Jan 1;87(1):4-14.
3. World Health Organization. Prevention of blindness from diabetes mellitus: report of a WHO consultation in Geneva, Switzerland, 9-11 November 2005. World Health Organization; c2006.
4. Rema M, Pradeepa R. Diabetic retinopathy: an Indian perspective. Indian journal of medical research. 2007 Mar 1;125(3):297-310.
5. Deschler EK, Sun JK, Silva PS. Side-effects and complications of laser treatment in diabetic retinal disease. In seminars in ophthalmology. Taylor & Francis. 2014 Sep 1;29(5-6):290-300.
6. Sabrosa NA, Sabrosa AS, Gouvea KC, Gonçalves Filho P. Surgical management of diabetic retinopathy. Revista Brasileira de Oftalmologia. 2013;72:204-9.
7. Dogru M, Nakamura M, Inoue M, Yamamoto M. Long-term visual outcome in proliferative diabetic retinopathy patients after panretinal photocoagulation. Japanese Journal of Ophthalmology. 1999 May 1;43(3):217-24.
8. Keen H, Lee ET, Russell D, Miki E, Bennett PH, Lu M. WHO Multinational Study Group. The appearance of retinopathy and progression to proliferative retinopathy: the WHO Multinational Study of Vascular Disease in Diabetes. Diabetologia. 2001 Sep;44:S22-30.
9. Sundaram RK, Bhaskar A, Vijayalingam S, Viswanathan M, Mohan R, Shanmugasundaram KR. Antioxidant status and lipid peroxidation in type II diabetes mellitus with and without complications. Clinical science (London, England: 1979). 1996;90(4):255-60.
10. Viswanath K, Murray McGavin DD. Diabetic Retinopathy: Clinical Findings and Management, Community Eye Health. 2003;16(46):21-24.
11. Gupta A, Gupta V, Dogra MR, Pandav SS. Risk factors influencing the treatment outcome in diabetic macular oedema. Indian Journal of Ophthalmology. 1996 Sep 1;44(3):145-8.

How to Cite This Article
Jupalli V. Role of pan retinal photocoagulation in managing proliferative diabetic retinopathy: A comprehensive study. International Journal of Medical Ophthalmology. 2019;1(2):55-58.