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From Surgery To Silence: Uncovering The Causes Of Treatment Dropouts In Advanced Diabetic Retinopathy Patients

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ABSTRACT

Background: This study aimed to investigate the proportion and underlying causes of surgical treatment dropouts among patients with high-risk proliferative diabetic retinopathy (HR-PDR) and advanced diabetic eye disease.

Methods: An observational study was conducted at a tertiary healthcare center in Karnataka, India, from August 2022 to August 2024. Adult patients with type 2 diabetes mellitus diagnosed with severe non- proliferative or proliferative diabetic retinopathy and advised to undergo pars plana vitrectomy (PPV) were included. Clinical records were reviewed, and patients who failed to return for surgical treatment were contacted telephonically. A structured 19-item questionnaire was administered to assess reasons for non- adherence. Data were analyzed using SPSS version 22, with categorical variables expressed as n (%).

Results: Of 150 patients advised for PPV, 60 (40.0%) did not proceed with surgery. The largest subgroup of dropouts was aged 61-70 years (21/59; 35.6%), and 44/59 (74.6%) were male. Nearly half (28/59; 47.5%) had diabetes for more than 10 years, and 44/59 (74.6%) were insulin-dependent. While 36/59 (61.0%) were aware of disease progression, 23/59 (39.0%) lacked awareness of the consequences of delayed treatment.
Notably, 51/59 (86.4%) had never received any prior interventional therapy for diabetic retinopathy. The most frequently reported barriers to surgery were metabolic unfitness (35/59; 59.3%), financial constraints (32/59; 54.2%), transportation difficulties (30/59; 50.8%), and fear of post-surgical complications (29/59; 49.2%).

Conclusion: A considerable proportion of patients with advanced diabetic retinopathy fail to undergo timely vitrectomy, primarily due to modifiable barriers such as systemic instability, financial hardship, and poor awareness. Addressing these issues through structured patient counseling, pre-surgical optimization clinics, improved referral systems, and financial support mechanisms may help reduce surgical dropout.
Community-level education and integration of diabetic and ophthalmic care are essential for early engagement. Future multicenter studies will be important to validate these findings and inform scalable public health interventions that improve long-term visual outcomes in high-risk populations.

Categories: Internal Medicine, Ophthalmology, Endocrinology/Diabetes/Metabolism

Keywords: trd – tractional retinal detachment, prp – panretinal photocoagulation, ppv- pars plana vitrectomy, dr- diabetic retinopathy, hrpdr – high risk proliferative diabetic retinopathy.

INTRODUCTION

Diabetic retinopathy (DR) is a leading cause of vision loss and blindness among working-age adults worldwide, and its incidence continues to rise in parallel with the growing prevalence of diabetes mellitus [1,2]. As a microvascular complication, DR progresses from mild non-proliferative stages to high-risk proliferative diabetic retinopathy (HR-PDR), which is characterized by neovascularization and fibrous tissue formation on the retinal surface [3]. These pathological changes predispose patients to severe complications, including tractional retinal detachment (TRD), vitreous hemorrhage (VH), and vitreomacular interface (VMI) abnormalities [4,5].

Pars plana vitrectomy (PPV) is the primary surgical treatment for advanced diabetic eye disease, permitting removal of non-clearing vitreous hemorrhage, dissection of fibrovascular membranes, and relief of tractional forces. Intraoperatively, endolaser photocoagulation and tamponade agents are commonly used to stabilize the retina and reduce recurrence [6,7]. Despite these advances and the established benefit of PPV, a significant proportion of patients fail to undergo surgery even after formal recommendation, resulting in treatment dropout [8].

The barriers to surgical adherence in advanced DR remain poorly defined, particularly in resource-limited settings. Potential factors include financial constraints, poor systemic health, transportation difficulties, and limited patient knowledge regarding the consequences of disease progression [9,10]. Previous studies have primarily emphasized surgical outcomes following PPV, while the determinants of patient adherence have received limited attention. This knowledge gap underscores the need to better understand the behavioral and systemic barriers affecting surgical uptake [11].

MATERIALS AND METHODS

Objectives

The present study aimed to quantify the dropout rate among patients advised to undergo pars plana vitrectomy (PPV) for high-risk proliferative diabetic retinopathy (HR-PDR) and to identify patient-related and system-related factors associated with non-compliance. By clarifying these determinants, the study sought to inform targeted interventions that may improve patient engagement, optimize referral pathways, and ultimately reduce preventable vision loss in this high-risk population.

Study Design and Setting

This observational study was conducted at R. L. Jalappa Hospital, a tertiary care facility affiliated with Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka. The study period extended from August 2022 to August 2024 and focused on patients newly diagnosed with severe non-proliferative diabetic retinopathy (NPDR), proliferative diabetic retinopathy (PDR), or advanced diabetic eye disease who were recommended for PPV but subsequently opted not to undergo surgery.

Study Population

Eligible participants were adults with type 2 diabetes mellitus and either a new or pre-existing diagnosis of diabetic retinopathy. Patients were included if they had been advised PPV. Exclusion criteria included prior history of vitrectomy or cases managed exclusively with medical treatment without subsequent surgical recommendation. Patients lost to follow-up while on medical therapy alone were not included.

Sample Size and Data Collection

A total of 227 patients with PDR were screened, of whom 150 (66.1%) were recommended vitrectomy. Among these, 60 (40.0%) did not return for surgery and were classified as surgical dropouts, comprising the final study cohort. Demographic and clinical characteristics, including age, sex, duration of diabetes, diagnosis, and treatment history, were obtained from hospital chart records. Identified dropouts were contacted telephonically, and a 19-item structured questionnaire was administered to explore reasons for non-compliance with surgical treatment.

Assessment Tools and Questionnaire

The structured survey addressed a wide range of potential barriers to adherence, including awareness of diabetic retinopathy and its complications, history of prior treatments, systemic fitness for surgery, financial limitations, transportation difficulties, fear of surgical complications, and family or occupational commitments. The standardized questionnaire ensured consistent assessment of patient-reported reasons for surgical dropout across the cohort.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 22.0 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized as frequency and proportion, expressed as n (%). Continuous variables were reported as mean ± standard deviation (SD). Associations between categorical variables were assessed with the Chi-square test, and comparisons of continuous variables were performed using the independent t-test. A p-value <0.05 was considered statistically significant.

Ethical Considerations

This study was approved by the Central Ethics Committee, Research and Development Cell, Sri Devaraj Urs Academy of Higher Education & Research (Approval Ref: SDUAHER/KLR/R&D/CEC/S/PG/100/2024-25; dated January 16, 2025). The research was conducted in accordance with the Indian Council of Medical Research (ICMR) National Ethical Guidelines (2017), Good Clinical Practice (GCP) standards, and the Declaration of Helsinki (2013 revision).

Informed Consent

Verbal informed consent was obtained from all participants prior to telephonic interviews, following a standardized explanation of the study's objectives, voluntary nature, confidentiality measures, and the right to withdraw at any stage. All data were anonymized and securely stored. Given the minimal risk involved and absence of direct clinical intervention, no adverse ethical issues were anticipated. The study received no external funding, and all authors declared no conflicts of interest.

Results

A total of 150 patients with high-risk proliferative diabetic retinopathy (HR-PDR) were advised to undergo pars plana vitrectomy (PPV) during the study period. Of these, 60 (40.0%) did not proceed with surgery and were classified as surgical dropouts.

Demographic and Clinical Profile of Dropouts

The mean age of dropout patients was 61.3 ± 9.4 years, with the largest proportion aged 61-70 years (21; 35.6%). Only 3 (5.1%) were younger than 40 years. Males constituted nearly three-quarters of the cohort (44; 74.6%). Almost half (28; 47.5%) reported diabetes duration of 6-10 years, and 7 (11.9%) had disease duration
exceeding 20 years. At presentation, most patients (44; 74.6%) were insulin-dependent,

while 12
(20.3%) were on oral hypoglycemic agents (OHAs) alone, and 3 (5.1%) received combined therapy (Table 1).

Variable	Category	n (%)
Age group (years)	<40	3 (5.1)
	41–50	12 (20.3)
	51–60	19 (32.2)
	61–70	21 (35.6)
	>70	4 (6.8)
Sex	Male	44 (74.6)
	Female	15 (25.4)
Duration of diabetes	≤10 years	28 (47.5)
	11–20 years	24 (40.7)
	>20 years	7 (11.9)
Current treatment	Insulin	44 (74.6)
	Insulin + OHA	3 (5.1)
	OHA only	12 (20.3)

TABLE 1: Demographic and clinical characteristics of surgical dropout patients (N = 59–60*).

*Variation in N due to missing demographic data.

Awareness and Prior Interventions

Awareness of disease impact was suboptimal. Nearly 23 (39.0%) were unaware that diabetes affects vision, and the same proportion did not know that diabetic retinopathy can cause irreversible blindness. Only 35 (59.3%) recognized that the disease may progress despite regular follow-up, and 36 (61.0%) acknowledged that timely intervention could preserve vision. Awareness of available treatment modalities, such as laser photocoagulation, intravitreal anti-VEGF injections, or surgery, was reported by 36 (61.0%).

Prior treatment exposure was uncommon: 51 (86.4%) reported never having undergone any interventional therapy for DR. Among the minority who had (8; 13.6%), all had received laser photocoagulation, often delayed by weeks to months after recommendation (Table 2).

Variable	Yes n (%)	No n (%)
Aware that diabetes affects eye/vision	36 (61.0)	23 (39.0)
Aware DR can cause irreversible vision loss	36 (61.0)	23 (39.0)
Aware DR can progress under follow-up	35 (59.3)	24 (40.7)
Aware timely treatment can preserve vision	36 (61.0)	23 (39.0)
Aware of treatment options	36 (61.0)	23 (39.0)
Prior interventional treatment received	8 (13.6)	51 (86.4)
— Laser photocoagulation (among n=8)	8 (100.0)	—

TABLE 2: Awareness and prior interventional treatment among surgical dropouts (N = 59–60*).

*Variation in N due to non-response in some items.

Counseling, Surgical Scheduling, and Reasons for Deferral

Preoperative counseling coverage was high: 57 (96.6%) reported being informed that advanced DR may require surgery, and 58 (98.3%) received information regarding vitrectomy, potential complications, prognosis, and postoperative follow-up. Nevertheless, surgical scheduling was substantially delayed; only 1 (1.7%) patient was scheduled within days of counseling, while 58 (98.3%) experienced postponement.

The principal reasons cited for surgical deferral were metabolic unfitness (35; 59.3%), financial constraints (32; 54.2%), and transportation difficulties (30; 50.8%). Nearly half (29; 49.2%) reported fear of
complications or poor outcomes. Additional barriers included lack of local vitreoretinal services (19; 32.2%), family or occupational commitments (20; 33.9%), and prolonged wait times for vitreoretinal surgeons (1; 1.7%). Other reasons were cited by 18 (30.5%). Multiple responses were common (Table 3).

Reason	n (%)
Metabolically unfit for surgery	35 (59.3)
Financial constraints	32 (54.2)
Lack of transportation	30 (50.8)
Fear of complications/poor prognosis	29 (49.2)
VR services unavailable locally	19 (32.2)
Work/family obligations	20 (33.9)
Long wait for VR surgeon	1 (1.7)
Other reasons	18 (30.5)

TABLE 3: Reported reasons for surgical deferral (multiple responses allowed, N = 59–60).

Summary of Key Findings

The dropout cohort was predominantly older, male (44; 74.6%), insulin-dependent (44; 74.6%), and had long-standing diabetes (28; 47.5% with ≤10 years; 24; 40.7% with 11-20 years; 7; 11.9% with >20 years). Despite high rates of counseling (57; 96.6% informed of surgical need; 58; 98.3% informed about vitrectomy and prognosis), prior interventional treatment was rare (8; 13.6%), and major gaps in awareness
persisted (23; 39.0% unaware that diabetes affects vision; 23; 39.0% unaware DR causes blindness). Surgical deferral was multifactorial, with the most frequent reasons being metabolic instability (35; 59.3%), financial barriers (32; 54.2%), and transportation difficulties (30; 50.8%).

DISCUSSION

Our study identified a high dropout rate of 60/150 (40.0%) among patients advised pars plana vitrectomy (PPV) for advanced diabetic retinopathy, specifically HR-PDR. The dropout cohort was predominantly older men, with over one-third aged 61-70 years and nearly half [31; 52.0%] having diabetes for more than a decade. Most were insulin-dependent, lacked prior therapeutic intervention for diabetic retinopathy (DR), and demonstrated limited awareness of disease progression. The leading barriers to surgical uptake were poor metabolic fitness (35; 59.3%), financial constraints (32; 54.2%), transportation difficulties (30; 50.8%), and fear of surgical complications (29; 49.2%). These findings emphasize that modifiable patient- and system-level challenges remain critical determinants of surgical adherence.

Patel et al. [6] reported favorable outcomes in a retrospective review of PPV with panretinal photocoagulation for PDR, with minimal dropouts attributed to robust preoperative counseling and effective system-level organization. In contrast, our cohort illustrates how inadequate perioperative arrangements and resource limitations result in significant attrition before surgery. While Patel et al. demonstrated improved visual outcomes following PPV, our patients never advanced to surgery, underscoring a lost opportunity for visual preservation. This contrast highlights systemic barriers unique to lower-resource settings.

Our findings align with population-level epidemiology. Lundeen et al. [7] reported the highest prevalence of DR in U.S. men aged 65-79 years, consistent with our dropout demographics. Favas et al. [8] observed that longer disease duration and poor systemic control predispose to advanced DR, paralleling our observation that nearly half of patients had diabetes for over 10 years [31; 52.0%] and many were metabolically unfit for surgery (35; 59.3%). Al-Sarraf et al. [9] similarly confirmed that cumulative risk of DR rises with disease duration. In South Asia, Ahmed et al. [10] found that only 63% of diabetic patients were aware of ocular complications, comparable to the 36 (61.0%) awareness rate in our cohort. Additional studies by Lu et al. [12] and Al-Shehri et al. [13] have emphasized that delayed awareness and late presentation remain global drivers of poor DR outcomes. These parallels validate our results and reinforce the urgent need for targeted education, early screening, and accessible treatment pathways.

Strengths and Limitations

The principal strength of this study lies in its comprehensive assessment of real-world barriers to surgical adherence, achieved through a structured, multidimensional questionnaire and direct patient follow-up. This approach provided nuanced insights into both logistical and psychosocial contributors to dropout. However, as a single-center study, the findings may not be generalizable to larger populations. Recall bias is possible due to reliance on retrospective telephone interviews, and unmeasured factors such as psychological distress, family support, or geographic disparities in healthcare access may

also have influenced patient decisions.

Implications

From clinical and public health perspectives, these findings carry significant implications. Improving surgical uptake for HR-PDR requires interventions targeting modifiable barriers such as metabolic instability, financial hardship, and transportation limitations. The establishment of preoperative metabolic optimization clinics, structured counseling protocols, and systematic integration of diabetic and ophthalmic services may reduce surgical ineligibility and improve patient confidence. Policy-driven subsidization of
care and transportation support, particularly in rural communities, could further mitigate structural barriers. Ultimately, a coordinated strategy combining patient education, financial support, and integrated care delivery may improve surgical adherence and preserve vision in high-risk diabetic populations.

CONCLUSIONS

This study revealed a substantial dropout rate among HR-PDR patients recommended for vitrectomy, driven largely by modifiable socioeconomic and systemic barriers. Targeted strategies including enhanced patient education, perioperative metabolic optimization, and structured integration of diabetic and ophthalmic services may reduce attrition and improve surgical uptake. Failure to address these barriers not only prevents timely intervention but also perpetuates avoidable blindness in a highly vulnerable population.
Future multicenter studies across diverse healthcare settings are warranted to identify scalable solutions that strengthen surgical access for patients with advanced diabetic retinopathy.

Additional Information

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Central Ethics Committee, Research and Development Cell, Sri Devaraj Urs Academy of Higher Education & Research issued approval SDUAHER/KLR/R&D/CEC/S/PG/100/2024-25; dated January 16, 2025. The research was conducted in accordance with the Indian Council of Medical Research (ICMR) National Ethical Guidelines (2017), Good Clinical Practice (GCP) standards, and the Declaration of Helsinki (2013 revision). Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue. Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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