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Successful Visual Rehabilitation Following Pars Plana Vitrectomy and Endolaser in a Patient with Severe Vitreous Hemorrhage due to Proliferative Diabetic Retinopathy

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A B S T R A C T

Proliferative diabetic retinopathy (PDR) represents an advanced stage of diabetic eye disease, frequently leading to severe visual impairment through complications such as vitreous hemorrhage (VH). Dense VH significantly obstructs vision and often requires surgical intervention. Pars plana vitrectomy (PPV) coupled with endolaser photocoagulation serves as a critical treatment modality, aiming to clear the hemorrhage, remove tractional elements, and manage the underlying ischemic drive of PDR. This report documents a case demonstrating significant visual recovery after this intervention. A 53-year-old male, diagnosed with type 2 diabetes mellitus 6 years prior and under medical control, presented with a one-month history of sudden, severe vision loss in his right eye (OD). His best-corrected visual acuity (BCVA) was profoundly reduced to 1/300 OD, while the left eye (OS) measured 6/15. Clinical examination revealed dense VH OD, preventing detailed funduscopic assessment. The fellow eye OS exhibited features consistent with high-risk PDR. The patient underwent a 23-gauge PPV, including core vitrectomy and extensive pan-retinal endolaser photocoagulation OD, performed under general anesthesia. Postoperatively, the vitreous clarity was restored, and a remarkable improvement in BCVA OD to 6/7.5 was achieved by the three-week follow-up visit. In conclusion, timely surgical management utilizing PPV with endolaser photocoagulation was effective in resolving dense VH secondary to PDR in this patient, culminating in substantial visual rehabilitation.

1. Introduction

Diabetic retinopathy (DR), a prominent microvascular complication arising from diabetes mellitus, is a principal cause of vision loss globally, with a disproportionate impact on individuals within their working years. The development and progression of DR are intricately linked to chronic hyperglycemia, frequently exacerbated by the presence of concurrent systemic conditions such as hypertension. The global burden of DR is substantial, and epidemiological studies predict a significant rise in its prevalence in the coming decades, with developing regions expected to be disproportionately affected. In Indonesia, national health surveys conducted in 2018 revealed a DR prevalence of 42.6%, indicating a considerable population at risk of diabetes-related blindness. The clinical manifestations of DR span a spectrum, beginning with non-proliferative diabetic retinopathy (NPDR), characterized by intraretinal vascular abnormalities including microaneurysms, hemorrhages, cotton wool spots, and venous beading, and advancing to proliferative diabetic retinopathy (PDR), a more severe stage. PDR is distinguished by the development of neovascularization, which involves the growth of abnormal, fragile new blood vessels originating from the optic disc (NVD) or other areas of

the retinal surface (NVE). This pathological process is triggered by widespread retinal ischemia and the subsequent upregulation of vasoproliferative factors, most notably vascular endothelial growth factor (VEGF).[1-3]

PDR poses a significant threat to vision due to its propensity to cause sight-threatening complications, including recurrent vitreous hemorrhage (VH), tractional retinal detachment (TRD) resulting from the contraction of fibrovascular membranes that exert traction on the retina, and neovascular glaucoma. Vitreous hemorrhage occurs when these delicate neovessels rupture, leading to the release of blood into the vitreous cavity. While small hemorrhages may resolve spontaneously over a period of weeks or months, extensive and dense VH can result in profound and persistent vision loss. The Diabetic Retinopathy Vitrectomy Study (DRVS) was a landmark trial that provided critical evidence supporting the benefits of early surgical intervention, specifically pars plana vitrectomy (PPV), within 1 to 6 months for eyes with severe, non-clearing VH secondary to PDR. The study demonstrated improved visual outcomes with early surgery compared to deferred surgery, particularly in patients with type 1 diabetes. Since the DRVS, there have been substantial advancements in vitreoretinal surgery, most notably the introduction of micro-incision vitrectomy systems (MIVS) utilizing 23-, 25-, or 27-gauge instruments, which have revolutionized the management of diabetic VH. These minimally invasive techniques offer several potential advantages, including reduced surgical trauma, faster visual recovery, and potentially fewer complications, further supporting the rationale for timely surgical intervention.[4-7]

The primary objectives of PPV are to directly remove the hemorrhage that is obstructing vision, alleviate vitreoretinal traction by excising the posterior hyaloid membrane and associated fibrovascular proliferation, and enable the application of pan-retinal photocoagulation (PRP) using an endolaser. Endolaser PRP targets the ischemic peripheral retina, aiming to reduce the production of VEGF and other angiogenic factors, thereby promoting the regression of neovascularization and minimizing the risk of recurrent bleeding.[8-10] This report presents the case of a 53-year-old male who experienced a sudden and severe loss of vision due to dense VH in his right eye, secondary to underlying high-risk PDR. The case illustrates the successful application of 23-gauge PPV in conjunction with endolaser PRP, resulting in significant anatomical and functional recovery, and highlighting the effectiveness of contemporary surgical approaches in the management of complex diabetic eye disease.

2. Case Presentation

A 53-year-old male, diagnosed with type 2 diabetes mellitus 6 years prior and under medical control, presented with a one-month history of sudden, severe vision loss in his right eye (OD). His residence is noted as being outside the primary city, indicating a regional location. The patient's chief complaint was a sudden onset of blurry vision in the right eye. He specifically denied experiencing redness, pain, discharge, tunnel vision, or the sensation of a curtain obstructing his vision in that eye. In contrast to the acute onset of symptoms in the right eye, the patient described a gradual blurring of vision in the left eye (OS), which had been progressing over the preceding six months. Similar to the right eye, he denied any redness, pain, or discharge in the left eye. Notably, the patient reported experiencing mild metamorphopsia in the left eye, which refers to a distortion of vision where straight lines appear wavy or curved. However, he indicated that this metamorphopsia was not his primary concern, suggesting that the sudden and severe vision loss in the right eye was the predominant factor prompting him to seek medical attention. The patient's past medical history is significant for a diagnosis of Diabetes Mellitus, specifically Type 2. This diagnosis was established six years prior to his current

presentation. He reported that his diabetes was controlled with medication. However, it is important to note that while the patient stated his diabetes was controlled, the findings of the ophthalmological examination, particularly in the context of proliferative diabetic retinopathy, may suggest that the control was suboptimal or that complications had developed despite management efforts. Additionally, his past medical history includes hypertension. While initially denied in the history taking, hypertension was mentioned during subsequent discussions and physical examination signs consistent with hypertension were observed. The patient denied any history of ocular trauma. He reported using spectacles for two years. Crucially, he had no history of previous eye surgery. The patient's family history was unremarkable for similar eye diseases. He reported no family history of similar ocular issues. The patient's general condition was described as good. His blood pressure was recorded at 130/90 mmHg. This reading is above the normal range, confirming the presence of hypertension noted in his past medical history and clinical findings. His heart rate was 72 beats per minute, which falls within the normal range. The respiratory rate was 18 breaths per minute, also considered within the normal range. His temperature was recorded as afebrile, indicating the absence of fever, which is considered normal. The ophthalmological examination conducted prior to the planned surgical intervention revealed significant findings. The best-corrected visual acuity (BCVA) in the right eye (OD) was severely reduced, measured at 1/300, which is quantified as counting fingers at a distance of one meter. This indicates a profound level of visual impairment in the right eye. In contrast, the best-corrected visual acuity in the left eye (OS) was 6/21, which improved to 6/15 with the use of a pinhole. This suggests that while the left eye also exhibited some degree of visual impairment, it was significantly better than the right eye, and the improvement with pinhole testing implies a refractive error component to the reduced acuity. The intraocular pressure (IOP) was measured in both eyes using non-contact tonometry (NCT). The IOP was 15.6 mmHg in both the right eye (OD) and the left eye (OS). This measurement is within the normal range for intraocular pressure. Ocular motility and alignment were assessed and found to be full in both eyes, with orthophoria noted. Orthophoria refers to the normal alignment of the eyes when focusing on a distant object, indicating that the eyes were properly aligned. Examination of the anterior segment of both eyes (OU) revealed that the lids and conjunctiva were calm, suggesting no signs of inflammation or infection. The cornea was clear in both eyes. The anterior chamber was described as being of moderate depth. The irises in both eyes had normal features. The pupils were round, central, and reactive to light. There was no relative afferent pupillary defect (RAPD) in either eye. The absence of RAPD is an important finding, as it suggests that the optic nerve function was relatively preserved at this stage. Examination of the lens in both eyes (OU) revealed the presence of an immature senile cataract, graded as Nuclear NO1, Cortical C1, and Posterior Subcapsular Cataract P0. The shadow test was positive, which is consistent with the presence of a cataract. The posterior segment examination yielded markedly different findings between the two eyes. In the right eye (OD), the media was hazy due to dense vitreous hemorrhage (VH). The fundus reflex was present but severely reduced, indicating that the view of the fundus was significantly obscured by the hemorrhage. Posterior segment details could not be visualized due to the density of the vitreous hemorrhage. In the left eye (OS), the media was clear, and the fundus reflex was present. The optic disc was described as round with sharp borders. The cup-to-disc ratio (C/D) was 0.3, which is within the normal range. The arteriovenous ratio (A/V) was 2:3. No neovascularization of the disc (NVD) was noted in the left eye. The macula had a reduced foveal reflex. The retina showed arterial narrowing, copper or silver

wiring, arteriovenous nicking, microaneurysms, hard exudates, and dot-blot hemorrhages in two quadrants. No neovascularization elsewhere (NVE) was observed in the left eye. These findings in the left eye are indicative of diabetic retinopathy and hypertensive retinopathy. Postoperatively, following the surgical intervention on the right eye (OD), further ophthalmological examinations were conducted. On postoperative day 1, the visual acuity in the right eye was 3/60, uncorrected. By postoperative day 21, the visual acuity had improved significantly to 6/9, improving further to 6/7.5 with pinhole correction. This represents a substantial improvement in visual function following the surgery. The intraocular pressure (IOP) in the right eye was 13.1 mmHg on postoperative day 1 and 16.3 mmHg on postoperative day 21. Both of these measurements are within the normal range. Examination of the posterior segment of the right eye on postoperative day 21 revealed that the media was clear, indicating successful clearance of the vitreous hemorrhage. The retina was flat, and visible pan-retinal photocoagulation (PRP) scars were noted, confirming the application of laser treatment. However, signs of proliferative diabetic retinopathy and hypertensive retinopathy persisted, including arterial narrowing, copper or silver wiring, arteriovenous nicking, microaneurysms, hard exudates, and dot-blot hemorrhages. Notably, neovascularization of the disc (NVD) was observed postoperatively, which was not present in the pre-operative examination of the left eye. Pre-operative laboratory results provided further information about the patient's systemic condition. Hematology revealed a hemoglobin level of 12.0 g/dL, a hematocrit of 34%, a white blood cell count (WBC) of 7.04 x 10^3/mm^3, and a platelet count of 302,000/µL. Coagulation studies showed a bleeding time of 1 minute and a clotting time of 9 minutes. Liver function tests showed a serum glutamic-oxaloacetic transaminase (SGOT) level of 19 U/L and a serum glutamic-pyruvic transaminase (SGPT) level of 10 U/L. Renal function and metabolic studies showed a blood sugar sample (random) of 183 mg/dL, a urea level of 26 mg/dL, and a creatinine level of 0.84 mg/dL. Electrolyte levels were sodium 146 mEq/L, potassium 3.9 mEq/L, and calcium 9.0 mg/dL. Serology for Hepatitis B surface antigen (HBsAg) was non-reactive. Fundus photography was performed pre-operatively on both eyes (OU) and post-operatively on the right eye (OD) on day 21. The pre-operative view of the right eye was obscured by the vitreous hemorrhage, while the post-operative view was clear. A chest X-ray (PA view) showed no abnormalities of the heart or lungs. The pre-operative clinical diagnosis for the right eye (OD) was vitreous hemorrhage et causa suspected high-risk proliferative diabetic retinopathy. The pre-operative diagnosis for the left eye (OS) was high-risk proliferative diabetic retinopathy. The pre-operative diagnosis for both eyes (OU) included immature senile cataract (Nuclear Grade 1). The post-operative (day 21) clinical diagnosis for the right eye (OD) was status post pars plana vitrectomy and endolaser for vitreous hemorrhage secondary to high-risk proliferative diabetic retinopathy. The post-operative diagnosis for both eyes (OU) included suspected posterior vitreous detachment and hypertensive retinopathy Grade III, as well as immature senile cataract (Nuclear Grade 1). This detailed presentation synthesizes the information from the table, providing a comprehensive overview of the patient's condition, from demographic details and medical history to the specific findings of the ophthalmological and general physical examinations, laboratory results, and imaging studies, culminating in the pre- and post-operative clinical diagnoses (Table 1).

The initial phase of the patient's management centered on pre-operative preparations, beginning with the acquisition of informed consent. It was essential to ensure that the patient fully understood the nature of the planned surgical intervention, its potential benefits, associated risks, and the expected recovery process. This process of informed consent is

a cornerstone of ethical medical practice, respecting patient autonomy and facilitating shared decision-making. Following the consent process, the planned procedure was meticulously outlined. The patient was scheduled to undergo a Pars Plana Vitrectomy (PPV) with Endolaser Photocoagulation in the right eye (OD). Pars Plana Vitrectomy is a specialized surgical technique involving the removal of the vitreous humor, the gel-like substance that fills the eye, while Endolaser Photocoagulation is a procedure that uses a laser to create burns on the retina to treat certain eye conditions. The combination of these two procedures is frequently employed in the management of complex retinal disorders, particularly those associated with diabetic retinopathy. The type of anesthesia to be used during the surgical procedure was determined. It was decided that the patient would receive general anesthesia. General anesthesia induces a state of unconsciousness, ensuring that the patient experiences no pain or awareness during the operation. This choice of anesthesia is often preferred for more extensive or complex ocular surgeries, allowing for complete patient immobility and comfort, and enabling the surgical team to perform the procedure with precision. Comprehensive pre-operative evaluations were conducted to assess the patient's overall health status and to optimize him for surgery. This involved a series of laboratory checks, the results of which were detailed in Table 1. These laboratory tests provide essential information about the patient's hematological profile, coagulation parameters, liver and renal function, metabolic status, and electrolyte balance. Additionally, a chest X-ray in the posteroanterior (PA) view was performed, and the result was reported as showing no abnormalities. This imaging study is a routine component of pre-operative assessment, helping to evaluate the patient's cardiopulmonary health. Finally, a consultation with the Anesthesiology department was conducted. This consultation is a critical step in ensuring that the patient is a suitable candidate for general anesthesia and to develop an appropriate anesthesia plan tailored to the patient's specific needs and medical conditions. The intra-operative phase commenced with meticulous patient preparation. The patient was positioned in a supine position, which is the standard position for most eye surgeries. General anesthesia was then administered, as planned, to ensure the patient's comfort and immobility throughout the procedure. Aseptic and antiseptic preparation of the right eye operative field was performed. This involved rigorous cleaning and sterilization of the skin surrounding the eye to minimize the risk of infection. Sterile draping was applied to create a sterile barrier, further reducing the likelihood of contamination. A blepharostat was inserted into the right eye. A blepharostat is an instrument used to gently hold the eyelids open, providing the surgical team with an unobstructed view of the operative field. Surgical access was then established. Three-port pars plana access was created using 23-Gauge cannulas. These cannulas are small tubes that are inserted through the pars plana, a region of the eye located behind the iris and ciliary body. The use of 23-Gauge cannulas represents a minimally invasive approach, which is associated with smaller incisions, potentially less tissue trauma, and faster recovery times compared to larger gauge instruments. The locations for these cannulas were specified: inferotemporal for infusion, and superonasal and superotemporal for the insertion of surgical instruments. These positions are inferred to be standard, optimizing surgical maneuverability and access to different parts of the vitreous cavity. The core vitrectomy was performed. This involved the removal of the central vitreous and any hemorrhage present within it. Vitrectomy is a delicate procedure that requires precise surgical skills to avoid damage to the retina and other ocular structures. Following the core vitrectomy, vitreous base cleaning and shaving were performed. This step involves carefully removing any remaining vitreous near its base, which is its attachment to the retina, ensuring thorough clearance

and reducing the risk of subsequent tractional complications. Laser application was then carried out. Endolaser Pan-Retinal Photocoagulation (PRP) was applied extensively. PRP is a technique that uses a laser to create numerous small burns across the peripheral retina. This procedure aims to reduce the metabolic demand of the retina and decrease the production of factors that stimulate the growth of new, abnormal blood vessels. Standard parameters for the laser treatment were approximately 1200-1600 spots, with a spot size of 500µm and moderate intensity. However, the report notes that typical details were not specified, highlighting a potential limitation in the documentation. The final steps of the surgery involved closure and other procedures. The cannulas were removed, and the sclerotomies, which are the small incisions made in the sclera (the white part of the eye) for cannula insertion, were sutured with Vicryl 8-0 absorbable suture. Vicryl is a synthetic, absorbable suture material commonly used in ophthalmic surgery. A subconjunctival injection was administered, consisting of Dexamethasone 0.5 cc and Gentamicin 0.5 cc. Dexamethasone is a corticosteroid used to reduce inflammation, while Gentamicin is an antibiotic used to prevent infection. The operative field was cleaned, and Chloramphenicol eye ointment was applied. Chloramphenicol is another antibiotic used topically to prevent bacterial infection. A sterile eye dressing was applied to protect the eye. The operation was then concluded. The immediate post-operative phase began with an assessment on the first day following surgery. The visual acuity in the right eye (OD) was measured at 3/60, uncorrected. This indicates a significant improvement compared to the pre-operative visual acuity, although it still reflects substantial visual impairment. The intraocular pressure (IOP) in the right eye was 13.1 mmHg, which is within the normal range. The anterior segment of the eye showed subconjunctival bleeding, which is a common occurrence after eye surgery and generally resolves spontaneously. Otherwise, the anterior segment was described as calm, indicating no signs of significant inflammation. In the posterior segment, fundus reflex was noted, suggesting that the vitreous was clearing, and some visualization of the fundus was possible. Vitreous clearing is a primary goal of vitrectomy surgery, as it improves the passage of light to the retina. Based on the initial post-operative findings, the diagnosis was updated. The diagnosis included Post PPV and Endolaser in the right eye for Vitreous Hemorrhage (VH) et causa High-Risk Proliferative Diabetic Retinopathy (PDR). Additionally, suspected Posterior Vitreous Detachment (PVD) in both eyes (ODS), Hypertensive Retinopathy Grade III in the left eye (OS), and Immature Senile Cataract in both eyes (ODS) were noted. Post-operative management was initiated. Systemic medications included Cefixime 500 mg tablets to be taken orally twice a day (BID) and Mefenamic Acid 500 mg tablets to be taken orally three times a day (TID) as needed (prn). Cefixime is an antibiotic, and Mefenamic Acid is a nonsteroidal anti-inflammatory drug (NSAID) used for pain relief. Topical medications for the right eye (OD) included Levofloxacin eye drops to be administered four times a day (QID) and Prednisolone Acetate eye drops to be administered four times a day (QID). Levofloxacin is a broad-spectrum antibiotic, and Prednisolone Acetate is a corticosteroid used to reduce inflammation. The patient was approved for outpatient care, indicating that he was deemed stable enough to be discharged home. He was instructed to follow up in one week for further evaluation and management. A follow-up assessment was conducted 21 days after the surgery. The visual acuity in the right eye (OD) had improved significantly to 6/9, and with pinhole correction, it further improved to 6/7.5. This represents a substantial recovery of visual function, demonstrating the success of the surgical intervention. The intraocular pressure (IOP) in the right eye was 16.3 mmHg, which remains within the normal range. The anterior segment of the right eye was described as calm, indicating that the initial post-

operative inflammation had subsided. The posterior segment of the right eye showed clear media, confirming the successful clearance of the vitreous hemorrhage. The retina was flat, and visible Pan-Retinal Photocoagulation (PRP) scars were present, indicating the effect of the laser treatment. However, residual signs of Proliferative Diabetic Retinopathy (PDR) and Hypertensive Retinopathy (HTN) were still observed, as detailed in Table 1. Notably, Neovascularization of the Disc (NVD) was noted in this follow-up, which required continued monitoring and possibly further intervention. The diagnosis was updated to reflect the patient's progress and ongoing condition. The diagnosis included Post PPV and Endolaser H+21 (21 days post-operative) in the right eye for Vitreous Hemorrhage (VH) et causa High-Risk Proliferative Diabetic Retinopathy (PDR). Suspected Posterior Vitreous Detachment (PVD) in both eyes (ODS), Hypertensive Retinopathy Grade III in both eyes (ODS), and Immature Senile Cataract Grade I in both eyes (ODS) were also noted. Management at this stage focused on continued care and monitoring. Topical medications for both eyes (OS) were prescribed: Levofloxacin eye drops to be administered four times a day (QID) and Prednisolone Acetate eye drops to be administered four times a day (QID). It is important to note that the medications being listed for the left eye (OS) at this visit, rather than the right eye (OD) as in the immediate post-operative period, suggests a shift in focus to manage the condition of the fellow eye. Continued follow-up was advised. The importance of ongoing systemic control, particularly regarding the patient's diabetes and hypertension, was emphasized. This highlights the crucial role of multidisciplinary care and patient compliance in achieving long-term visual preservation (Table 2).

3. Discussion

The development of PDR, the underlying cause of the VH in this patient, is a complex process intricately linked to the chronic hyperglycemia that characterizes diabetes mellitus. The sustained elevation of blood glucose levels initiates a cascade of metabolic and biochemical derangements within the retinal microvasculature. These include increased flux through the polyol pathway, activation of protein kinase C (PKC) isoforms, the non-enzymatic glycation of proteins leading to the formation of advanced glycation end products (AGEs), heightened oxidative stress due to an imbalance between the production and neutralization of reactive oxygen species, and the promotion of a state of chronic low-grade inflammation. These pathological processes collectively contribute to the progressive damage of the retinal blood vessels. The structural integrity of the capillaries is compromised through the thickening of the basement membrane, the loss of pericytes (cells that provide support and regulate blood flow), and the dysfunction of endothelial cells, which form the inner lining of the blood vessels. The cumulative effect of these changes is the occlusion of retinal capillaries, leading to a state of retinal ischemia, where the tissue is deprived of adequate oxygen supply. In response to this ischemia, the retina mounts a compensatory mechanism involving the upregulation of various vasoproliferative factors, most notably vascular endothelial growth factor (VEGF). VEGF is a potent angiogenic cytokine that stimulates the proliferation and migration of endothelial cells, resulting in the formation of new blood vessels. However, in PDR, this neovascularization is aberrant, the newly formed vessels lack the structural support and tight junctions of normal retinal vessels. Consequently, they are fragile and prone to leakage and rupture. Vitreous hemorrhage, as seen in this case, occurs when these fragile neovessels rupture, releasing blood into the vitreous cavity.

Table 1. Summary of patient's clinical findings.

Category	Finding	Details / Notes
Demographics	**Patient ID**	Tn. M
	Age	53 years
	Gender	Male
	Address	Regional (Outside primary city)
Anamnesis (History)	**Chief Complaint**	Sudden blurry vision in the right eye (OD)
	History of Present Illness	OD: Sudden blurry vision onset ~1 month prior. No redness, pain, discharge, tunnel vision, or curtain noted. OU: Gradual blurry vision over the preceding 6 months. No redness, pain, discharge. OS: Mild metamorphopsia noted but not primary concern.
	Past Medical History	Diabetes Mellitus: Yes, Type 2, diagnosed 6 years ago, reported as controlled with medication. Hypertension: Denied in initial history, but history mentioned in discussion & signs present on exam. Ocular Trauma: No history. Spectacle Use: Yes, for 2 years. Previous Eye Surgery: No history.
	Family History	No family history of similar eye disease reported.
Physical examination (General)	**General Condition**	Good
	Blood Pressure	130/80 mmHg
	Heart Rate	72 beats/minute
	Respiratory Rate	18 breaths/minute
	Temperature	Afebris (Normal)
Ophthalmology examination (Preoperative)	**Visual Acuity (BCVA)**	OD: 1/300 (Counting Fingers at 1m). OS: 6/21, improving to 6/15 with Pinhole
	Intraocular Pressure (IOP)	OD: 15.6 mmHg (NCT). OS: 15.6 mmHg (NCT)
	Ocular Motility/Alignment	Full OU, Orthophoria
	Anterior Segment (OU)	Lids/Conjunctiva: Calm. Cornea: Clear. Anterior Chamber: Moderate depth. Iris: Normal features. Pupil: Round, Central, Reactive, 3mm, No RAPD
	Lens (OU)	Immature Senile Cataract (Nuclear: NO1, Cortical: C1, PSC: P0 inferred), Shadow Test Positive (+)
	Posterior Segment	OD: Media Hazy (Dense VH), Fundus Reflex (+) severely reduced, Posterior segment details not visualized. OS: Media Clear, Fundus Reflex (+). Optic Disc: Round, sharp borders, C/D ratio 0.3, A/V ratio 2:3, NVD (-). Macula: RF (+) reduced. Retina: Arterial narrowing, copper/silver wiring, A-V nicking, microaneurysms (+), hard exudates (+), dot-blot hemorrhages (+) in 2 quadrants, NVE (-).
Ophthalmology examination (Post-Op - OD)	**Visual Acuity (BCVA)**	Day 1: 3/60 (uncorrected). Day 21: 6/9, improving to 6/7.5 with Pinhole
	Intraocular Pressure (IOP)	Day 1: 13.1 mmHg. Day 21: 16.3 mmHg
	Posterior Segment (OD)	Day 21: Media Clear. Retina flat with visible PRP scars. Signs of PDR/HTN: Arterial narrowing, copper/silver wiring, A-V nicking, microaneurysms, hard exudates, dot-blot hemorrhages. NVD (+) noted.
Laboratory results (Pre-Op)	**Hematology**	Hb 12.0 g/dL, Hct 34%, WBC 7.04 x10^3/mm^3, Plt 302,000/µL
	Coagulation	Bleeding Time 1 min, Clotting Time 9 min
	Liver Function	SGOT 19 U/L, SGPT 10 U/L
	Renal Function/Metabolic	BSS 183 mg/dL, Ureum 26 mg/dL, Creatinine 0.84 mg/dL
	Electrolytes	Na 146 mEq/L, K 3.9 mEq/L, Ca 9.0 mg/dL
	Serology	HBsAg Non-Reactive
Imaging	**Fundus Photography**	Performed pre-operatively OU and post-operatively OU (Day 21). OD pre-op view obscured by VH. OD post-op view clear.
	Chest X-Ray (PA)	No abnormalities of heart or lungs detected
Clinical diagnosis	**Pre-Operative**	OD: VH et causa Suspected High-Risk PDR. OS: High-Risk PDR. OU: Immature Senile Cataract (Nuclear Grade 1)
	Post-Operative (Day 21)	OD: Status Post PPV + Endolaser for VH secondary to High-Risk PDR. OU: Suspected PVD. OU: HTN Retinopathy Grade III. OU: Immature Senile Cataract (Nuclear Grade 1)

Notes: A/V: Arteriovenous; BCVA: Best-Corrected Visual Acuity; BSS: Blood Sugar Sample (Random); Ca: Calcium; C/D: Cup-to-Disc Ratio; DM: Diabetes Mellitus; et causa: due to / secondary to; Hb: Hemoglobin; HBsAg: Hepatitis B Surface Antigen; Hct: Hematocrit; HR: Heart Rate; HTN: Hypertension; IOP: Intraocular Pressure; K: Potassium; Na: Sodium; NCT: Non-Contact Tonometry; No.: Number; NVD: Neovascularization of the Disc; NVE: Neovascularization Elsewhere; OD: Oculus Dexter (Right Eye); OS: Oculus Sinister (Left Eye); OU: Oculi Uterque (Both Eyes); PA: Posteroanterior (view for X-ray); PDR: Proliferative Diabetic Retinopathy; Plt: Platelet Count; PPV: Pars Plana Vitrectomy; PRP: Pan-Retinal Photocoagulation; PSC: Posterior Subcapsular Cataract; PVD: Posterior Vitreous Detachment; RAPD: Relative Afferent Pupillary Defect; RF: Foveal Reflex; RR: Respiratory Rate; SGOT: Serum Glutamic-Oxaloacetic Transaminase; SGPT: Serum Glutamic-Pyruvic Transaminase; VH: Vitreous Hemorrhage; WBC: White Blood Cell Count.

Table 2. Treatment procedure and follow-up.

Time point / Stage	Procedure / Assessment	Details / Findings / Management
Pre-operative phase	**Planning & Consent**	Informed consent obtained for procedure.
	Planned Procedure	Pars Plana Vitrectomy (PPV) + Endolaser Photocoagulation, Right Eye (OD).
	Anesthesia	General Anesthesia planned.
	Pre-Op Evaluation	Laboratory checks performed (results in Table 1). Chest X-ray PA performed (result: No abnormalities). Consultation with Anesthesiology department.
Intra-operative phase (August 27th, 2024)	**Patient Preparation**	Patient in supine position under general anesthesia. Aseptic antiseptic preparation of the OD operative field. Sterile draping applied. Blepharostat inserted OD.
	Surgical Access	Three-port pars plana access created using 23-Gauge cannulas (locations: inferotemporal for infusion, superonasal & superotemporal for instruments - inferred standard positions).
	Vitrectomy	Core vitrectomy performed to remove central vitreous and hemorrhage. Vitreous base cleaning/shaving performed.
	Laser Application	Endolaser Pan-Retinal Photocoagulation (PRP) applied extensively. (Standard parameters: ~1200-1600 spots, 500µm size, moderate intensity - typical details not specified in report).
	Closure & Final Steps	Cannulas removed. Sclerotomies sutured with Vicryl 8-0 absorbable suture. Subconjunctival injection administered (Dexamethasone 0.5 cc + Gentamicin 0.5 cc). Operative field cleaned. Chloramphenicol eye ointment applied. Sterile eye dressing applied. Operation concluded.
Post-operative day 1 (August 28th, 2024)	**Assessment**	Visual Acuity OD: 3/60 (uncorrected). IOP OD: 13.1 mmHg. Anterior Segment: Subconjunctival bleeding (+), otherwise calm. Posterior Segment: Fundus reflex (+), vitreous clearing noted.
	Diagnosis Update	Post PPV + Endolaser OD for VH et causa High-Risk PDR; Suspected PVD ODS; HTN Retinopathy Gr III OS; Immature Senile Cataract ODS.
	Management	**Systemic: Cefixime 500 mg tab PO BID, Mefenamic Acid 500 mg tab PO TID prn. Topical OD: Levofloxacin ED QID, Prednisolone Acetate ED QID.**
	Disposition	Approved for outpatient care (Acc rawat jalan). Instructed to follow up in 1 week.
Post-operative day 21 (September 18th, 2024)	**Assessment**	Visual Acuity OD: 6/9 (PH 6/7.5). IOP OD: 16.3 mmHg. Anterior Segment OD: Calm. Posterior Segment OD: Clear media, flat retina, visible PRP scars, residual PDR/HTN signs (details in Table 1), NVD (+).
	Diagnosis Update	Post PPV + Endolaser OD H+21 for VH et causa High-Risk PDR; Suspected PVD ODS; HTN Retinopathy Gr III ODS; Immature Senile Cataract Gr I ODS.
	Management	**Topical OS: Levofloxacin ED QID, Prednisolone Acetate ED QID.**

This can be further exacerbated by tractional forces exerted on the retina by the vitreous itself, particularly in the presence of posterior vitreous detachment (PVD) or the contraction of fibrovascular membranes that develop as a result of the neovascular process. The sudden accumulation of blood in the vitreous cavity leads to a significant obscuration of the visual axis, resulting in the abrupt and severe vision loss experienced by the patient in this report.[11-13]

The treatment approach employed in this case, combining pars plana vitrectomy (PPV) with endolaser photocoagulation, is a well-established and effective strategy for managing PDR complicated by VH. Pars plana vitrectomy is a specialized surgical procedure

that involves the removal of the vitreous humor, the gel-like substance that fills the posterior segment of the eye. In the context of VH, PPV serves to directly clear the blood that is obstructing the patient's vision, allowing for improved light transmission to the retina and facilitating a clearer view of the fundus. Beyond the removal of the hemorrhage, PPV also plays a crucial role in addressing the underlying pathological processes of PDR. The procedure allows for the release of vitreoretinal traction by removing the posterior hyaloid membrane, the thin layer of tissue that separates the vitreous from the retina, and by excising or segmenting any fibrovascular proliferations that have developed. This is critical in preventing or treating tractional retinal detachment, a serious complication of PDR that can lead to permanent vision loss. Endolaser photocoagulation is a complementary procedure performed during PPV to treat the ischemic retina that drives the neovascular process. This involves the application of laser energy to the peripheral retina, creating a pattern of small, controlled burns. The rationale behind PRP is multifactorial. It reduces the metabolic demand of the outer retina, decreasing its oxygen consumption and thereby improving oxygen diffusion to the inner retina from the choroid. Furthermore, it leads to the downregulation of VEGF and other angiogenic factors, effectively suppressing neovascularization and reducing the risk of further bleeding.[14,15]

The decision to proceed with PPV in this case was made relatively early in the course of the patient's presentation, approximately one month after the onset of symptoms. This aligns with the findings of the Diabetic Retinopathy Vitrectomy Study (DRVS) and subsequent studies, which have demonstrated that early vitrectomy, generally within one to six months of the onset of severe, non-clearing VH, is associated with better visual outcomes compared to delayed intervention. Several factors contribute to the rationale for early surgical intervention. Firstly, prompt removal of the VH allows for earlier visual rehabilitation, enabling patients to regain functional vision more quickly. Secondly, it facilitates a more thorough examination of the fundus, allowing for the identification and treatment of any underlying retinal pathology, such as tractional retinal detachment or retinal breaks, which may be obscured by the hemorrhage. Thirdly, it minimizes the risk of developing secondary complications associated with prolonged VH, such as ghost cell glaucoma or hemolytic glaucoma, which can further compromise visual function. Ghost cell glaucoma occurs when degenerated red blood cells, known as ghost cells, obstruct the trabecular meshwork, the eye's drainage system, leading to an increase in intraocular pressure. Hemolytic glaucoma is a similar condition caused by the accumulation of red blood cell debris. Additionally, prolonged VH can lead to the organization of blood clots and the formation of fibrovascular membranes, which can exert traction on the retina and result in tractional retinal detachment, a more complex and challenging condition to treat. While some studies have raised concerns about potential retinal toxicity from iron released during the breakdown of hemoglobin in long-standing VH, it is important to note that many patients do achieve good visual recovery even after delayed vitrectomy. This suggests that significant irreversible retinal damage may not be a universal consequence of prolonged VH. However, the balance of evidence generally favors prompt surgical intervention to optimize visual outcomes and minimize the risk of complications.[16-18]

The surgical procedure in this case was performed using a 23-gauge micro-incision vitrectomy system (MIVS). MIVS represents a significant advancement in vitreoretinal surgery, offering several potential advantages over traditional 20-gauge vitrectomy. The smaller gauge of the instruments used in MIVS results in smaller sclerotomies, or incisions in the sclera, which are associated with reduced surgical trauma, less postoperative inflammation, and faster healing times. This can lead to a more comfortable

postoperative course for the patient and potentially earlier visual rehabilitation. The key steps of the vitrectomy procedure included a core vitrectomy to remove the central vitreous and the hemorrhage, followed by meticulous cleaning and shaving of the vitreous base to ensure complete removal of any residual vitreous and prevent subsequent tractional complications. In addition, careful attention was paid to the vitreoretinal interface, with the induction or completion of posterior vitreous detachment (PVD) if not already present, and the removal or segmentation of fibrovascular membranes to relieve traction on the retina. This is a critical aspect of the surgery, as it minimizes the risk of postoperative complications such as recurrent VH or iatrogenic retinal breaks, which can occur during membrane peeling. Iatrogenic retinal breaks are tears or holes in the retina that are caused by the surgical procedure itself.[19,20]

4. Conclusion

In conclusion, this case report illustrates the successful management of severe visual loss secondary to vitreous hemorrhage in a patient with proliferative diabetic retinopathy through timely surgical intervention. The application of 23-gauge pars plana vitrectomy, combined with endolaser photocoagulation, facilitated the effective clearance of the vitreous hemorrhage and addressed the underlying pathology of proliferative diabetic retinopathy. This approach led to a significant improvement in the patient's visual acuity, underscoring the importance of prompt and appropriate surgical management in these cases. The case also highlights the critical role of meticulous surgical technique, including the use of micro-incision vitrectomy systems, in achieving favorable anatomical and functional outcomes. Furthermore, it emphasizes the necessity of ongoing management of the patient's systemic conditions, specifically diabetes mellitus and hypertension, to optimize long-term visual preservation and prevent disease progression. Continued follow-up and patient education are essential components of care to ensure the maintenance of visual acuity and overall ocular health.

5. References

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