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# Management of persistent exudative retinal detachment: exploring etiology and surgical outcomes

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## Abstract

**Background** This report aims to present the causes, clinical features, and surgical outcomes of persistent exudative retinal detachment (ERD) in a single tertiary referral center experience.

**Methods** We retrospectively analyzed 48 patients who underwent vitreoretinal intervention for persistent ERD between 2017 and 2024. The study assessed patient demographics, underlying causes of ERD, the success rate of surgical interventions, and postoperative visual outcomes.

**Results** Of the 2040 eyes with retinal detachment treated at our center, 48 (2.35%) were diagnosed with ERD. Coats disease was the most frequent underlying cause, identified in 18 (37.5%) of ERD cases. Choroidal hemangioma ($n=6$, 12.5%) and nanophthalmos ($n=5$, 10.4%) were the next most common etiologies. The study population comprised 48 patients (30 males and 18 females) with a mean age of 37.48 years (range, 4–88 years). The mean best-corrected visual acuity remained stable from baseline to follow-up. The recurrence rate following primary surgery was 29.2%. Patients underwent a mean of $1.75 \pm 1.00$ surgeries. Globe preservation was achieved in 44 eyes (91.7%), while phthisis bulbi developed in 4 eyes (8.3%).

**Conclusion** Vitreoretinal surgery may be considered as a salvage procedure in cases where persistent ERD threatens the posterior pole. In our study, Coats' disease, choroidal hemangioma, and nanophthalmos were identified as the most common etiologies associated with persistent ERD. Surgical intervention has the potential to preserve vision, but the high recurrence rate necessitates a cautious approach and the possibility of multiple surgeries.

**Keywords** Exudative retinal detachment, Coats' disease, Vitreoretinal surgery, Surgical outcomes

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## Introduction

Exudative retinal detachment (ERD) is a condition that arises from dysfunction in the retinal pigment epithelium or vascular compromise, which leads to the accumulation of subretinal fluid. Potential causes include inflammatory, infectious, or neoplastic processes in the choroid or retina [1]. The prognostic outcomes for ERD exhibit significant variability and are strongly influenced by the underlying etiology. Acute, self-resolving etiologies of ERD are associated with a favorable prognosis, while chronic, irreversible etiologies present a poor prognosis [2]. While medical management represents the primary therapeutic approach for ERDs, pars plana vitrectomy (PPV) may be warranted in cases of persistent posterior pole involvement that demonstrate resistance to medical treatment. Surgical intervention is typically reserved as a salvage procedure, it plays a crucial role in optimizing visual outcomes or preventing enucleation in advanced presentations of ERD [2].

The management of ERD exhibits significant variability, with no universally accepted surgical algorithm. The role of vitreoretinal surgery in treating ERD remains a topic of debate within the ophthalmic literature. Existing studies have documented a range of surgical approaches based on the patient's etiology, age, and disease severity. The impaired blood-retinal barrier and increased inflammation in ERD cases may result in the recurrence of subretinal fluid (SRF), proliferative vitreoretinopathy, and ultimately surgical failure [1]. This report aims to present the causes, clinical features, and surgical outcomes of persistent ERD in a single tertiary referral center experience.

This study evaluated the characteristics of patients undergoing surgery for persistent ERD, investigating both its epidemiological and clinical features, and analyzing surgical outcomes. A dearth of data exists within the current ophthalmic literature regarding the prevalence of ERD. Therefore, we additionally sought to determine the prevalence of ERD in a large sample of patients with retinal detachment who were treated surgically at a tertiary vitreoretinal surgery center.

## Method

We performed a retrospective, descriptive, single-center study to investigate the characteristics of patients undergoing surgery for ERD. A consecutive series of patients diagnosed with ERD who underwent surgery at a tertiary referral center in Turkey between 2017 and 2023 were the subjects of the data collection. The study was approved by the Hamidiye Ethics Committee of University of Health Sciences. All authors adhered to the tenets of the Declaration of Helsinki.

This study included patients who underwent surgical intervention for persistent ERD despite an aggressive medical treatment. Patients with rhegmatogenous and tractional retinal detachment were excluded. The diagnosis of ERD was established based on clinical findings, including the presence of a convex retinal detachment, the absence of retinal breaks, and no evidence of vitreoretinal traction. The diagnosis was further supported by shifting SRF on patient repositioning and a suspected inflammatory etiology. Additionally, cases with intraoperative retinal breaks were excluded from the study.

A comprehensive medical history was obtained from each participant, encompassing demographic information, details of the disease process, laterality, underlying etiology, and any concurrent systemic conditions. We meticulously extracted and recorded the following data points from the database: preoperative, and final best-corrected visual acuity (BCVA); intraocular pressure at each follow-up visit; details of the surgical procedure; number of retinal detachment recurrences; and final anatomical status of the retina. The study comprised solely of patients who underwent surgical intervention for persistent ERD despite intensive medical treatment.

To evaluate the size and extent of the retinal detachment, patients underwent regular follow-up examinations, including fundus photography and ultrasound imaging. A multidisciplinary approach was employed to comprehensively evaluate all cases, ultimately guiding the decision for surgical intervention. Surgical intervention was undertaken in cases where patients exhibited no improvement with medical treatment or a demonstrable worsening of the ERD. Before surgery, patients received a comprehensive explanation of the surgical procedure and provided written informed consent. Four surgical approaches are employed for retinal detachment repair, each customized based on individual factors such as etiology, age, and disease severity: scleral buckling (SB) with external drainage, PPV with external drainage, combined PPV and SB with external drainage, and scleral window surgery. A four-quadrant partial-thickness sclerectomy and sclerotomy technique was employed for scleral window surgery. In recurrent cases, PPV was employed as the sole surgical approach for patients with a prior SB. Conversely, patients without a prior SB underwent a combined procedure of PPV and SB for their recurrent detachment.

### Statistical analysis

Data analysis was conducted using SPSS for Windows version 20 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized as frequencies and percentages, presented in the format n (%). The normality of continuous variables was assessed with the Shapiro-Wilk test. For continuous data with a normal distribution, descriptive statistics included the mean and standard deviation (SD). Continuous variables that did not conform to a

**Table 1** Etiology of exudative retinal detachments

| Etiology | Frequency (number of eyes) | Percentage (%) |
|---|---|---|
| Coats disease | 18 | 37.5 |
| Choroidal hemangioma | 6 | 12.5 |
| Nanophthalmos | 5 | 10.4 |
| Secondary metastases | 2 | 4.2 |
| Post trabeculectomy | 2 | 4.2 |
| Idiopathic uveal effusion syndrome | 2 | 4.2 |
| Intraocular lymphoma | 2 | 4.2 |
| Uveitis | 2 | 4.2 |
| Exudative age-related macular degeneration | 2 | 4.2 |
| Familial exudative vitreoretinopathy | 1 | 2.1 |
| Coats-like retinitis pigmentosa | 1 | 2.1 |
| Retinal capillary hemangioblastoma | 1 | 2.1 |
| Choroidal melanoma | 1 | 2.1 |
| Unknown | 3 | 6.3 |

**Table 2** The age distribution of the exudative retinal detachment patients

| Age | Number of patients | Percentage (%) |
|---|---|---|
| < 18 years | 12 | 25 |
| 18–60 years | 29 | 60.42 |
| > 60 years | 7 | 14.58 |

normal distribution were expressed as the median and interquartile range (IQR), with the values presented as Median (IQR 25–75). In this context, the median represents the central tendency, or the 50th percentile. The IQR, calculated as the range between the 25th percentile (Q1) and the 75th percentile (Q3), indicates the spread of the middle 50% of values. For comparisons between two dependent variables, we used the Wilcoxon signed-rank test in cases of non-normally distributed data, and the paired t-test for normally distributed data. A p-value of $<0.05$ was considered statistically significant.

## Results

Of the 2040 eyes with retinal detachment treated at our center, 48 (2.35%) were diagnosed with ERD. The etiology of the ERDs is represented in Table 1. Coats disease was the most frequent underlying cause, identified in 18 (37.5%) of ERD cases. Choroidal hemangioma ($n=6$, 12.5%) and nanophthalmos ($n=5$, 10.4%) were the next most common etiologies. The study population comprised 48 patients (30 males and 18 females) with a mean age of 37.48 years (range, 4–88 years). The age distribution of the population is presented in Table 2.

ERD was bilateral in 3 patients (6.3%) and unilateral in 45 patients (93.8%). In cases in which both eyes were affected, surgery was performed on one eye, while the other eye continued to be treated with medical therapy. Primary surgical interventions included PPV in 27 patients, SB with PPV in 10 patients, SB alone in 6 patients, and partial-thickness sclerectomy in 5 patients. The mean BCVA remained stable from baseline to follow-up. The pre-operative BCVA value was $2.02\pm0.59$ LogMAR, and the post-operative value was $2.00\pm0.72$ LogMAR. The recurrence rate following primary surgery was 29.2% (14/48). Patients underwent a mean of $1.75\pm1.00$ surgeries. Globe preservation was achieved in 44 eyes (91.7%), while phthisis bulbi developed in 4 eyes (8.3%). During the intraoperative period, subretinal haemorrhages were observed in four patients due to external drainage. These resolved during the postoperative period. Furthermore, eight patients developed postoperative glaucoma, which was successfully managed with medical therapy. In patients undergoing PPV or a combined SB and PPV approach, tamponading agents such as silicone oil or $C_3F_8$ gas were employed. Among these, 15 patients received silicone oil as a tamponade; it was subsequently removed in all but four cases where phthisis bulbi developed, rendering silicone oil removal unfeasible. In patients who had not experienced any complications, the silicone oil was removed approximately six months after the initial surgery.

Table 3 summarizes the clinical characteristics, surgical procedures performed, and postoperative outcomes of patients diagnosed with ERD. The data are stratified by the most common underlying etiologic subgroups. Table 4 provides a comprehensive summary of patients who underwent surgical intervention for ERDs caused by other etiologies. The table includes detailed information on the patient's baseline characteristics, preoperative findings, and surgical outcomes.

Seven patients presented with stage 3B Coats disease, while 11 presented with stage 4. All cases of Idiopathic Uveal Effusion Syndrome identified were classified as Type 3. These patients exhibited non-nanophthalmic eyes, with normal scleral size and thickness. Two patients diagnosed with ERD secondary to choroidal metastasis had breast cancer as the primary malignancy. The patient with Familial exudative vitreoretinopathy presented with Stage IVA disease at diagnosis.

## Discussion

This study represents the largest reported case series to date, analyzing data from 48 patients who underwent surgical intervention for ERD. Our institutional data demonstrates a 2.35% prevalence of ERD, contributing valuable real-world data to the limited existing body of knowledge on the epidemiology of this condition. ERD in this patient cohort was primarily associated with Coats' disease, choroidal hemangioma, and nanophthalmos. The surgical intervention achieved visual preservation in a majority of cases. However, considering the whole

**Table 3** Clinical features, surgical procedures, and postoperative results of the most common etiologic subgroups of Exudative Retinal detachments

| | Coats disease (*n* = 18) | Choroidal hemangioma (*n* = 6) | Nanophthalmos (*n* = 5) |
|---|---|---|---|
| Sex (F/M) | (6/12) | (2/4) | (1/4) |
| Age (years) | 15.00 (12.50–25.00) | 36.50 (18.75-49.00) | 48.00 (44.00–48.00) |
| **Initial operative details** | | | |
| PPV + SB (n, %) | 6 (33.3%) | 0 (0.0%) | 0 (0.0%) |
| PPV only (n, %) | 8 (44.4%) | 5 (83.3%) | 0 (0.0%) |
| SB (n, %) | 4 (22.2%) | 1 (16.7%) | 0 (0.0%) |
| Scleral Window Surgery (n, %) | 0 (0.0%) | 0 (0.0%) | 5 (100.0%) |
| Lens Surgery (n, %) | 6 (33.3%) | 1 (16.7%) | 0 (0.0%) |
| **Anatomical Success** | | | |
| Primary Success (n, %) | 11 (61.1%) | 1 (16.7%) | 5 (100.0%) |
| Final Success (n, %) | 14 (77.8%) | 5 (83.3%) | 5 (100.0%) |
| Mean number of operations | 1.00 (1.00–2.00) | 2.50 (1.75-4.00) | 1.00 (1.00–1.00) |
| **Visual outcomes** | | | |
| Preop BCVA (logMAR) | 1.90 (1.60–2.55) | 2.30 (1.97–2.85) | 1.90 (1.30–2.30) |
| Final BCVA (logMAR) | 2.30 (1.30–2.80) | 2.30 (1.90-3.00) | 1.30 (0.84–1.60) |
| p value for BCVA* | 0.849 | 0.672 | **0.032** |

Wilcoxon signed-rank test* Non-parametric data expressed as Median (Interquartile range 25—Interquartile range 75). F; female, M; male, BCVA; best-corrected visual acuity, logMAR; logarithm of the minimum angle of resolution, SB; Scleral buckling, PPV; Pars plana vitrectomy

patient cohort, we observed a high rate of recurrence. Additional surgical intervention was required in the high number of patients with ERD secondary to choroidal haemangioma.

Coats disease was the most frequent underlying cause, identified in 18 (37.5%) of ERD cases. In Coats' disease with ERD, ablation therapy, and laser photocoagulation may exhibit limited efficacy in disease control and stabilization. Notably, laser treatment can be ineffective due to the inability to create chorioretinal burns on the detached retina. Additionally, direct coagulation in eyes with ERD is often challenging due to the obscured visualization of peripheral retinal vessels. According to the literature, SRF can be drained externally or internally, with or without vitrectomy and endophotocoagulation. Each technique has its advantages and disadvantages. Vitrectomy facilitates the removal of vitreous, thereby eliminating a potential source of vascular endothelial growth factor (VEGF) [3]. PPV was the primary surgical modality in most patients (12 of 18) with Coats' disease. This approach facilitates intraoperative laser photocoagulation, a crucial therapeutic component in managing this condition. The surgical approach employed in this study involved external drainage in conjunction with PPV. Internal drainage techniques were deliberately avoided due to concerns identified in the literature. The use of internal drainage carries the risk of creating retinal breaks, which, in the context of Coats' disease, could lead to persistent total retinal detachments – either exudative or rhegmatogenous. This potential complication arises from the underlying exudative process and compromised retinal pigment epithelium function characteristic of these diseased eyes [4].

There are a number of disadvantages to vitrectomy, including a higher risk of complications and technical difficulties. There are also relatively high risks of developing proliferative vitreoretinopathy in eyes with high levels of VEGF. Shields pointed out that younger patients generally have more severe disease and a greater extent of retinal detachment. Studies involving younger patients tend to produce worse results [3, 5]. Our analysis revealed a mean age of 15.00 years (IQR: 12.50–25.00) in patients with ERD secondary to Coats' disease. This group also exhibited a high recurrence rate, which could potentially be associated with their younger mean age.

Circumscribed choroidal hemangioma is a rare, benign hamartomatous neoplasm that mainly affects the posterior pole of the eye. Patients with choroidal hemangioma have a significant risk of vision loss, often caused by ERD. Several treatment modalities have been used to treat secondary ERD in choroidal hemangioma, including external beam radiotherapy, vitrectomy, proton beam radiotherapy, posterior sclerectomy, and photodynamic therapy [6–10]. Six patients in our cohort presented with ERD caused by choroidal hemangioma. These patients had undergone prior interventions in the Department of Ocular Oncology, including cryotherapy, brachytherapy, or photodynamic therapy. However, despite these treatments, persistent ERD involving the fovea persisted. Revision surgery was required in this subgroup, with recurrence in five of the six patients. Globe preservation was achieved in all cases. Visual outcomes varied: one patient demonstrated an improvement in visual acuity, two patients experienced a decline in visual acuity, and three patients maintained stable visual acuity.

Two of these patients also presented with Sturge-Weber syndrome. Prior to referral to our department, both patients with Sturge-Weber syndrome received plaque radiotherapy for their diffuse choroidal hemangioma with ERD. Follow-up examinations conducted by the ocular oncology department did not reveal any evidence of ERD regression. Various treatment modalities, including medical management, laser therapy, PDT, and different radiation therapy options, have been employed for ERDs associated with diffuse choroidal hemangioma. There is currently no evidence in the literature regarding surgical treatment for these patients. However, a recent

**Table 4** Baseline demographics, preoperative findings, and surgical outcomes in patients with exudative retinal detachments due to other etiologies

| Case | Age (years) | Etiology | Initial operation | Number of operations | Preop BCVA (logMAR) | Final BCVA (logMAR) | Final Retinal Status |
|---|---|---|---|---|---|---|---|
| 1 | 45 | Secondary metastases | PPV | 1 | 1.30 | 2.80 | Attached |
| 2 | 39 | Secondary metastases | PPV | 1 | 2.80 | 3.00 | Attached |
| 3 | 16 | Post trabeculectomy | PPV | 1 | 2.80 | 2.80 | Attached |
| 4 | 76 | Post trabeculectomy | PPV | 1 | 2.30 | 1.90 | Attached |
| 5 | 41 | Idiopathic uveal effusion syndrome | PPV | 1 | 2.30 | 2.30 | Attached |
| 6 | 75 | Idiopathic uveal effusion syndrome | PPV | 1 | 1.90 | 0.69 | Attached |
| 7 | 65 | Intraocular lymphoma | PPV | 1 | 2.30 | 2.30 | Attached |
| 8 | 79 | Intraocular lymphoma | PPV | 1 | 2.30 | 1.90 | Attached |
| 9 | 44 | Uveitis | PPV + SB | 2 | 2.30 | 2.30 | Attached |
| 10 | 49 | Uveitis | PPV + SB | 1 | 1.90 | 2.30 | Attached |
| 11 | 88 | Exudative age-related macular degeneration | PPV | 1 | 2.30 | 2.30 | Attached |
| 12 | 72 | Exudative age-related macular degeneration | PPV | 1 | 1.00 | 1.90 | Attached |
| 13 | 47 | Familial exudative vitreoretinopathy | PPV + BS | 5 | 2.30 | 2.30 | Attached |
| 14 | 43 | Coats-like retinitis pigmentosa | PPV | 2 | 2.30 | 3.00 | Attached |
| 15 | 21 | Retinal capillary hemangioblastoma | PPV + BS | 1 | 0.52 | 1.90 | Attached |
| 16 | 48 | Choroidal melanoma | PPV | 1 | 1.90 | 1.90 | Attached |
| 17 | 55 | Unknown | PPV | 1 | 1.90 | 1.30 | Attached |
| 18 | 47 | Unknown | PPV | 1 | 2.30 | 2.30 | Attached |
| 19 | 56 | Unknown | BS | 1 | 1.00 | 0.39 | Attached |

BCVA; best-corrected visual acuity, logMAR; logarithm of the minimum angle of resolution, SB; Scleral buckling, PPV; Pars plana vitrectomy

case report has described recurrent ERD in a young patient with Sturge-Weber Syndrome following intraocular pressure lowering treatment. The authors opted for posterior sclerectomy to treat SRF in this patient who had previously undergone proton beam therapy [7]. In our study, both patients underwent PPV as the initial surgical intervention. One patient experienced three subsequent recurrences, while the other patient only had one recurrence. Following these recurrent surgeries, both patients demonstrated maintenance of visual acuity and preservation of their globes at the final follow-up.

It has been proposed that the pathogenesis of nanophthalmos-related uveal effusion involves reduced permeability of the sclera to fluid and proteins, compression of the vortex veins, and increased permeability of the choroid. Surgical treatment is the preferred option for the management of uveal effusion, and a variety of surgical techniques have been reported to be effective in the literature [11, 12]. Our series utilized the four-quadrant partial-thickness sclerectomy and sclerotomy technique for scleral window surgery. This technique aims to solve the pathophysiological problems caused by thickened sclera in the eyes with nanophthalmos. In 2022, Ozdek et al. demonstrated the efficacy of quadrantic partial-thickness sclerectomy/sclerotomy for uveal effusion in nanophthalmic eyes, achieving a 78.6% final retinal reattachment rate and 85.7% BCVA improvement [12]. Mansour et al. reported successful resolution of uveal effusions in eight nanophthalmic eyes following an extensive circumferential, partial-thickness scleral excision [11]. This study employed a four-quadrant partial-thickness sclerectomy and sclerotomy technique for scleral window surgery in all nanophthalmic patients, achieving a 100% success rate.

Exudative retinal detachment is associated with a wide range of ocular and systemic pathologies. The source of the SRF in ERD can originate from either the retinal or choroidal vasculature [13]. ERD may be a presenting manifestation of secondary choroidal metastases. The presence of metastases may be indicative of an underlying systemic malignancy. For patients with disseminated disease encompassing choroidal metastases, systemic therapy remains the primary treatment modality [2]. A review of the existing literature reveals a paucity of data on surgery for ERD due to secondary metastasis, with only a few case-reports available [14]. In the cases presented in this study, surgical intervention was deemed necessary due to the persistence of retinal detachment despite the administration of systemic treatment. Following PPV, anatomical success was achieved in both cases, and no recurrence was observed.

Given that primary intraocular lymphoma primarily manifests as vitreous opacities and subretinal infiltrative lesions, its traditional diagnostic approach relies on the

evaluation of cellular morphology obtained through PPV. In our patients, the definitive cause of the retinal detachment was established by performing a PPV with vitreous sampling. All patients underwent a complete PPV with silicone oil tamponade, which was successfully completed in all cases and led to successful retinal reattachment. A recent case report described draining SRF through an iatrogenic tear in a case of intraocular lymphoma. However, this approach required re-operation due to persistent SRF [15]. In the patients presented here, external drainage of the SRF achieved a successful outcome with a single operation. This suggests that external drainage may be a more effective strategy in similar situations, potentially reducing the risk of recurrence and facilitating complete removal of SRF.

Uveal effusion syndrome is a rare condition characterized by idiopathic serous detachment of the retina and choroid. The proposed mechanism involves compression of the vortex veins by a thickened sclera, leading to choroidal congestion and SRF accumulation [16]. Scleral window surgery represents the primary surgical treatment modality. For nanophthalmic, type 1, and 2 Uveal effusion syndrome eyes, scleral window surgery may be the preferred initial approach. Type 3 Uveal effusion syndrome is observed in non-nanophthalmic eyes with normal scleral size and thickness and is reportedly unresponsive to this approach. Our cases belonged to this less common type. The existing literature indicates that vitrectomy for non-nanophthalmic Uveal effusion syndrome may facilitate retinal reattachment and potentially enhance visual outcomes [17]. In these cases, we performed vitrectomy with external drainage, and in two of our patients, we obtained a favourable outcome with a single surgery.

Post-trabeculectomy transient choroidal detachments are a relatively frequent occurrence, often manifesting subtly and resolving spontaneously with conservative management. Conversely, the incidence of ERD following trabeculectomy remains exceedingly low, with only a limited number of cases reported in the literature [18]. Our findings suggest external drainage with PPV as a potentially efficacious treatment for this patient cohort.

In this study, we employed an external drainage technique in patients who underwent PPV and SB. There is a paucity of evidence in the literature on the optimal approach to SRF drainage in this patient group. A recent case report documented successful retinal reattachment in a patient with ERD secondary to central serous chorioretinopathy utilizing external drainage and vitrectomy. The authors contended that their approach of external drainage offered a potentially safer and more efficacious alternative to internal drainage via vitrectomy, citing a prior case by Kang et al. where vitrectomy with internal drainage reportedly resulted in recurrence [19, 20]. A recent multicenter study has indicated that the potential benefits of external drainage may be reflected in improved anatomical success rates in advanced Coats disease patients undergoing PPV with external drainage compared to those without. Furthermore, the authors posited that external drainage offers the advantage of preventing retinal tears in severely inflamed eyes and is particularly useful for pediatric patients, thereby justifying its adoption in surgical practice [21]. In the event of ERD, retinal reattachment may prove challenging in instances where a tear has been created on a retina with a substantial quantity of exudate surrounding it. This is because the application of a laser burn is not possible on a retina with an underlying exudate, and the risk of developing proliferative vitreoretinopathy may also be relatively high in an eye with elevated inflammation [3]. Analysis of all cases revealed a mean number of surgeries of $1.75 \pm 1.00$ in the overall patient population. In the Coats disease subgroup, the number of surgeries had a median of 1.00 (IQR: 1.00–2.00). We advocate for prioritizing the avoidance of iatrogenic tears, especially in ERDs, given the potential safety advantages offered by external drainage.

In 2016, Paulsen et al. conducted a study involving 779 surgeries to investigate the incidence of retinal detachment and evaluate patient profiles and surgical characteristics. However, the inclusion of only two patients undergoing primary surgery for ERD limited the sample size for significant statistical analysis, precluding the generation of reliable data on either incidence or prevalence. In contrast, our current study analyzed a larger cohort of 2040 surgeries. Furthermore, as a referral center for advanced surgical procedures, our clinic manages a higher volume of patients undergoing ERD surgery. This study represents the largest series reported in the current ophthalmic literature on patients undergoing surgery for ERD [22].

In our study, Coats' disease, choroidal hemangioma, and nanophthalmos were identified as the most common etiologies associated with persistent ERD. Surgical intervention has the potential to preserve vision, but the high recurrence rate necessitates a cautious approach and the possibility of multiple surgeries.

This study represents the largest reported case series of surgically treated ERD to date, analyzing data from 48 patients. Our clinic population additionally identified a 2.35% prevalence of ERD, contributing valuable real-world data to the presently limited epidemiological knowledge of this condition. Vitreoretinal surgery may be considered as a salvage procedure in cases where persistent ERD threatens the posterior pole. The study investigated the surgical management of ERDs, employing four established surgical techniques. Our findings highlight

the importance of tailoring surgical approaches to specific patient presentations within the ERD population.

It is important to consider the limitations of this study when interpreting the findings. Firstly, the retrospective, single-center design may limit the generalizability of the results to other clinical settings or broader populations. Consequently, the findings may primarily reflect the practices and patient characteristics unique to our institution. Further multicenter studies would be valuable to validate these results across different populations. Secondly, certain subgroups within the study were characterized by relatively small sample sizes. Consequently, the statistical power to perform comparisons was limited, which may have influenced the statistical outcomes. The inclusion of larger sample sizes in future studies would assist in enhancing the statistical robustness of comparisons and facilitating more definitive conclusions.

In light of our findings and a comprehensive review of the existing literature, external SRF drainage appears to be a more suitable approach for ERDs. In our study, Coats' disease, choroidal hemangioma, and nanophthalmos were identified as the most common etiologies associated with persistent ERD. Surgical intervention has the potential to preserve vision, but the high recurrence rate necessitates a cautious approach and the possibility of multiple surgeries. Patients with ERD from choroidal hemangioma had higher recurrence rates, highlighting the need for surgical preparedness for reoperations and thorough patient education on potential repeat interventions.

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**Author contributions**
M.O. conducted the data analysis and interpretation, prepared the manuscript, drafted the article, and performed the literature search. R.A. collected the data, contributed to data analysis and interpretation, and edited the manuscript. Ö.A. executed the study, reviewed the manuscript, revised the article, and was responsible for the conception and design of the study. All authors reviewed the manuscript.

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**Data availability**
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

## Declarations

**Ethics approval and consent to participate**
The study was approved by the Hamidiye Ethics Committee of University of Health Sciences. All authors adhered to the tenets of the Declaration of Helsinki. Written informed consent was provided from all participants enrolled in the study.

**Consent for publication**
Not Applicable.

**Competing interests**
The authors declare no competing interests.

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