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ORIGINAL ARTICLE / ОРИГИНАЛНИ РАД

The epidemiology and clinical characteristics of rhegmatogenous retinal detachment in a Serbian tertiary health care institution – a two-year-long retrospective study

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SUMMARY

Introduction/Objective Rhegmatogenous retinal detachment is an ophthalmic emergency which can result in vision loss. The aim of our study was to evaluate the demographic, epidemiological, and clinical characteristics and treatment methods of rhegmatogenous retinal detachment.

Methods This retrospective study was conducted at the Department of Vitreoretinal Surgery and Eye Trauma in the period between January 1, 2024, and December 31, 2025. The data included sex, age, season, onset of symptoms, presence of myopia, previous cataract surgery, as well as the method of treatment.

Results Out of 275 patients, there were 177 males (64.36%) and 98 females (35.64%). The majority of the study population was 61–80 years old (n = 140, 50.91%). The most commonly selected surgical procedure was pars plana vitrectomy (n = 226, 81.88%). Silicone oil was the preferred tamponade (n = 191, 75.2%). Best-corrected visual acuity on admission was worse than 0.1 in the majority of the affected eyes (n = 177, 64.13%), while one month after surgery nearly half (n = 130, 47.1%) achieved visual acuity between 0.1 and 0.5. Recurrent detachment occurred in 29 patients (10.32%).

Conclusion In conclusion, our study emphasizes that rhegmatogenous retinal detachment primarily affects males and individuals over 60 years of age within our region. Consequently, there is an urgent need to implement targeted public health initiatives to educate high-risk individuals on early symptoms, optimize primary ophthalmic triage, and establish efficient referral pathways to ensure timely surgical intervention and preserve functional vision.

Keywords: rhegmatogenous retinal detachment; pars plana vitrectomy; visual outcomes; epidemiology; Serbia

INTRODUCTION

Rhegmatogenous retinal detachment (RRD) is an ophthalmic emergency which can result in vision loss. It represents separation of the neurosensory retina from the retinal pigment epithelium caused by retinal breaks – tears or holes. Posterior vitreous detachment is a normal, age-related process. However, it can lead to the formation of retinal breaks in 8–16% of patients. Additionally, these breaks can progress to RRD in up to half of cases, if left untreated [1, 2].

Recent epidemiological data from 2024 estimate the mean annual incidence of RRD in Europe at 14.5 cases per 100,000 persons, with longitudinal trends pointing towards a projected doubling in incidence over the next 20 years [3].

Rhegmatogenous retinal detachment requires surgical treatment and can be managed by three main procedures: scleral buckling (SB), pars plana vitrectomy (PPV) and pneumatic retinopexy. Success rates with SB have been reported to be 66–96.7%; PPV is reported to be successful in about 71–97% of cases [4], while pneumatic retinopexy was successful in 51–82% [5]. Selection of a surgical procedure involves consideration of patients' characteristics, ocular comorbidities and characteristics of the retinal detachment itself, as well as the personal preference of the surgeon [6]. Previous studies have shown that even with appropriate and prompt treatment, many patients with RRD still need additional surgery and often do not fully recover functional vision in the affected eye [7].

The aim of our study was to evaluate the demographic, epidemiological, and clinical characteristics and treatment methods of patients hospitalized and treated for RRD at the Department of Vitreoretinal Surgery and Eye Trauma in a tertiary health care institution. These findings can assist in the early recognition, evaluation, and treatment of RRD, which contributes to the prevention of irreversible vision loss.

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METHODS

This retrospective study was conducted in the period between January 1, 2024, and December 31, 2025. The study included all patients hospitalized at the Department of Vitreoretinal Surgery and Eye Trauma for the treatment of RRD in the specified period. The patients' data were collected from the Heliant Healthcare medical system. The data included sex, age, season, onset of symptoms, presence of myopia, previous cataract surgery, as well as the method of treatment and postoperative complications.

Patients with other forms of retinal detachment (tractional and exudative) and those who presented with retinal redetachment were excluded from the study.

Patients who met the inclusion criteria underwent a complete ophthalmic examination of both eyes (best-corrected visual acuity (BCVA) measured on a Snellen chart, intraocular pressure (IOP) measurement using Goldmann applanation tonometry, anterior segment examination and indirect fundoscopy using a slit-lamp biomicroscope).

Patients were divided according to sex and into four groups according to age (≤ 40, 41–60, 61–80 and ≥ 81). Best-corrected visual acuity was analyzed at admission and one month postoperatively. According to BCVA, patients were divided into three groups (BCVA ≤ 0.1, 0.1–0.5, and ≥ 0.6).

Statistical analysis

Statistical analysis was performed using Microsoft Excel 2016 software (Microsoft Corporation, Redmond, WA, USA), Google Sheets (Google LLC, Mountain View, CA, USA), and R version 4.3.1 (2023 The R Foundation for Statistical Computing). Descriptive data are presented as absolute and relative numbers in the form of n (%). The normality of distribution for numerical variables was assessed using the Shapiro–Wilk test. Numerical variables deviated from a normal distribution ($p < 0.05$) and were presented as medians and ranges. The Mann–Whitney U test was used to compare two independent groups, the Kruskal–Wallis test for comparisons among multiple groups, and the Wilcoxon test was used to evaluate dependent variables. Categorical variables are expressed as frequencies and percentages, and were compared using the χ^2 test. Statistical significance was established at a p-value of less than 0.05.

RESULTS

During the defined period, a total of 275 patients (276 eyes) were hospitalized for RRD. There were significantly ($p < 0.001$) more males (n = 177, 64.36%) than females (n = 98, 35.64%), with a male-to-female ratio of 1.8:1. The youngest patient was 23 years old, and the oldest was 87, with a median age of 62. There was a statistically significant difference in the distribution of patients across age groups ($p < 0.001$). The majority of the study population was 61–80 years old (n = 140, 50.91%).

The number of cases whose RRD involved the fovea (macula-off RRD) was 220 (79.71%). In the remaining 56 (20.29%) the fovea was preserved (macula-on RRD). Patients with macula-off RRD presented significantly later ($p = 0.002$) with a median delay of 5.5 days (interquartile range (IQR) 11), while in macula-on patients it was three days (IQR 5). Details regarding the age distribution of the entire study group, as well as foveal involvement among age groups, are presented in Table 1.

Table 1. Age distribution and distribution of foveal involvement in all study groups

Age (years)	n (%)	Macula-on RRD (n, %)	Macula-off RRD (n, %)
≤ 40	9 (3.27)	1 (1.79)	8 (3.63)
41–60	120 (43.64)	34 (60.71)	87 (39.55)
61–80	140 (50.91)	21 (37.5)	119 (54.09)
81 and older	6 (2.18)	0	6 (2.73)

RRD – rhegmatogenous retinal detachment

The median time from onset of symptoms until the first examination was five days (IQR 12; range: 1–120). There was a statistically significant difference in onset of symptoms between age groups ($p < 0.001$). The shortest time from symptom onset to the first examination was observed in the group of patients aged 41–60 years (four days), while the longest time was recorded in patients aged 61–80 years (seven days). The median time to presentation was seven days for women and four days for men ($p = 0.002$).

Seasonal analysis showed the highest number of RRD cases in spring (n = 82, 29.71%) and seasonal distribution was statistically uneven ($p = 0.024$).

The right eye was more frequently affected (n = 152, 55.07%). Of the 275 patients, one had bilateral eye involvement at the time of examination. The majority of the eyes with RRD were phakic (n = 198, 71.74%).

Retinal breaks were classified based on the quadrant in which they were located: superotemporal (STQ), superonasal (SNQ), inferotemporal (ITQ), and inferonasal (INQ). Most cases of RRD were caused by a superotemporal retinal break (n = 175, 55.56%). Table 2 provides comprehensive information on the affected eye (right or left), seasonality, lens status, and location of the retinal break.

In the majority of the affected eyes (n = 176, 63.77%), only one retinal break was found, while the highest number of retinal breaks was six. Table 3 summarizes the distribution of patients by the number of retinal breaks.

According to the medical history and anamnestic data collected during admission, 69 (25%) of all patients had myopia.

Intraocular pressure was measured on the day of admission and one month postoperatively. On the day of admission, the median IOP was 13 mmHg (IQR 4; range: 1–21), and one month after surgery it was 14 mmHg (IQR 5; range: 3–28), $p < 0.001$.

Best-corrected visual acuity significantly improved after treatment ($p < 0.001$). Best-corrected visual acuity on admission was worse than 0.1 in 177 (64.13%) eyes, while one month after surgery nearly half of the affected eyes

Table 2. Baseline characteristics of the entire study population, including laterality, seasonality, lens status and location of retinal break in eyes with rhegmatogenous retinal detachment

Characteristics	Number of eyes	%
Laterality		
Right	152	55.07
Left	124	44.93
Season		
Spring	82	29.71
Summer	71	25.72
Fall	48	17.39
Winter	75	27.17
Lens status		
Phakic	198	71.74
Pseudophakic	76	27.54
Aphakic	2	0.72
Quadrants		
STQ	175	55.56
SNQ	35	11.11
ITQ	78	24.76
INQ	27	8.57

STQ – superotemporal quadrant; SNQ – superonasal quadrant; ITQ – inferotemporal quadrant; INQ – inferonasal quadrant

Table 3. Number of retinal breaks found in eyes with rhegmatogenous retinal detachment

Number of retinal breaks	n	%
1	176	63.77
2	55	19.93
3	27	9.78
4	6	2.17
5	6	2.17
6	2	0.73
Dialysis	3	1.09
Macular hole	1	0.36

(n = 130, 47.1%) achieved visual acuity between 0.1 and 0.5. Details regarding visual acuity before and one month after surgery are shown in Figure 1.

At the time of the first examination, 32 (11.59%) patients had developed proliferative vitreoretinopathy (PVR). Patients with PVR presented considerably later. The median time was 30 days in patients with PVR compared with four days in patients without PVR ($p < 0.001$). The vast majority of patients with PVR (n = 30, 93.75%) presented with very poor visual acuity, which was less than 0.1. The rest of the cases with PVR (n = 2, 6.25%) had visual acuity 0.1–0.5 on admission. One month postoperatively, 25 (78.13%) patients with PVR at admission still had BCVA below 0.1, whereas seven (21.87%) of them obtained visual acuity 0.1–0.5. Out of 32 eyes with preoperative PVR, redetachment developed in six (18.75%).

In terms of treatment method, six (2.17%) of the affected eyes were managed with a non-surgical procedure – argon laser retinopexy. The most commonly selected surgical procedure was PPV, performed in 226 (81.88%) cases of RRD. Thirty-two (11.59%) underwent SB, and 12 (4.36%) were treated with pneumatic retinopexy.

Silicone oil (SO) was the preferred tamponade for RRD (n = 191, 75.2%), followed by sulfur hexafluoride (SF6) tamponade (n = 24, 9.45%), ethane hexafluoride in 1.97%

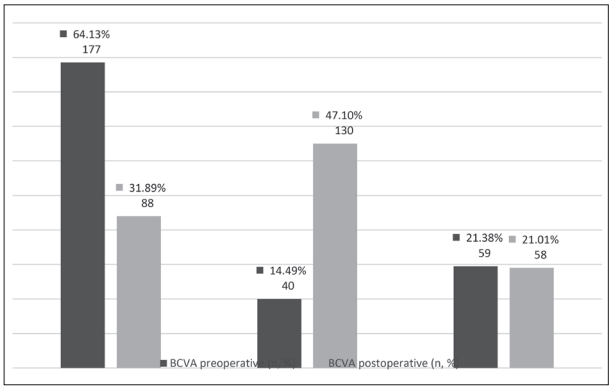


Figure 1. Best-corrected visual acuity (BCVA) of eyes with rhegmatogenous retinal detachment before surgery and one month after surgery

(n = 5) and propane octafluoride in six cases (2.36%). In 22 (68.75%) of 32 cases managed with SB, no intraocular tamponade was used. In six (18.75%) of the remaining cases, air was used and in four (12.5%), SF6 was used as an intraocular tamponade.

When SO was applied in PPV, the mean duration of oil tamponade was 5.9 ± 2.03 months. At the time of gathering data for this study and analyzing it, SO removal had been performed in 136 cases (49.29%).

In terms of postoperative complications, most study patients remained without complications (n = 187, 66.55%). The most common complications were postoperative glaucoma (n = 44, 15.66%), recurrent RRD (n = 29, 10.32%), SO in the anterior chamber (n = 10, 3.56%), and hyphema (n = 7, 2.49%). Additional complications comprised endophthalmitis, conjunctival cysts, cystoid macular edema and scleral rupture, observed in one case each. Some patients had more than one complication at the same time.

Of the 29 patients with recurrent RRD, 18 (6.55%) had redetachment under SO after PPV, four (1.45%) patients had recurrence after SO removal, and three patients (1.09%) had recurrence after SB; in one of these cases, the retina was initially attached, whereas in the other two cases the initial scleral buckling procedure had been unsuccessful.

DISCUSSION

Our study showed that males are at greater risk of RRD compared to females. This finding was consistent with the results reported by Rhyno et al. [8] in 2026, who also observed a statistically significantly higher number of male patients. The right eye was more frequently affected in most patients, in agreement with the results reported by Kasetty et al. [9]. Furthermore, several studies reported a correlation between the higher rate of RRD in men and work-related physical strain, such as lifting heavy objects. This could explain the higher incidence of RRD in males in general, considering that most of the physically demanding jobs are undertaken by males [10]. On the other hand, one Danish study did not find a higher incidence of RRD in men who perform physical work [11]. In recent studies, most patients are men, but one study shows a

predominance of female patients with a median age of 93, which can be explained by the longer life span of women. This study included an elderly population because it has been underrepresented in recent studies [12].

We analyzed seasonal variations in RRD frequency and found a decreased number of patients in fall and a higher number in spring. The results are contradictory: while one study reports a higher number of patients during warmer periods, as in our study, possibly related to increased physical activity and the influence of ultraviolet light on the vitreous and retina which initiates posterior vitreous detachment and retinal breaks [13], another reports no significant seasonal variations [14].

Myopia represents one of the major risk factors for RRD, because of the increased axial length and peripheral degenerative changes [15]. In our study, only a quarter of the entire study group had myopia, which is in contrast to results from other studies where the number of myopes with RRD was three times higher than that of non-myopes with RRD [16].

Cataract surgery is also considered a risk factor for RRD [17]; however, in our study, it was shown that twice as many patients had natural crystalline lenses, but most patients with RRD belonged to the 61–80-year age group, which is a risk factor by itself. Most studies have identified older age as a significant risk factor, which aligns with our study, demonstrating that the highest incidence of RRD is in patients 50–70 years old [18, 19]. One of the latest studies also showed similar results, with a median age of 61 years among patients with RRD [8]. Furthermore, similar findings were reported in another study performed at our clinic from 2020 to 2022 [20]. In contrast, one study from Nigeria reported that the mean age for RRD is 44 ± 17.5 years without a clearly identified reason [21].

The study has shown that PPV was the preferred surgical method for RRD in relation to SB, which concurs with the study by Rajsirisongsri et al. [22], which had the same results. These findings might be due to advances in surgical techniques – small-gauge PPV – and also to late referral to an ophthalmologist and advanced retinal detachment. In addition, since the majority of our patients were elderly and required cataract surgery, it was considered optimal to perform cataract surgery with PPV. However, in younger patients with a clear lens and uncomplicated RRD, scleral buckling would be the treatment of choice. Our study showed a high primary anatomic success rate, consistent with recent reports on RRD surgery [23]. SO was frequently used for temporary intraocular tamponade in our study. While prolonged tamponade carries risks of complications such as secondary glaucoma and cataract development in patients with a natural lens, there is also a risk of redetachment after SO removal. In contrast to our findings, one study from 2026 reported recurrent RRD in 21.1% and demonstrated that, in addition to PVR as the main factor, high myopia, pre-existing glaucoma, and systemic hypertension were also identified as contributing factors [24]. In a study done by Gisquet et al. [25], the rate of redetachment was 14.9% and SO tamponade lasted almost three months, which the authors regarded as a short time and a potential contributing factor to recurrent RRD after removal of SO. In contrast, the mean duration of SO tamponade in our study was approximately six months. Gas tamponade is another treatment option, with SF6 most frequently used for RRD without PVR, in cases with superior retinal breaks, or as an intraocular tamponade during SB.

For vitreoretinal surgeons, PVR is still difficult to overcome and is one of the most significant factors for surgical failure and poor functional outcome, with success rates decreased by more than 46.9% in cases with PVR [26]. Our study showed no significantly increased number of patients with PVR compared to the results of the previously mentioned study, but the reattachment rate in the group of patients with preoperative PVR was 18.76%, and BCVA improved by 15.62%. However, study results are contradictory: while some recent studies indicate that PVR is associated with poor visual outcomes [24, 27], another study reports no significant correlation between PVR and final BCVA [28]. Primary surgical success and the absence of a severe postoperative inflammatory reaction are considered to have the greatest impact on BCVA improvement in patients with successful retinal reattachment.

Postoperative visual acuity is a crucial indicator of surgical success, and a study by Zaletel Benda et al. [28] has demonstrated a direct relationship between preoperative and postoperative visual acuity and vice versa. The duration of symptoms seems to be closely related to postoperative BCVA, with a duration longer than seven days being associated with poor functional visual outcomes [29]. The time from the onset of symptoms until examination and treatment was longest in patients aged between 61 and 80 years in this study. This finding may be associated with age-related factors and socioeconomic conditions. Barequet et al. [27] found that macular status is important and that macula-on detachment had better anatomical and functional outcomes. In our study, a significant number of patients achieved better postoperative BCVA, even though the average duration of symptoms in the largest group of patients was longer than one week, and the majority of them had an affected macula. The majority of patients in our study had a single break, most frequently in the superior temporal quadrant, which is the reason why most of the patients had "macula-off" at the time of admission. This finding is consistent with a study reporting that more than half of patients have retinal breaks located in the superior half of the retina [30].

This study has several limitations. First, it was retrospective and based on data obtained from medical records. Second, it was performed at a single center, which may limit generalization to a larger population. In addition, only patients with primary RRD were included.

CONCLUSION

In conclusion, our study emphasizes that rhegmatogenous retinal detachment primarily affects males and individuals over 60 years of age within our region. Pars plana

vitrectomy with a six-month SO tamponade represents the predominant and anatomically effective surgical approach in our tertiary center. Most patients delay seeking ophthalmic evaluation for more than seven days, typically presenting only after macular involvement causes significant vision loss. Consequently, there is an urgent need to implement targeted public health initiatives to educate high-risk individuals on early symptoms, optimize primary ophthalmic triage, and establish efficient referral pathways to ensure timely surgical intervention and preserve functional vision.

Ethics: This study was conducted according to the tenets of the Helsinki Declaration and approved by the Hospital's Committee on Ethics (635/11).

Conflict of interest: None declared.

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Епидемиологија и клиничке карактеристике регматогене аблације мрежњаче у терцијарном здравственом центру у Србији – двогодишња ретроспективна студија

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САЖЕТАК

Увод/Циљ Регматогено одвајање мрежњаче представља ургентно стање у офталмологији које може довести до трајног губитка вида. Циљ ове студије био је да се анализирају демографске, епидемиолошке и клиничке карактеристике, као и методе лечења регматогеног одвајања мрежњаче.

Методе Спроведена је ретроспективна студија на Одељењу за ретиновитреалну хирургију и трауматологију ока у периоду од 1. јануара 2024. године до 31. децембра 2025. године. Анализирани су подаци о полу, старости, годишњем добу, почетку симптома, присуству миопије, операцији катаракте и методи лечења.

Резултати Од 275 пацијената, мушкараца је било 177 (64,36%), а жена 98 (35,64%). Већина испитаника била је старости између 61 и 80 година (*n* = 140, 50,91%). Витректомија је била најчешћа хируршка метода лечења (*n* = 226, 81,88%), а силиконско уље најчешће средство за тампонаду (*n* = 191, 75,2%). Најбоље коригована видна оштрина на пријему била је мања од 0,1 у већини захваћених очију (*n* = 177, 64,13%), док је месец дана након операције код скоро половине очију забележена видна оштрина између 0,1 и 0,5 (*n* = 130, 47,1%). Поновно одвајање мрежњаче забележено је код 29 пацијената (10,32%).

Закључак Наша студија показује да се регматогено одвајање мрежњаче на нашим просторима чешће јавља код мушкараца и особа старијих од 60 година. Сходно томе, потребно је хитно спровести циљане јавноздравствене иницијативе за едукацију високоризичних особа о раним симптомима, унапређење примарне офталмолошке тријаже и успостављање ефикасних путева упућивања како би се обезбедила правовремена хируршка интервенција и очување функционалног вида.

Кључне речи: регматогено одвајање мрежњаче; витректомија; видни исходи; епидемиологија; Србија