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Igor Kovačević[1,2], Goran Damjanović[2], Mladen Bila[1,2], Vesna Šobot[1,2], Jelena Mirković[2], Igor Vujović[2], Miloš Maksimović[2], Kristina Vuković[2], Anđela Popović[0,3], Jelena Vasilijević[1,2,♣]

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

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

[1]University of Belgrade, Faculty of Medicine, Belgrade, Serbia;
[2]University Clinical Centre of Serbia, Clinic for Eye Diseases, Belgrade, Serbia;
[3]Savski Venac Community Health Centre, Belgrade, Serbia

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♣**Correspondence to:**
Jelena VASILIJEVIĆ
University Clinical Centre of Serbia, Clinic for Eye Diseases, Pasterova 2, 11000 Belgrade, Serbia
e-mail: **bkjelena@gmail.com**

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

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

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, clinical characteristics and treatment method 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 between 61 and 80 years old (n = 140, 50.91%). The most commonly selected surgical procedure was PPV (n = 226, 81.88%). Silicon 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 had 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

САЖЕТАК

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

Методе Спроведена је ретоспективна студија на одељењу за ретиновитреалну хирургију и трауматологију ока у периоду између 1. јануара 2024. године и 31. децембра 2025. године. Подаци који су укључени су пол, године, годишње доба, почетак симптома, миопија, операција катаракте, као и метод лечења.

Резултати Од 275 пацијената, мушкарца је било 177 (64,36%), а жена 98 (35,64%). Већина студијске популације је била између 61 и 80 година (*n* = 140, 50,91%). Витректомија је била најчешћи хируршки третман (*n* = 226, 81,88%), са силиконским уљем као најчешћом тампонадом (*n* = 191, 75,2%). Најбоља коригована видна оштрина на пријему је била мања од 0,1 у већини захваћених очију (*n* = 177, 64,13%), да би месец дана након операције скоро половина постигла видну оштрину између 0,1 и 0,5 (*n* = 130, 47,1%). Поновно одвајање је имало 29 пацијената (10,32%).

Закључак Наша студија наглашава да регматогено одљубљивање мрежњаче примарно захвата мушкарце и особе преко 60 година на нашим просторима. Сходно томе, постоји хитна потреба за спровођењем циљаних јавноздравствених иницијатива за едукацијом 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

INTRODUCTION

Rhegmatogenous retinal detachment (RRD) is an ophthalmic emergency which can result in vision loss. It represents separation of 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 to 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 between 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 surgical procedure involves consideration of patients' characteristics, ocular comorbidities and characteristics of retinal detachment itself, as well as 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 on the affected eye [7].

The aim of our study was to evaluate the demographic, epidemiological, clinical characteristics and treatment method 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 early recognizing, evaluation and treatment of RRD, which contributes to prevention of irreversible vision loss.

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 patient's 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 complete ophthalmic examination of both eyes (best-corrected visual acuity (BCVA) measured on Snellen chart, intraocular pressure (IOP) measurement using Goldmann applanation tonometry, anterior segment examination and indirect fundoscopy on slit-lamp biomicroscope).

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

Statistical analysis

Statistical analysis was performed using Microsoft Excel 2016 software, Google Sheets 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 Kruscal-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 male to female ratio 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 between 61 and 80 years old (n = 140, 50.91%).

The number of cases whose RRD involved 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 presented significantly later ($p = 0.002$) with a median delay of 5.5 days (IQR 11), while in macula-on patients it was 3 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.

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 between 41 and 60 years (4 days), while the longest time was recorded in patients aged between 61 and 80 years (7 days). The median time to presentation was 7 days for women and 4 days for men ($p = 0.002$).

Seasonal analysis showed most significant numbers of RRD 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%). From 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 of the RRD was caused by 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, median IOP was 13 mmHg (IQR 4; range: 1–21), and one month after surgery 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 (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 moment of first examination, 32 (11.59%) patients developed proliferative vitreoretinopathy (PVR). Patients with PVR presented considerably later. Median time was 30 days in patients with PVR opposite to patients without PVR which was 4 days ($p < 0.001$). 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 between 0.1 and 0.5 on admission. One month postoperatively, 25 (78.13%) patients with PVR at admission still had BCVA below 0.1, whereas 7 (21.87%) of them obtained visual acuity between 0.1 and 0.5. Out of 32 eyes with preoperative PVR, redetachment developed in 6 (18.75%).

In terms of treatment method, 6 (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.

Silicon oil 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% (n = 5) and Propane octafluoride in 6 cases (2.36%). In 22 (68.75%) of 32 cases managed with SB, no intraocular tamponade was used. In 6 (18.75%) of the remaining cases, air was used and in 4 (12.5%) – SF6 as an intraocular tamponade.

When the silicon oil 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, silicone oil removal had been performed in 136 cases (49.29%).

In terms of postoperative complications, most study patients remained without complications (n = 187, 66.55%). Most common complications were postoperative glaucoma (n = 44, 15.66%), recurrent RRD (n = 29, 10.32%), silicon oil 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.

From 29 patients with recurrent RRD, 18 (6.55%) had redetachment under silicon oil after PPV, 4 (1.45%) patients had recurrence after silicon oil removal, and three patients (1.09%) after SB, of which in one case the retina was primary attached, whereas in two other 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 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 predominant patients are men, but one study shows predominance in female patients with a median age of 93, that can be explained by the longer life span of women this age. This study included elderly demographic population, because it has been underrepresented in newer studies [12].

We analyzed seasonal variations in RRD frequency and it showed a decreased number of patients in autumn and significant numbers in spring. The results are contradictory, while a study reports a higher number of patients during warmer periods like ours, possibly related to increased physical activity and the influence of ultraviolet light on the vitreous and retina which initiates posterior vitreous detachment and RB [13], other one 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 the opposite to results from other studies where the number of myopes with RRD was three times higher than 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 the most patients with RRD belonged to the 61–80 years 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 between 50 and 70 years [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 study by Rajsirisongsri et al. [22] which has the same results. These findings might be because of advancement in surgical techniques - small gauge PPV, also because of 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 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]. Silicon oil is frequently used for temporary intraocular tamponade in our study. While prolonged tamponade carries risks for complications such as secondary glaucoma and cataract development in patients with natural lens, there is also 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] rate of redetachment was 14.9% and SO tamponade lasted almost 3 months, which the authors regarded as 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 6 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 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 indicates that PVR is associated with poor visual outcomes [24, 27], other study reports no significant correlation between PVR and final BCVA [28]. Primary surgical success and absence of 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 study by Zaletel et al. [28] have demonstrated a direct relationship between preoperative and postoperative visual acuity and vice versa. The duration of symptoms seems to be closely related with postoperative BCVA, with duration longer than 7 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 el al. found that macular status is important, that macula-on detachment had better anatomical and functional outcomes [27]. 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” in 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 silicone oil tamponade represents the predominant and anatomically effective surgical approach in our tertiary center. The 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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Table 1. Age distribution and distribution of foveal involvement in all study groups

Age (years)	n (%)	Macula-on RRD (n, %)	Macula-off RRD (n, %)
under 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

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
Autumn	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

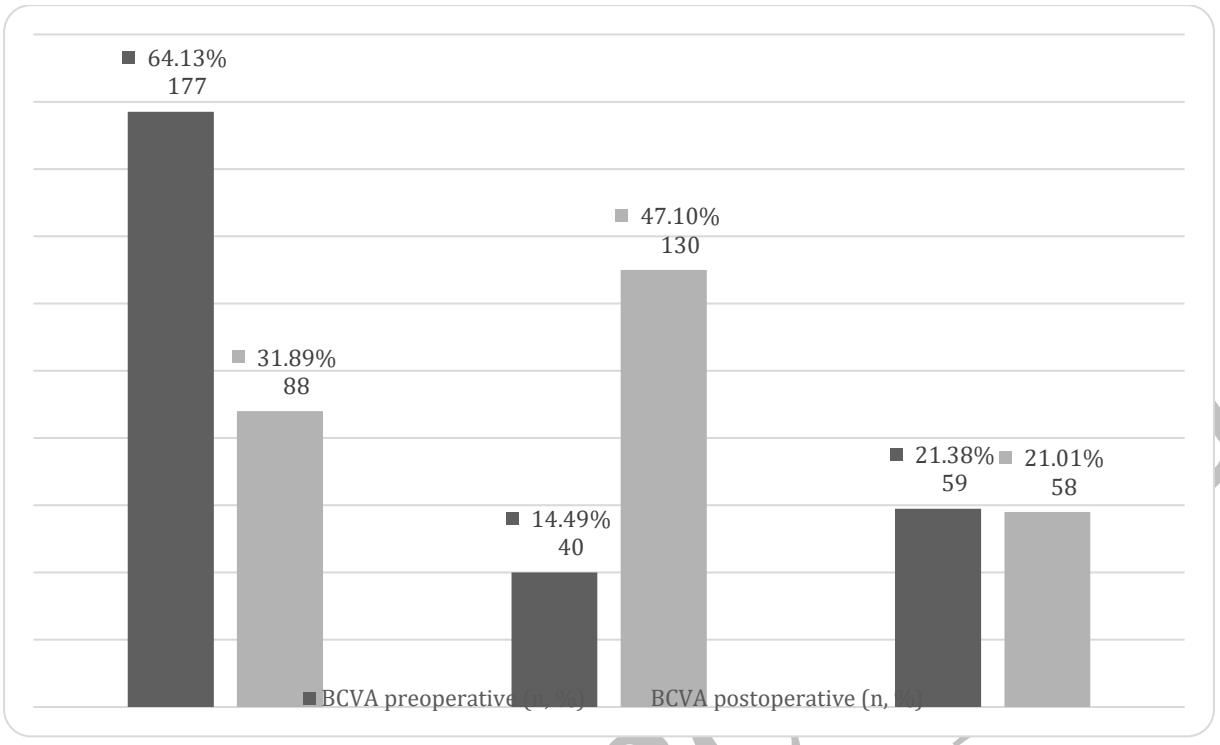

Figure 1. Best corrected visual acuity of eyes with rhegmatogenous retinal detachment before surgery and one month after surgery

