

## ORIGINAL ARTICLE

# The profile of patients presenting to the department of vitreoretinal surgery and ocular trauma at the university clinic for eye diseases – a two-year retrospective study

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**Summary**

**Introduction/Aim:** Vitreoretinal diseases can lead to permanent vision loss. The aim of our study was to present the frequency, demographics and treatment options of the patients hospitalized and treated at the tertiary healthcare Department of Vitreoretinal Surgery and Eye Trauma in a two-year period.

**Material and Methods:** The retrospective study was conducted at the Clinic for Eye Diseases, University Clinical Center of Serbia in Belgrade, Serbia in the period between November 30, 2020 and December 4, 2022. [Data on demographics, seasonality and treatment methods were collected from “Heliant” healthcare software and subsequently interpreted.

**Results:** During the study period, a total of 1295 patients were hospitalized. Cataract was the most common reason for hospitalization (n=355, 27.4%), followed by ocular trauma (n=303, 23.4%) and rhegmatogenous retinal detachment (n=287, 22.2%). The majority of patients with eye trauma (n=125, 41.2%, p<0.001) were between 19 and 44 years old. Male predominance was found in ocular trauma (n=261, 86.1%, p<0.001), and also in patients hospitalized for rhegmatogenous retinal detachment surgery (n=166, 57.8%, p<0.001) and surgery due to complications of proliferative diabetic retinopathy (n=41, 71.9%, p<0.001). Patients aged between 45 and 64 years were at the highest risk (n=136, 47.4%, p<0.001) and vitrectomy was performed more often as a treatment of rhegmatogenous retinal detachment (n=193, 67.2%, p<0.001). Rhegmatogenous retinal detachment most commonly occurred in autumn (n=103, 35.9%, p<0.001).

**Conclusion** Further studies focusing more on some of the pathologies included in this study may be beneficial for a better understanding of epidemiology, preventive measures, and optimal treatment methods.

**Keywords:** vitreoretinal diseases, rhegmatogenous retinal detachment, ocular trauma

## INTRODUCTION

Vitreoretinal diseases such as rhegmatogenous retinal detachment (RRD), eye trauma and endophthalmitis can lead to permanent vision loss. Ocular trauma is thought to be the primary cause of monocular blindness and accounts for around 19 million cases of vision loss worldwide (1-4). Rhegmatogenous retinal detachment is a common ophthalmological emergency with an incidence of approximately 10 to 18 per 100 000 (5, 6). On the other hand, the main cause of vision loss in middle-aged people is diabetic retinopathy (7).

Over the last decades, pars plana vitrectomy (PPV) instruments and techniques have evolved. It is now considered the standard treatment for many vitreoretinal disorders (3, 8). Regmatogenous and tractional retinal detachment, vitreal hemorrhage, macular hole (MH), epiretinal membrane (ERM), endophthalmitis, and eye trauma are some of the indications for vitrectomy. If left untreated, many of these diseases lead to blindness (2, 3, 9, 10).

Department of Vitreoretinal Surgery and Eye Trauma of the Clinic for Eye Diseases, University Clinical Center of Serbia in Belgrade admits adults suffering from any kind of ocular trauma who require clinical observation, and conservative or surgical treatment. Emergency and various elective vitreoretinal diseases, as well as senile, complicated and traumatic cataracts are also treated and operated on at this department. The aim of our study was to present the frequency, demographics and treatment options of the patients hospitalized and treated at the tertiary healthcare Department of Vitreoretinal Surgery and Eye Trauma over a two-year period.

## MATERIAL AND METHODS

### Study design and data source

The retrospective study was conducted at the Clinic for Eye Diseases, University Clinical Center of Serbia in Belgrade, Serbia. The study included all patients hospitalized at the Department of Vitreoretinal Surgery and Eye Trauma in the period between November 30, 2020 and December 4, 2022. The patients' data were collected from "Heliant" healthcare software.

All patients hospitalized during the defined period were included in the study, regardless of the need for surgical treatment. The demographic data we tracked were age and sex. Data on seasonality were obtained for diseases that, according to literature, showed a connection with certain seasons. All patients were divided into groups according to the reason for hospitalization: cataract, ocular trauma, RRD, complications of proliferative diabetic retinopathy (PDR), endophthalmitis, ERM/MH, lens (crystalline or artificial intraocular lens) luxation and subluxation, silicon oil removal, secondary in-

traocular lens (IOL) implantation and other. In addition to demographic data, certain information was collected in particular groups. Surgical method was analyzed in the cataract group – phacoemulsification or conventional extracapsular extraction (ECCE) surgery. Seasonality and surgical method data were obtained for RRD and ocular trauma. We divided eye trauma into closed globe injuries (contusions) and open globe injuries (OGI). We further divided open globe injuries into those with intraocular foreign body (IOFB), without IOFB, and globe rupture. The PDR complication group included patients with tractional retinal detachment and vitreal hemorrhage, while the "other" group included those patients who could not be classified into any of the other categories—iris reposition, iridoplasty, or corneal suture removal. We divided all patients into four age categories: – up to 18 years or less, between 19 and 44 years, 45 and 64 years and 65 or older. This study was undertaken according to the tenets of Helsinki Declaration and approved by the hospital's committee.

### Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics version 29.0.0.0. Descriptive data are presented as absolute numbers (n) and percentages (%). Mean and standard deviation are calculated for continuous variables. Chi-square test was used to examine statistical significance and p-value; the value below 0.05 was considered statistically significant.

## RESULTS

During the study period, a total of 1295 patients were hospitalized at the Department of Vitreoretinal Surgery and Eye Trauma. The details regarding age distribution in specific groups are shown in Table 1. The average age of all patients was  $61.16 \pm 15.87$  years with the youngest patient being 15 and the oldest 90 years old. Cataract was the most common reason for hospitalization (n=355, 27.4%), followed by ocular trauma (n=303, 23.4%) and RRD (n=287, 22.2%). One hundred forty-three patients (11%) were hospitalized for silicon oil removal. Fifty-seven (4.4%) patients required vitrectomy for complications of PDR, while 40 (3.1%) and 39 (3%) of all patients were hospitalized for treatment of ERM/MH and lens luxation/ subluxation, respectively. Twenty-four (1.9%) secondary IOL implantations were performed, while 25 (1.9%) patients were hospitalized for other reasons. Endophthalmitis was the rarest of all and it accounted for 1.7% (n=22) of the entire examined population.

The youngest patient with cataract was 34, and the oldest was 90. The average age was  $70.04 \pm 9.76$ . The majority of them (n=265, 74.6%) were 65 years or older,  $p < 0.001$ . Details of the age range in cataract group

**Table 1.** Age distribution in different study groups

Age n (%)	≤18	19-44	45-64	≥65	Total	P value
Group						
Cataract	0 (0%)	7 (2%)	83 (23.4%)	265 (74.6%)	355 (100%)	<b>&lt;0.001</b>
Ocular trauma	10 (3.3%)	125 (41.2%)	83 (27.4%)	85 (28.1%)	303 (100%)	<b>&lt;0.001</b>
Rhegmatogenous retinal detachment	2 (0.7%)	25 (8.7%)	136 (47.4%)	124 (43.2%)	287 (100%)	<b>&lt;0.001</b>
Complications of PDR	0 (0%)	4 (7%)	25 (43.9%)	28 (49.1%)	57 (100%)	<b>&lt;0.001</b>
Endophthalmitis	0 (0%)	1 (4.5%)	10 (45.5%)	11 (50%)	22 (100%)	<b>0.016</b>

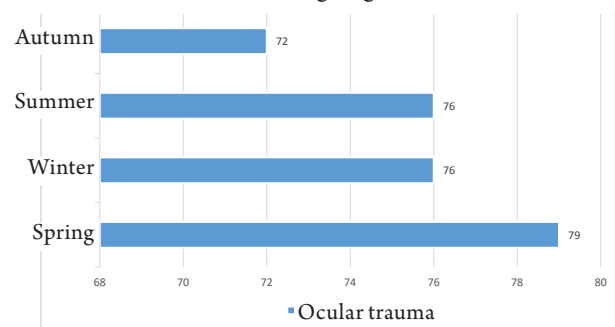
Results are presented in the form of absolute numbers and percentages (n, %). The level of significance <0.05. Abbreviation: PDR: proliferative diabetic retinopathy.

are shown in **Table 1**. Similar numbers of males and females were observed (n=179, 50.4% and n=176, 49.6% respectively, p=0.873). Phacoemulsification was the most common surgical technique (n=323, 91%) compared to ECCE (n=27, 7.6%), p<0.001. Five (1.4%) patients were not treated surgically due to poor general condition or technical issues.

The age range of ocular trauma was from 15 to 88 years, with a mean age of 49.32 ± 18.78 years. A statistically significant majority of patients (n=125, 41.2%) were between 19 and 44 years old, p<0.001. Details of the age range in ocular trauma are shown in **Table 1**. A statistically significant male predominance was found in both open and closed globe injuries, as well as in the entire group of ocular trauma. Detailed information on the gender distribution in ocular trauma are shown in **Table 2**. The largest number of eye injuries were OGI (n=175, 57.8%), while there were 128 (42.2%) closed globe injuries, p=0.006. The most common ocular globe injuries were those without IOFB (n=86, 49.6%), followed by ocular globe injuries with IOFB (n=50, 28.6%) and globe rupture (n=39, 22.3%), p<0.001 respectively. In almost all OGI, operations were performed (n=171, 97.7%), p<0.001. Only 4 (2.3%) patients were treated conservatively and all of these were OGI without IOFB. Early primary PPV was the method of choice in 28 (16%) patients with OGI, while the majority of patients with open globe injury (143, 81.7%) were treated with some other surgical intervention (primary wound repair or different surgeries other than PPV), p<0.001. Statistical significance regarding the treatment method was also found in closed globe injuries. Most of those patients (n=64, 50%) were treated conservatively, while 49 (38.3%) patients required surgery. Laser photocoagulation was the treatment

method in 13 (10.2%) patients and 2 (1.6%) patients were hospitalized only for observation without any treatment, p<0.001. Ocular trauma occurred more often in spring (n=79, 26.1%) compared to other seasons, still with no statistical significance, p=0.955. The analysis related to the seasonality of ocular trauma is shown in **Figure 1**.

The youngest patient with RRD was 17 years old and the oldest was 85. The average age was 60.91 ± 12.66.



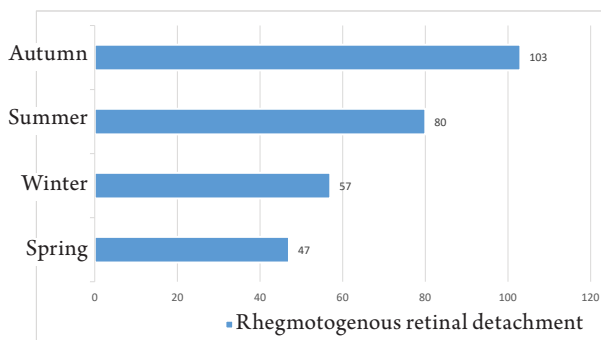
**Figure 1.** Seasonality of ocular trauma. Results are presented in the form of absolute numbers and percentages (n, %). The level of significance <0.05.

The patients aged between 45 and 64 years were at the highest risk of RRD (n=136, 47.4%), p<0.001. More information on age distribution of RRD is presented in **Table 1**. Among 287 patients hospitalized for RRD surgery, 166 (57.8%) were male, while 121 (42.2%) were female, p=0.007. Vitrectomy was performed more often (n=193, 67.2%) compared to scleral buckle surgery (n=73, 25.4%), p<0.001. The remaining patients were treated either with laser photocoagulation (n=5, 1.7%) or were not operated on due to poor general condition or technical issues (n=16, 5.6%). It was found that rhegmatogenous retinal detachment was most common in autumn (n=103,

**Table 2.** Analysis of gender distribution in ocular trauma

Gender	Male	Female	Total	P-value
Diagnosis				
Open globe injuries	151 (86.3%)	24 (13.7%)	175 (100%)	<b>p&lt;0.001</b>
Closed globe injuries	110 (85.9%)	18 (14.1%)	128 (100%)	<b>p&lt;0.001</b>
Total	261 (86.1%)	42 (13.9%)	303 (100%)	<b>p&lt;0.001</b>

Results are presented in the form of absolute numbers and percentages (n, %). The level of significance <0.05.



**Figure 2.** Seasonality of rhegmatogenous retinal detachment. Results are presented in the form of absolute numbers and percentages (n, %). The level of significance <math>p</math><math><0.05</math>.

35.9%),  $p<0.001$ . The analysis related to the seasonality of RRD is presented in **Figure 2**.

The age range for patients with complications of PDR was from 36 to 84 years, with a mean age of  $63.07 \pm 10.65$ . Almost half of these patients ( $n=28$ , 49.1%) were 65 years old or older,  $p<0.001$ , details are presented in **Table 1**. Men were more often affected ( $n=41$ , 71.9%) compared to women ( $n=16$ , 28.1%),  $p<0.001$ . Vitreous hemorrhage was observed in 49 (87.5%) patients, while tractional retinal detachment was found in 7 (12.5%) of all the patients with PDR,  $p<0.001$ .

The minimum age of patients admitted for endophthalmitis treatment was 33 years and the maximum was 87 years. Mean age was  $62.05 \pm 15.02$ . Half of them ( $n=11$ ) were in the age group of 65 years and older,  $p<0.016$  (details are given in **Table 1**). Endophthalmitis was more common in men ( $n=14$ , 63.6%) than in women ( $n=8$ , 36, 4%),  $p=0.201$ . Post-traumatic endophthalmitis accounted for 54.5% ( $n=12$ ), while postoperative endophthalmitis accounted for 45.5% ( $n=10$ ),  $p=0.677$ .

## DISCUSSION

In our study, elective surgeries (ERM/MH, secondary IOL implantation, most of the silicon oil removals and lens luxations or subluxations and other reasons) altogether accounted for only 20.9% of all patients admitted to the Department of vitreoretinal surgery and ocular trauma. On the other hand, Gupta et al. showed in their study that macular surgeries were performed in 11% (11), which is significantly more than in our study (3.1%). The lower frequency of elective procedures could be a result of COVID-19 pandemic, taking into account that a relevant time period of our study was affected by the pandemic. This assumption is supported by previous research from our Clinic, which reported a significant reduction in elective surgeries during the quarantine in 2020 due to COVID-19, compared to the same period in 2019 because most elective interventions were then postponed (12).

Cataract surgery is one of the most commonly performed eye surgeries and the numbers are still increas-

ing, in accordance with the results of our study, given that it was the most common reason for admission. Indications for cataract surgery are expanding to younger patients as operative techniques and visual outcomes improve (13). Although the majority of the cataract patients in this study were older than 65 years, almost a third of the patients were younger than this age. Previous studies and systematic reviews have shown that phacoemulsification compared to ECCE results in better postoperative visual acuity and a lower complication rate, and has thus become the technique of choice in cataract management (14-16). In our study, we also observed a trend towards phacoemulsification as the surgical method of choice, which is important for minimizing potential complications and achieving the best long-term outcome.

Ocular trauma was an important cause of hospitalization in our study. The mean age of our patients was slightly higher compared to other studies, which may be due to the fact that our study did not include the pediatric population (17, 18). However, a 15-year-long retrospective study of ocular trauma from Portugal that included children, reported the mean age of 48.9 years, which is almost the same as ours (19). When comparing the results of studies, it is useful to keep in mind that different age ranges were used in different studies. However, nearly two-thirds of our patients were between 18 and 65 years old, which is consistent with most previous studies (17-20). Male predominance found in this research was also observed in other studies (17-23). In our research, OGI represented the majority of all eye trauma cases. Studies that exclusively included hospitalized patients produced the same results (18, 19). These results are opposite from some studies that included both inpatient and outpatient eye trauma, where closed globe injuries occurred either more frequently or equally frequently to open globe injuries (21, 24). Alem et al. in their two-year study concluded that among OGI, the most common were OGI without IOFB, followed by IOFB and globe rupture, which is all in accordance with our findings (24). However, there are studies that observed a higher incidence of globe ruptures and a lower incidence of IOFB compared to this study (18, 19). Our preferred surgical method for OGI was primary wound repair, which did not differ from results from other studies, which also performed vitrectomy and other operations as a second operation (18, 19, 24). The majority of closed globe injuries in our study were treated non-surgically, which is supported by the Helsinki Ocular Trauma Study (21). In our study, the occurrence of eye trauma did not show seasonality to be statistically significant, either in all cases of eye trauma or in closed and open globe injuries separately. It was almost equally distributed over the four seasons. Literature data are controversial, reporting peaks in different seasons and months – summer (July, September) and the period between May and October (20, 22, 23).

In the study by Gupta et al. as well as the study by Xu et al., the mean age of patients with RRD was  $60.07 \pm 13.92$

and  $60 \pm 14$ , respectively, which is practically the same as in our findings (11, 25). Others obtained different results regarding the mean age of patients with RRD, ranging from 53 to 61.8 years (5, 6, 26-28). However, this supports our findings that RRD mainly affects people aged between 45 and 64 years. A significant male predominance was found in this study, as in other studies, while the opposite results were not found in literature (5, 6, 11, 26, 28). Some authors believe that greater axial length in men and differences in basal vitreoretinal adhesion, i.e. posterior migration of the posterior border of the vitreous base in men, may contribute to a higher incidence of RRD (29). In contrast to our results where vitrectomy was performed more frequently in the treatment of RRD compared to scleral buckling, a 4-year-long study of 24,928 patients revealed a slightly higher incidence of scleral buckling (45.6%) compared to vitrectomy (42.5%) in treating RRD (1). However, other researchers reported vitrectomy as a more common primary surgical method (6, 11, 27, 28). This may be attributed to the surgeon's preference for one type of surgery, but vitrectomy has also grown in popularity over the past decades due to its better ergonomics and recent technological advances. In this study, a significantly higher incidence of RRD was observed in autumn. It occurred least frequently in winter, which is in accordance with an American study that found a reduced incidence of surgery due to RRD during holidays, especially during winter months (5). Another study also reported results consistent with ours, with the highest number of cases in September and the lowest in December (30). However, a study from France showed that RRD was most common in July and least common in August (31).

The second most common indication for vitrectomy in the study by Gupta et al. was diabetic vitrectomy due to nonclearing vitreous hemorrhage and tractional retinal detachment, as in our study. They reported 10-year lower mean age in Caucasians with PDR complications compared to our study, but the same findings regarding male predilection (23). Another study showed PDR as the second most common reason for vitrectomy, with a higher incidence of vitreous hemorrhage compared to tractional retinal detachment, all consistent with our findings (32). However, most of their patients were 50 to 60 years old, while in our study almost half of the cases were older than 65 years. This discrepancy may be the result of several factors. During the research period, partly affected by the pandemic, only the most complicated cases were hospitalized, which can be related to older age i.e., longer duration of diabetic retinopathy. On the other hand, it may be due to negligence, non-acceptance of the health condition but also due to poor awareness of the complications of diabetes among the younger population.

The rarest, but very important reason for hospitalization in our study was endophthalmitis. The largest number of patients with endophthalmitis were 65 and older, while almost all patients included in this study were older than 45 years. Two previous studies observed an even higher mean age compared to our results (33, 34). Although there are studies that reported significantly lower mean age, they included the pediatric population, which was not the case in our study (35, 36). We found a higher risk of endophthalmitis in men. This was also confirmed by previous studies (33, 35, 36). However, no statistical significance regarding gender distribution was confirmed in this study. These findings may be explained by the higher incidence of OGI in men, which was also shown in our study. Post-traumatic endophthalmitis accounted for slightly more than 50% of the cases. Data from the literature on the causes of endophthalmitis are diverse. In a study by Yang et al. post-traumatic endophthalmitis accounted for as much as 82.6% of all cases, while Almarzouki et al. reported only 7.2% of all cases as a result of OGI (35, 37). Post-traumatic endophthalmitis was most common in a study from Philippines (55.4%), while a Korean study reported that postoperative endophthalmitis was the most common in their sample (33, 36).

The limitations of our study are the absence of the pediatric population, the retrospective nature of the study, and the pandemic period included in the research.

## CONCLUSION

Our results showed that cataract was the most common reason for hospitalization, followed by ocular trauma and RRD. The preferred surgical method for cataract was phacoemulsification, vitrectomy for RRD, and primary wound repair for OGI. Patients of 65 years of age and older accounted for a significant majority of cataract, PDR and endophthalmitis cases. Ocular trauma was the most common in the age group between 19 and 44 years, while RRD mostly affected people between 45 and 64 years. Men had a significantly higher risk of ocular trauma, RRD and complications of PDR. They were also at a higher risk of endophthalmitis, yet statistical significance was not found. Further studies focusing more on some of the pathologies included in this study may be beneficial for a better understanding of epidemiology, preventive measures, and optimal treatment methods. Our findings could enable better evaluation strategies for dealing with ocular trauma and vitreoretinal patients, and provide a substrate for investment and development of a medical system which would care for these patients.

**Conflict of interest:** None to declare.

**Ethics:** Principles of the Declaration of Helsinki were respected in this study.

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## PROFIL PRIMLJENIH PACIJENATA NA ODELJENJE VITREORETINALNE HIRURGIJE I OČNE TRAUME NA UNIVERZITETSKOJ OČNOJ KLINICI - DVOGODIŠNJA RETROSPEKTIVNA STUDIJA

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### Sažetak

**Uvod/Cilj:** Vitreoretinalna oboljenja mogu dovesti do trajnog oštećenja vida. Cilj naše studije bio je da prikazemo učestalost, demografske karakteristike i metode lečenja pacijenata hospitalizovanih i lečenih u tercijarnoj ustanovi na Odeljenju za vitreoretinalnu hirurgiju i traumatologiju oka u periodu od dve godine.

**Metod:** Sprovedena je retrospektivna studija na Klinici za očne bolesti, Univerzitetskog Kliničkog centra Srbije, Beograd, Srbija, u periodu od 30. novembra 2020. godine do 4. decembra 2022. godine. Demografski podaci, podaci o sezonalnosti i metodama lečenja prikupljeni su iz „Heliant“ zdravstvenog softvera i nakon toga interpretirani.

**Rezultati:** U toku studijskog perioda hospitalizovano je ukupno 1295 pacijenata. Katarakta je bila najčešći uzrok hospitalizacije (n=355, 27.4%), zatim povrede oka (n=303, 23.4%) i regmatogena ablacija retine (n=287, 22.2%). Ve-

ćina pacijenata sa povredom oka (n=125, 41.2%, p<0.001) bila je između 19 i 44 godine starosti. Veća učestalost kod muškaraca uočena je među povredama oka (n=261, 86.1%, p<0.001), kao i kod pacijenata hospitalizovanih radi hirurgije regmatogene ablacije retine (n=166, 57.8%, p<0.001) i hirurgije komplikacija proliferativne dijabetične retinopatije (n=41, 71.9%, p<0.001). Pacijenti starosti između 45 i 64 godine bili su u najvećem riziku (n=136, 47.4%, p<0.001), a vitrektomija je izvođena češće u lečenju regmatogene ablacije retine (n=193, 67.2%, p<0.001). Regmatogena ablacija retine bila je najčešća tokom jeseni (n=103, 35.9%, p<0.001).

**Zaključak:** Dalje studije koje bi se više fokusirale na pojedina oboljenja uključena u ovu studiju mogle bi biti korisne za bolje razumevanje epidemiologije, preventivnih mera i optimalnog metoda lečenja.

**Ključne reči:** vitreoretinalna oboljenja, regmatogena ablacija retine, povrede oka

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