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Research Article

Clinical Analysis of Rhegmatogenous Retinal Detachment in A Mexican Adult Population

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Abstract

Since rhegmatogenous retinal detachment (RRD) is one of the most frequent ophthalmological emergencies in Mexico, with an estimated incidence of 6 to 17 cases per 100,000 inhabitants, a retrospective, observational, descriptive, and cross-sectional study was conducted. This study included patients over 18 years of age diagnosed with RRD in the ophthalmology department of a tertiary care hospital. Patient assessment notes were collected, analyzing the various clinical characteristics of the anterior and posterior ocular segments. A total of 208 eyes with RRD treated between March 2023 and June 2025 were included in this study. The average age of the patients was 53.6 years, with a predominance of males. Horseshoe tears were the most frequent cause (51.4%), followed by lattice degeneration. These lesions occurred mainly in the upper meridians, while retinal dialysis and operculated holes were in the lower meridians.

Macular involvement was associated with worsening visual acuity (20/2143 vs. 20/83) and greater extent of retinal detachment. Findings such as fixed folds and subretinal bands were more common in cases with a longer disease duration. A positive correlation was observed between extent of retinal detachment and poor vision, but not with disease duration. Myopia was a frequent antecedent, and trauma was mainly related to dialysis. Tobacco dust was the most common finding on physical examination (89.4%). Other abnormalities such as grade C proliferative vitreoretinopathy (PVR), macular involvement (MI), and intraretinal cysts were associated with retinal detachment. Measures of central tendency and standard deviation were used for variable analysis, as well as measures of dispersion in cases of normal-like distribution.

These results suggest that patients seek specialized care late, possibly due to barriers to access and referral. The need for timely detection and prompt referral within the first hours of symptom onset is underscored, as these measures are essential to facilitate specialized management of RRD and improve visual outcomes in the Mexican population.

Keywords: rhegmatogenous retinal detachment; macular involvement; visual acuity; proliferative vitreoretinopathy

1.Introduction

Rhegmatogenous retinal detachment (RRD) is one of the most frequent ophthalmological emergencies. It is defined as the separation of the neurosensory retina from its adjacent layer, which prevents proper visual function. [1,2] This condition occurs due to retinal tearing, allowing vitreous humor to enter and accumulate between the retina and the choroid, thus separating the neurosensory retina from its structural and nutritional

substrate. [2,3] Risk factors for the development of RRD include moderate myopia, advanced age, and a family or personal history of retinal detachment. [2,4,5] Although ocular trauma and a history of previous phacoemulsification are also considered important risk factors.[3,6]

The symptoms experienced by patients with RRD should be part of the knowledge of all healthcare professionals, due to the visual impact of early diagnosis and timely treatment. [1,7] The symptoms that have been classically described in this condition are the sudden appearance of photopsias or floaters, and the progressive and continuous loss of peripheral vision, also described as “curtain vision”.[7,8]

The length of time the retina remains detached, which for practical purposes represents the time from the first symptom until the patient seeks medical attention and retinal surgical reattachment is performed, [6,7] has a significant impact on the patient's visual prognosis, because the loss of nutrient substrate prevents the proper metabolism of the photoreceptors. [9,10] The longer the retina remains detached, the greater the likelihood of permanent damage and the worse the visual prognosis. [4,9] RRD is treated exclusively with surgery; all the techniques described aim to remove the subretinal fluid and reposition the retina, seeking to restore its function. [7,11]

In Mexico, RRD has an incidence of 6.3 to 17.9 per 100,000 inhabitants. Despite the significant visual repercussions of this condition, there are few specific studies on the clinical characteristics of this type of detachment in Mexican population. Therefore, we consider it important to investigate how retinal detachment behaves, emphasizing the initial symptoms and the factors that trigger them. This is essential for training healthcare personnel in primary and secondary care centers. [9,12]

In addition, knowing the average time between the onset of symptoms and diagnosis will allow for the establishment of patient referral protocols to specialized care centers.[13] It is necessary to know the clinical characteristics of the posterior segment of retinal detachment at the time of diagnosis, allowing for the evaluation of bridging therapies while the patient is awaiting transfer to a tertiary care center equipped with the necessary resources for definitive treatment, thus improving the patient's final visual prognosis. [13,14]

2. Materials and Methods

The assessment notes of Mexican patients over 18 years of age diagnosed with RRD without prior ophthalmic surgery or laser application, who attended the Ophthalmology Service, Specialty Hospital of the National Medical Center Century XXI, Mexican Institute of Social Security (IMSS), during the period from March 2023 to June 2025, were retrospectively analyzed. The protocol was registered with the hospital's local research committee under number R-2025-3601-157.

The following variables were considered:

1. Age, 2. Sex, 3. Visual acuity, 4. Affected eye, 5. Duration of symptoms, 6. Presence of floaters, 7. Presence of photopsias, 8. Decreased vision, 9. History of trauma, 10. Previously diagnosed myopia, 11. History of RRD in the contralateral eye, 12. Cellularity in the anterior chamber, 13. Iris synechiae, 14. Retinal pigment epithelium cells in the vitreous, 15. Vitreous hemorrhage, 16. Type of primary retinal break, 17. Retinal detachment mobility, 18. Extent of retinal detachment, 19. Involvement of the macular area, 20. Presence of retinal folds, 21. Presence of intraretinal cysts 22. Presence of subretinal cord.

2.1. Inclusion Criteria.

Mexican nationality, Gender not specified, individuals over 18 years of age, beneficiaries of the IMSS, patients diagnosed with DRR, patients with a complete ophthalmological evaluation in electronic medical record, no prior ophthalmological interventions, no prior evaluations or treatments for the pathology under study at the time of the study.

2.2. Exclusion Criteria.

History of eye surgery, patients with prior laser treatment, previous retinal diseases, patients with incomplete eye exam.

2.3. Elimination Criteria.

Patients whose assessment notes are incomplete, patients without an assessment note in the electronic system, patients who have not decided to continue their care at Oftalmology Service at the Specialty Hospital.

The data were collected and analyzed using the SPSS® Statistics statistical package, version 22.0 for Windows. For all inferential statistical tests, a P value of less than 0.05 was established as the threshold for considering statistical significance.

To perform the statistical analysis, the visual acuity reported on the Snellen chart was converted to its equivalent in the logarithm of the minimum angle of resolution (logMAR). Visual acuity was converted from Snellen to decimal values following the Holladay equivalence table.[15]

2.4. Ethical aspects.

This study complies with Article 17 of the Regulations of the General Health Law on Research, which establishes that all research conducted must have a scientifically and socially useful purpose. Likewise, the procedures described respect the ethical standards established in the Declaration of Helsinki,[16] similarly, this work is in accordance with the principles contained in the Nuremberg Code.[17] Based on Article 14 of the same regulations, this protocol is classified as retrospective, descriptive, and cross-sectional, and therefore poses no risk to participants. The anonymity of all patients whose data was analyzed in this protocol will be maintained. Patient selection was based on the inclusion and exclusion criteria previously outlined in the selection criteria section.

3. Results

208 eyes from 208 patients diagnosed with retinal degeneration (RD) treated at the Retina Service of the Division of Ophthalmology were included in this study. Data collection spanned the period from March 2023 to June 2025. The study cohort consisted of 116 men and 92 women.

3.1 General demographic and clinical characteristics.

The mean age of the patients was 53.6 ± 14.6 years (range: 18 to 85 years). Males predominated (55.77% vs. 44.23%). The number of RRD cases presenting according to age was as follows: 62 years (n=12), 67 years (n=10), and 55 years (n=9). The right eye was affected more frequently than the left eye (52.4% vs. 44.2%). The mean visual acuity at admission, expressed in LogMAR, was 1.83 ± 0.83, corresponding to approximately counting fingers at 2 meters (equivalent to 20/1352 on a Snellen chart). The mean duration of symptoms before seeking medical attention was 33.43 ± 48.73 days, with considerable variability (range: 1 to 180 days). 55.3% (n=115) of patients presented with peripheral retinal degenerations in the contralateral eye at the time of initial evaluation. Related to medical history, myopia was the most common prior diagnosis among those evaluated, while a low percentage of

patients reported a history of retinal detachment in the contralateral eye (Table 1).

3.2 Symptoms and findings on physical examination.

Regarding symptoms, decreased vision was the most frequently reported symptom (95.2%), followed by floaters (65.4%) and photopsias (41.8%). On physical examination the presence of tobacco dust in the vitreous humor was the most prevalent finding, reported in 89.4% of patients. Vitreous hemorrhage was identified in 6.3% of the cohort. In most patients (95.2%), the primary retinal break was identified (Table 1).

Background	Positive (%)	Negative (%)
Trauma	20 (9.6)	188 (90.4)
Myopia	160 (76.9)	48 (23.1)
Fellow-eye RRD	10 (4.8)	198 (95.2)
Reported symptoms		
Floaters	136 (65.4)	72 (34.6)
Photopsias	87 (41.8)	121 (58.2)
Decreased vision	198 (95.2)	10 (4.8)
Findings from ophthalmological examination		
Tobacco Dust Sign	186 (89.4)	22 (10.6)
Vitreous hemorrhage	13 (6.3)	195 (93.8)
Primary retinal Break identified	198 (95.2)	10 (4.8)
Most frequent primary retinal break		
Horseshoe tear	107 (51.4)	
Lattice Degeneration	70 (33.7)	
Capped hole	10 (4.8)	
Macular hole	7 (3.4)	
Retinal dialysis	4 (1.9)	
Retinal Pathological Findings		
Macular involvement	177 (85.1)	30 (14.4)
Fixed retinal folds	65 (31.3)	143 (68.8)
Intraretinal cysts	16 (7.7)	192 (92.3)
Subretinal bands	1 (5.3)	197 (94.7)

Table 1: Clinical characteristics of patients with RRD at the time of the first assessment

3.3. Characteristics of primary retinal break

The most frequent primary retinal break was a horseshoe tear (51.4%), followed by lattice degeneration (33.7%). No tears met the criteria to be considered giant (extending 3 or more meridians). The location of the lesion on the retinal meridians and its extent are relevant characteristics for management and prognosis, and their distributions are detailed in Table 2. When classifying the meridians as superior (MX-MII) and inferior (MIII-MIX), it was observed that more than half of the horseshoe tears (71%, n = 76) and lattice degenerations (62.9%, n = 44) were located on the superior meridians. In contrast, operculated holes (80%, n = 8) and all retinal dialysis lesions (n = 4) were predominantly located on the inferior meridians. Regarding the extent of the lesion, Lattice degeneration showed the greatest average extent, while operculated holes showed the least extent.

The association between a history of trauma and the type of lesion was analyzed. Although only 9.6% of the total population reported trauma, this history was significantly more prevalent in retinal dialysis (75% of cases) compared to operculated holes (20%) and horseshoe tears (8.4%). No macular holes were associated with trauma (Table 2). The difference in the distribution of this history among the lesion types was statistically significant ($p = 0.001$). On the other hand, myopia was a common history in more than half of the cases for all types of causative lesions; however, no significant differences were found in its prevalence among the different lesion types ($p = 0.611$).

Lesion	Most Frequent Location *(% of all lesions of that type)*	Extent of the Causative Lesion *(clock hours ± SD)*	History of trauma	History of myopia
Horsehoe tear (n = 107)	MXII (24.3%)	0.91 ± 0.54	9 (8.4%)	81 (75.7%)
	MX (16.8%)			
Lattice degeneration (n = 70)	MXI (30.0%)	1.48 ± 0.73	2 (20.0%)	9 (90.0%)
	MX y MXII (12.9% each)			
Operculated hole (n = 10)	MIX (30.0%)	0.60 ± 0.21	6 (8.6%)	53 (75.7%)
	MIV (30.0%)			
Macular hole (n = 7)	Macula (100%)	-	0	6 (85.7%)
Retinal dialysis (n = 4)	MV (50.0%)	1.25 ± 0.50	3 (75.0%)	2 (50.0%)

Table 2: Characteristic of primary retinal break.

3.4. Macular involvement and its association with clinical variables

Given that macular involvement is a key prognostic factor for visual outcome, the study population was stratified into two groups: macula-on and macula off. Comparison of various clinical variables between these groups (Table 3) revealed significant differences in:

1. Visual acuity: Patients macula-on had an average visual acuity of 20/83, while those with macula-off averaged counting fingers at 1 meter (equivalent to 20/2143 on the Snellen scale).

2. Floaters: These were reported more frequently in the group macula-on (83.3%) compared to the group with macula-off (62.4%).

3. Reported visual impairment: This was significantly more prevalent in the group with macula-off (98.9%) than in the group macula-on (73.3%).

4. Fixed retinal folds: These were observed more frequently in the group with macula-off (34.3%) than in the group macula-on (13.3%). Additionally, a significant difference was found in the presence of mobile folds (p=0.029), with a higher frequency in the group with macula-off (48.9%) than in the group macula-on (26.7%).

5. Extent of RRD: The average extent of the detachment was significantly greater in the group with macula-off (6.82 ± 2.25 meridians) compared to the group macula-on (4.53 ± 2.00 meridians).

No statistically significant differences were found for the other variables compared, including the duration of the condition (p=0.720) and the findings associated with Grade C proliferative vitreoretinopathy (PVR).

	Macula-off (n = 178)	Macula-on (n = 30)	P Value
Visual acuity logMAR (Snellen)	2.03 ± 0.68 (20/2143)	0.61 ± 0.52 (20/83)	<0.001[a]
Age (years)	53.45 ± 14.54	54.80 ± 15.49	0.475[a]
Symptom duration (days)	29.10 ± 40.20	33.43 ± 48.73	0.720[a]
Floaters	111 (62.4%)	25 (83.3%)	0.036[b]
Photopsias	76 (42.7%)	11 (36.7%)	0.690[b]
Decreased vision	176 (98.9%)	22 (73.3%)	<0.001[b]
History of trauma	15 (8.4%)	5 (16.7%)	0.178[b]
Pre-existing refractive error	134 (75.3%)	26 (86.7%)	0.241[b]
History of fellow-eye RRD	8 (4.5%)	2 (6.7%)	0.640[b]
Tobacco dust	162 (91.0%)	24 (80.0%)	0.101[b]
Vitreous Hemorrhage	12 (6.7%)	1 (3.3%)	0.698[b]
Primary Retinal break identified	168 (94.3%)	30 (100%)	0.372[b]
Horseshoe tear	90 (52.9%)	17 (56.7%)	0.764[b]
Lattice degeneration	59 (34.7%)	11 (36.7%)	
Operculated hole	8 (4.7%)	2 (6.7%)	
Macular hole	7 (4.1%)	0	
Retinal dialysis	4 (2.4%)	0	
RRD extent (clock hours)	6.82 ± 2.25	4.53 ± 2.00	<0.001[a]
Fixed retinal folds	61 (34.3%)	4 (13.3%)	0.031[b]
Intraretinal cyst	13 (7.3%)	3 (10.0%)	0.708[b]
Subretinal strand	10 (5.6%)	1 (3.3%)	1.000[b]

[a] Mann-Whitney U test
[b] χ^2 test

Table 3: Comparative analysis of clinical characteristics

3.5 Association between symptom duration and fundus findings

Considering the role of symptom duration in the development of PVR, the association between this variable and the different fundus findings was evaluated (Table 4). Significant differences in symptom duration were observed for the PVR criteria (fixed folds and subretinal band) and for intraretinal cysts (indicators of chronicity); in all these cases, symptom duration was longer in the group presenting the finding. In contrast, the presence of Grade B PVR (mobile folds) was associated with a shorter symptom duration.

	Mean days of evolution		P Value (Mann-Whitney U test)
	Present (n)	Absent (n)	
Mobile folds	18.44 ± 27.73 (95)	39.21 ± 48.26 (113)	0.001
Fixed folds	56.41 ± 52.34 (65)	17.59 ± 28.18 (143)	< 0.001
Intraretinal cyst	77.00 ± 61.62 (16)	25.78 ± 36.87 (192)	< 0.001
Subretinal strand	47.54 ± 48.12 (11)	28.73 ± 40.94 (197)	0.040

Table 4. Evolution-dependent differences in proliferative vitreoretinopathy findings

3.6 Correlation analyses

Pearson correlation analyses were conducted to explore the influence of RRD extension and symptom duration on visual capacity (LogMAR) (Table 5). A positive, moderate, and statistically significant correlation was identified between RRD extension (in meridians) and visual capacity (LogMAR), indicating that a greater extent of retinal detachment is associated with worse visual acuity. No significant correlation was found between symptom duration and visual capacity (LogMAR).

	P Value	Correlation Coefficient (ρ)
Symptom onset time	0.866	-
Extent of RRD (Clock hours)	<0.001	0.395

Table 5: Factors Influencing Initial Visual Acuity

Discussion

Characterizing the demographic and clinical features of DRR is fundamental to understanding its epidemiology and guiding management strategies. This study explored these variables in an adult Mexican population treated at a tertiary care center, seeking to identify significant differences and associations, as well as compare these findings with those reported in the international literature. In accordance with previous epidemiological studies, [18,19] diverse findings from our cohort showed patterns consistent with those described by other authors, which supports the central hypothesis of this work. The following similarities are detailed below:

a. Mean age: The mean age of our patients (53.6 ± 14.6 years) was similar to that reported in a recent multicenter study conducted in the United States (57.9 ± 12.4 years).[20] European studies have documented comparable age ranges, although regional variations are observed, such as the mean age of 47.8 years in Taiwan,[21] which underscores the demographic diversity of the populations studied.

b. Male predominance: Males were more affected in our cohort (55.77% men vs. 44.23% women), a finding consistent with reports from European studies (e.g., male-to-female ratio of 2.1:1[22]; Asians [6,21]; and Americans [14,23]).

c. Ocular laterality: The right eye showed a higher prevalence of involvement, which is consistent with reports in the international literature, which indicates right eye involvement in 52–63% of cases.[18,22,19] A recent multicenter analysis not only confirmed this predominance but also identified that the DRR phenotype can vary with laterality, with a higher frequency of foveal detachment and larger retinal tears in cases of right eye involvement.[24]

d. *History of ocular trauma*: The prevalence of a history of ocular trauma in our cohort (9.6%) was like that of the Scottish study (10.3%),[18] suggesting consistency in this etiological factor across populations. However, other studies have reported higher prevalences, reaching 34%,[25] which could reflect demographic variations, exposure to occupational hazards, or differences in access to ophthalmological care. Trauma, particularly of a blunt nature, can induce the formation of retinal lesions that predispose to detachment.

e. *Most frequent primary retinal break:* Horseshoe tears were the most frequent causative lesion in this study (51.4%), a finding consistent with the global epidemiology of retinal degeneration in adults, where percentages between 50% and 80% are reported. This high prevalence is explained by the pathophysiology of this lesion: a horseshoe tear involves active vitreous traction and a larger area of exposure of the underlying retinal pigment epithelium, which facilitates the entry of vitreous into the subretinal space. In contrast, in an operculated hole, vitreous traction has ceased, and the area of exposure is smaller. Although lattice degeneration also presents vitreous traction, it does not always provide a direct entry pathway for subretinal

fluid, unlike a frank tear. It is important to note that although lattice degeneration is the most common predisposing lesion in the general population (6-14.5%) [19,26] most of these lesions never progress to a RRD.

f. Location of lesions: The predominant location of lesions in the superior meridians was a finding consistent with the literature, which describes the superotemporal quadrant as the most frequently affected (up to 69% of cases), and the inferonasal as the least common (17%).[27] This is attributed to the gravitational effect, which facilitates the movement of subretinal fluid once it has entered space. Although inferior lesions are associated with a lower risk of detachment, they carry a higher risk of multiple lesions and recurrence after surgery.[28]

g. Vitreous hemorrhage: The percentage of patients who presented with vitreous hemorrhage in our study was 6.3%, comparable to the 7.5-10% reported in European studies.[18]

Furthermore, differences and factors associated with chronicity and severity were also identified. The prevalence of grade C PVR was significantly higher in our cohort (31.3%) compared to the European study (11.7%).[18] This figure is higher than the consistent prevalence of 5–10% reported in larger epidemiological studies,[29] although some studies have documented higher figures, up to 26.9%.[30]

Another important difference lies in the percentage of patients with macular involvement at presentation: 85.1% in our study versus 49.4% in the study by Mitry et al., [18] Considering the similarity in the location and characteristics of the predisposing lesions, this disparity in chronicity indicators (PVR and MI) and other findings such as intraretinal cysts suggests a greater delay in seeking medical attention after the onset of symptoms in our population. The average duration of symptoms in our study was 33.43 days, considerably longer than the 8.5 days reported in other cohorts.[31] This difference in duration likely allowed subretinal fluid to progress to involve the macula in a greater number of cases and contributes to the development of C-RVR. Evidence has shown that progression time is a risk factor for macular detachment, especially in RRD with a bullous configuration.[32] Consistently, in the present study, eyes with macula-off RRD showed a greater average extent (6.82 ± 2.25 meridians vs. 4.53 ± 2.00 meridians in the group of macula-on), and a greater RRD extent was found to be associated with worse visual acuity.

Regarding the presenting symptoms of RRD, decreased vision was the most frequent symptom, followed by floaters and photopsias. When stratified by macular status, floaters were more common in the group with macula-on while decreased visual acuity predominated in the group macula-off. This pattern aligns with previous reports,[33] as peripheral visual loss without macular involvement may be less noticeable to the patient. Although not evaluated in this study, curtain visual field loss is a highly specific symptom of RRD,[31] and its targeted investigation is crucial.

The mean visual acuity of the population at admission was LogMAR 1.83 (equivalent to counting fingers at 2 meters or 20/1352 Snellen). Division by macular status revealed considerably better preoperative vision in patients with an attached macula (LogMAR 0.61 or 20/83) compared to those with a detached macula (LogMAR 2.03 or counting fingers at 1 meter), a finding consistent with other studies (e.g., LogMAR 1.98 in DRRs with MI in a prospective UK cohort study).[34] Preoperative vision is recognized as one of the main biomarkers of postoperative visual outcome, where better baseline vision is associated with better results.[34]

4.1 Limitations

This study has certain limitations inherent to its design and the nature of data collection. First, as it is a retrospective study, the reliability of the findings is directly dependent on the quality and completeness of the clinical records. This means that the available information relies on the original documentation, which can lead to incomplete or missing data for variables of interest. In this regard, several relevant background and clinical data points for the complete characterization of DRR were not consistently documented in the records for this study. Among these variables highlight the presence or absence of complete posterior vitreous detachment, the exact number of causative lesions, and a family history of retinal detachment. It would also be interesting to document the average time it takes to operate on the patient after diagnosis. This lack of detailed information not only affected the depth of the analysis but also hinders a comprehensive comparison with previous studies [5] and opens the opportunity for future prospective research of this type to explicitly include these variables in its data collection protocol.

In addition, the research was based on patients treated at a single tertiary care center. While this ensures specialized expertise, it introduces the possibility of selection bias, as the study population may not be entirely representative of the general Mexican population; patients arriving at a tertiary care center often present with more complex cases or are referred late, which could influence the characteristics of the cohort.

As this was a cross-sectional and retrospective characterization study, it was not possible to establish causal relationships between the observed variables, only associations. Furthermore, the lack of long-term follow-up data at this stage of the study prevents direct evaluation of visual prognosis or the re-detachment rate based on initial clinical characteristics.

The results demonstrate consistency in several fundamental characteristics of RRD with those reported in epidemiological studies in other populations.[5] This study also revealed significant differences that warrant attention, such as the average age. In our population, a higher prevalence of indicators of chronicity and severity was found, such as post-refractive error of vision, fixed folds and intraretinal cysts. These differences, especially the greater extent of RRD and the poorer visual acuity in patients with PVR, suggest that a proportion of patients at this referral center may be seeking medical care with more advanced or longer-standing RRD. This could reflect inherent challenges within the healthcare system, such as barriers to access, delays in diagnosis, or timely referral, which directly impact prognosis.

4.Conclusions

This study provides a solid foundation for future research that complements the data obtained. Longitudinal studies would be valuable to evaluate long-term visual prognosis and the rate of re-detachment, as well as to investigate in depth the socioeconomic factors and access to healthcare that may influence the duration of the disease and its severity at presentation in the Mexican population. Finally, this work underlines the importance of timely detection and referral of RRD to mitigate the impact of chronicity factors and improve visual outcomes.

5.References

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