Research Article

Laterality of Rhegmatogenous Retinal Detachment

Carlos Sevillano[*1] , Eloy Viso[1], Santiago Moreira-Martínez[2], Alberto Parafita-Fernández[1], Marta Sampil[1], María José Blanco[3]

[1]Ophthalmology Department, Complexo Hospitalario Universitario de Pontevedra, Pontevedra, Spain

[2]Chemical Engineering Department. Computational Mathematics, Idener; Seville, Spain

[3]Ophthalmology Department, Complexo Hospitalario Universitario de Santiago de Compostela, Santiago de Compostela, Spain

[*]**Corresponding author:** Carlos Sevillano, Ophthalmology Department, Complexo Hospitalario Universitario de Pontevedra, Pontevedra, Spain

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Abstract

Introduction: Retinal detachment (RD) is a potentially blinding disease. The epidemiological characteristics of this disorder could help to understand the factors influencing its incidence.

Purpose: To investigate the laterality of rhegmatogenous retinal detachment (RRD) and the differences between right and left eyes.

Methodology: All RRD cases in Pontevedra from 2008 to 2014 were retrospectively analyzed. The epidemiological characteristics of them were investigated.

Results: The right eye (P=0.035) was most frequently involved (55.5%) with more detached macules (P=0.016). No ocular differences were found between right and left eyes but ocular hypertension, being the left eye more affected (P=0.039).

Conclusions: The right eye is more and worse involved than the left eye. The solar radiation effect on the eye might be one important factor.

Keywords: Asymmetry; Laterality; Retinal detachment; Right eye; Solar radiation

1. Introduction

RRD is a relatively infrequent pathology (7-22/100.000 inhabitants, depending on geographical location [1-9] with seasonal variation, probably due, among other factors, to solar radiation [10]. The rhegmatogenous RD (RRD) is caused by a retinal break through which the liquefied vitreous detaches the neurosensorial retina from the underlying pigment epithelium [11], and its associated risk factors are typically age, male sex, cataract surgery, myopia and lattice degeneration [2-4,9]. Laterality in ocular disease has been studied previously. The left eye has been found to be more frequently affected in glaucoma [10,11,12], whereas right predisponence has been found in ocular dominance [13-15] (in its three types) [16], in floppy eyelid syndrome [17] and solar retinopathy [18,19]. Laterality in palpebral carcinomas [20,21] is depending on the driver´s position in each country. With respect to RRD, there are many studies showing right predisponence [5-9,22-34] although only 4 statistically studied [1,22,24,35]. In a previous study we analyzed the relationship between the incidence of RD and solar radiation [23]. In this study we analize the laterality and eye characteristics.

2. Matherial and Methods

Study population

We retrospectively analyzed all the RRD patients diagnosed between 2008 and 2014 in the Department of Ophthalmology of the Complexo Hospitalario Universitario de Pontevedra. This Hospital Complex provides free public coverage for more than 95% of the population and was the only center with a capacity for vitreoretinal surgery in Pontevedra at the time. Only those patients residing in the area at the time of diagnosis were included in the study. In order to give more power to the statistics of laterality disbalance, we added the RRD cases between 2015 and 2019.

Data collection

RD patients who had underwent surgery during the study period were identified from surgical logbooks. Emergency records were also checked to identify patients who for any reason had not had surgery. The medical records of all these patients were reviewed. Data extracted included demographic and clinical information such as the age and sex of the patients, type of detachment, location of the breaks and of the detachment and presence of macula on or off, lattice degeneration, hemovitreous or vitreoretinal proliferation were recorded. Bilaterality, ocular disease (such as glaucoma, pseudoexfoliation, or age-related macular degeneration), myopia magna, and diopters (spheric equivalent) were taken into consideration. RRD was defined as an accumulation of subretinal fluid of at least 2 disc diameters in size associated with one or more full-thickness retinal breaks detected during the preoperative examination or during the surgical procedure [2,3]. Recurrent cases and subclinical RRD, which could be treated by laser, were excluded. Other types of RD were also excluded. Chronic DR was defined as that with more than 6 months of history. Statistical analysis of laterality, comparing left eye and right eye, was analyzed with the chi-square test.

Ethical considerations

The study conformed to the principles of the Helsinky Declaration and was reviewed and approved by the Regional Research and Ethics Committee.

3. Results

A total 259 patients with RRD, all of them Spanish Caucasians, were diagnosed during the study period from a population of 302688. The mean age (SD) of the patients was 61.1 (SD 13.7) years (range, 14-89 years). There were 217 women and 133 men (1.74:1). The right eye was 11% more frequently affected than the left (55.5% compared with 44.5%) (P=0.035). Ocular characteristics can be found in table 1. No differences in diopters, detachment characteristics neither ocular findings were found, but the macular status of RRD, that was more detached in right eyes (P=0.016), and in complications: both showed as first complication the ocular hypertension but left eyes were more affected (P=0.039). To give more power to the comparison between right and left eyes, all RRD cases in the same hospital from 2015 to 2019 were collected (208), resulting in 467 cases, from which 54.4% were right eyes.

	OD	OS	p
N	142 (53.3%)	117 (46.7%)	0.035
Mean age	62.72	58.7	NS
Man:woman	1:1.4 (83:59)	1:1.7 (74:43)	NS
Main symptom	Floaters (38.5%, n=54)	Floaters (46,5%. N=46)	NS
Macula-off	82 (58.1%)	49 (45.8%)	0.016
Hemovitreous	22 (15.5%)	24 (21.1%)	NS
Laticce	38 (45.8%)	29 (38.2%)	NS
Number quadrants	1.85	1.83	NS
Number of breaks	1.81	2	NS
PVR	28 (21.2%)	18 (16.7%)	NS
Chronic DR	15 (10.6%)	18 (16.7%)	NS
Refractive status (mean)	-4,3 diopters	-4,2 diopters	NS
Myopia (<-1d, >-7d)	79 (55.6%)	65 (55.5%)	NS
Hypermetropia (<+1d)	10 (5.6%)	5 (6.0%)	NS
Emetropia (<-1d, <+1d)	24 (16.9%)	13 (11.1%)	NS
High Myopia (>-7d)	29 (20.4%)	34 (29.5%)	NS
Aphakia	2 (1.4%)	2 (1.8%)	NS
Pseudophakia	51 (35.9%)	34 (29.1%)	NS
Pseudoexfoliation	5 (3.5%)	4 (3.4%)	NS
Trauma			
Penetrating	2 (1.4%)	0	NS
Blunt	2 (1.4%)	6 (5.1%)	NS
Bilaterality	25 (17.6%)	23 (19.6%)	NS
Redetachment	32 (22.5%)	19 (16.2%)	NS
Postsurgery complications	Ocular Hypertension (23.3%)	Ocular Hypertension (35.0%)	0.039

PVR: proliferative retinopathy. NS: non significative

Table 1: Comparison between RRD in right and left eyes.

4. Discussion

Almost all the studies reviewed where RRD laterality is studied agree with our results: approximately a 10% greater affectation of the right eye (52-58% 5-9,22-34). Even though, only 4 of them make this comparison statistically [1,22,24,35] and another one 23 talking about retinal breaks. The only one that do not follow this rule is the EDCC 36, with a 50% of right eyes. In this papers, the only explanation to this repetitive results can be found in the studies of Mitry [26] and Mahroo [27], suggesting that, as right eyes use to be the dominant one, tend to be larger (due to the association dominancy-axial length) and because of this are at major risk of developing RRD. Everett also refers to a possible difference in vascularization, as left carotid comes directly from aortic arc; and finally added that reading microsacades, in left-to-right writing, could make easier to detach the retina. This explanation lose strength when other study [25] showed the same ratio (52,5% right eyes) in patients with right-to-left writing. Talking about retinal breaks, the laterality maintains [25,26]. We believe that the solar radiation has the clue of this disbalance. RRD is associated with solar radiation in our population [22]. In addition, 66% of general population has the eye dominance in the right one [19-21]; and it is known that the eye winked in preference is the non-dominant [37]. These statements confirm that left eye is preferred for wink (in most people) and, because of this, the right eye catches more solar radiation along years.

This agree with the fact that solar retinopathy is more incident in right eyes. Chen [18] reviewed all cases until date and states a 55 % of right eyes. Moreover, after a personal communication with Akay [19], his 25 cases showed 16 (64%) of right predisponence. With other papers with only 1-3 cases, we found a 56.96 % as result. As the studies of Kavac [19], Costea [20] and Kato [21] for palpebral neoplasms, which have more frequency in the driver´s side (because of more solar radiation in the window side), we should have more RRD in the left side, and this is the opposite of the results. It is truth that we did not collect if the patient was driver neither the number of hours driving. The refractive status was not different between the two eyes (-4.3 diopters right eye; -4.2 diopters left eye), so we extrapolate that axial length must be similar (we did not collect it). Moreover, there is a slight superiority in left eyes in high myopia (29.5% instead of the 20.4% of right eye), so even could give more weight to this side if that had something to do with the laterality. As we can see in table 1, no differences in detachment characteristics neither ocular findings were found, but the macular status of RRD, that were more detached in right eyes (P=0.016). This fact can be related to more exposition at solar radiation. The last difference can be found in ocular hypertension, with a higher proportion of left eyes (P=0.039). This fact agrees with previous papers explaining vascular or sleeping factors that might increase ocular pressure in left eyes [11,38].

5. Conclusions

In RRD, we assess the more implication of right eye, showing worse macular status than left eye, and higher pressure as complication in left eyes. It is possible that the greater affectation of the right eye is related to solar exposure.

Declaration of conflicting Interest

The authors declare that there is no conflict of interest.

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References

1. Laatikainen L, Tolppanen EM, Harju H. Epidemiology of rhegmatogenous retinal

detachment in a Finnish population. Acta Ophthalmol (Copenh) 63 (1985): 59-64.

2. Polkinghorne PJ, Craig JP. Northern New Zealand Rhegmatogenous Retinal Detachment Study: epidemiology and risk factors. Clin Exp Ophthalmol 32 (2004): 159-163.
3. Mitry D, Charteris DG, Yorston D, et al. Rhegmatogenous retinal detachment in Scotland: research design and methodology. BMC Ophthalmol 9 (2009): 2-10.
4. Poulsen CD, Peto T, Grauslund J, et al. Epidemiologic characteristics of retinal detachment surgery at a specialized unit in Denmark. Acta Ophthalmol 94 (2016): 548-555.
5. Rowe JA, Erie JC, Baratz KH, et al. Retinal detachment in Olsmed County, Minnesota, 1976 through 1995. Ophthalmology 106 (1999): 154-159.
6. Zou H, Zhang X, Xu X, et al. Epidemiology survey of rhegmatogenous retinal detachment in Beixinjing District, Shanghai, China. Retina 22 (2002): 294 -299.
7. Mowatt L, Shun-Shin G, Price N. Ethnic differences in the demand incidence of retinal detachments in two districts in the West Midlands. Eye 17 (2003): 63-70.
8. Li X. Beijing rhegmatogenous retinal retachment group. Incidence and epidemiological characteristics of rhegmatogenous retinal detachment in Bejing, China. Ophthalmology 110 (2003): 2413-2417
9. Tornquist R, Stenkula S, Tornquist P. Retinal detachment. A study of a population-based patient material in Sweden 1971–1981. I. Epidemiology. Acta Ophthalmol (Copenh) 65 (1987): 213-222.
10. Kaplowitz K, Blizzard S, Blizzard DJ, Nwogu E, Hamill CE, Weinreb RN, Mohsenin V, Loewen NA. Time Spent in Lateral Sleep Position and Asymmetry in Glaucoma. Invest Ophthalmol Vis Sci 56 (2015): 3869-74.
11. Poinoosawmy D, Fontana L, Wu JX, Bunce CV, Hitchings RA. Frequency of asymmetric visual field defects in normal-tension and high-tension glaucoma. Ophthalmology 105 (1998): 988-91.
12. Figueira EC, Chen TS, Agar A, Coroneo MT, Wilcsek G, Nemet A, Francis IC. LESCs: Lateralizing Eyelid Sleep Compression Study. Ophthalmic Plast Reconstr Surg 30 (2014): 473-5.
13. Chen KC, Jung JJ, Aizman A. High definition spectral domain optical coherence tomography findings in three patients with solar retinopathy and review of the literature. Open Ophthalmol J 6 (2012): 29-35
14. Akay F, Toyran S, Oztas Z, et al. Long-term choroidal thickness changes after acute solar retinopathy. Ophthalmic surg lasers imaging retina 46 (2015): 738-742.
15. Kavak A, Parlak AH, Yesildal N, Aydogan I, Anul H. Preliminary study among truck drivers in Turkey: effects of ultraviolet light on some skin entities. J Dermatol 35 (2008): 146-50.
16. Costea CF, Turliuc MD, Sava A, et al. Periocular basal cell carcinoma: demographic, clinical, histological and immunohistochemical evaluation of a series of 39 cases. Rom J Morphol Embryol 60 (2019): 77-86.
17. Kato H, Oda T, Watanabe S, et al. Facial distribution of squamous cell carcinoma in

Japanese. Exp Dermatol 1 (2019):72-74.

18. Seyal M, Sato S, White BG, Porter RJ. Visual evoked potentials and eye dominance. Electroencephalogr Clin Neurophysiol 52 (1981): 424-8.
19. Ito M, Shimizu K, Kawamorita T, Ishikawa H, Sunaga K, Komatsu M. Association between ocular dominance and refractive asymmetry. J Refract Surg 29 (2013): 716-20.
20. Eser I, Durrie DS, Schwendeman F, Stahl JE. Association between ocular dominance and refraction. J Refract Surg 24 (7):685-9.
21. Reiss MR. Ocular dominance: some family data. Laterality 2 (1997): 7-16.
22. Sevillano Torrado C, Viso E, Moreira S, Blanco MJ, Gude F. Rhegmatogenous Retinal Detachment and Solar Radiation in Northwestern Spain. Ophthalmologica 243 (2020): 51-57
23. Mahroo OA, Mitry D, Williamson TH, Shepherd A, Charteris DG, Hamilton RD. Exploring Sex and Laterality Imbalances in Patients Undergoing Laser Retinopexy. JAMA Ophthalmol 133 (2015): 1334-6.
24. Everett WG, Katzin D. Meridional distribution of retinal breaks in aphakic retinal detachment. Am J Ophthalmol 66 (1968): 928-932.
25. Merin S. The higher frequency of retinal detachment in the right eye. Am J Ophthalmol 70 (1970): 312.
26. Smolin G. Statistical analysis of retinal holes and tears. Am J Ophthalmol 60 (1965): 1055-1059.
27. Huerkamp B, Leidig I, Klompp G. Bedeutung der Begleit symptome bei ein und beidseitiger Ablatio retinae, von Graefe's Arch Ophth 155 (1954): 556.
28. Mansour AM, Hamam RN, Sibai TA, Farah TI, Mehio-Sibai A, Kanaan M. Seasonal variation of retinal detachment in Lebanon. Ophthalmic Res 41 (2009): 170-174.
29. Auger N, Rhéaume MA, Bilodeau-Bertrand M, Tang T, Kosatsky T. Climate and the eye: Case-crossover analysis of retinal detachment after exposure to ambient heat. Environ Res 157 (2017): 103-109.
30. Bertelmann T, Cronauer M, Stoffelns B, Sekundo W. Seasonal variaton in the occurrence of rhegmatogenous retinal detachtment at the beginning of th 21st century. Study results and literature review. Ophthalmologe 108 (2011): 1155-63.
31. Mitry D, Tuft S, McLeod D, Charteris DG. Laterality and gender imbalances in retinal detachment. Graefes Arch Clin Exp Ophthalmol 249 (2011): 1109-10.
32. Haimann MH, Burton TC, Brown CK. Epidemiology of retinal detachment. Arch Ophthalmol 100 (1982): 289 –92.
33. Rosman M, Wong TY, Ong SG, Ang CL. Retinal detachment in Chinese, Malay and Indian residents in Singapore: a comparative study on risk factors, clinical presentation and surgical outcomes. Int Ophthalmol 24 (2001): 101-6.
34. Howie AR, Darian-Smith E, Allen PL, Vote BJ. Whole population incidences of patients presenting with rhegmatogenous retinal detachments within Tasmania, Australia. Clin Exp Ophthalmol 44 (2016): 144-6.
35. Mitry D, Charteris DG, Yorston D, Siddiqui

AR, Campbell H, Murphy AL, Fleck BW, Wright AF, Singh J, and the Scottish RD Study Group. The epidemiology and socioeconomic associations of retinal detachment in Scotland: a two year prospective population-based study. Invest Ophthalmol Vis Sci 51 (2010): 4963-4968.

36. The Eye Disease Case-Control Study Group. Risk factors for idiopathic rhegmatogenous retinal detachment. Am J Epidemiol 137 (1993): 749-57.
37. Jensen OL. Pterygium, the dominant eye and the habit of closing one eye in sunlight. Acta Ophthalmol (Copenh) 60 (1982): 568-74.
38. Booth FM. Increased numbers of higher left intraocular pressures in 428 patients referred to the glaucoma clinic. Aust N Z J Ophthalmol 20 (1992): 29-34.