Facteurs pronostiques de récupération visuelle dans le décollement de rétine idiopathique rhegmatogène : étude prospective à propos de 90 patients.

Prognostic factors for visual recovery in idiopathic rhegmatogenous retinal detachment: a prospective study of 90 patients.

Hsouna Zgolli, Sonya Mabrouk, Oumayma Khayrallah, Olfa Fekih, Imene Zeghal, Leila Nacef

Service d'ophtalmologie A / Institut Hédi Raïs d'ophtalmologie/université el Manar/faculté de médecine de Tunis

RÉSUMÉ

Objectif : Déterminer les facteurs cliniques et tomographiques préopératoires impliqués dans le pronostic visuel post opératoire des décollements de rétine rhegmatogènes (DRR) avec macula soulevée.

Méthodes : Étude prospective analytique évaluative menée auprès de 90 patients ayant présentés un DRR avec macula soulevée et ayant été opérés au service d'ophtalmologie de l'Institut Hédi Raies de Tunis (service A). Les patients ont été examinés en pré et en post-opératoire et ont été suivis sur une période minimale de 6 mois. Nous avons recherché les facteurs cliniques et tomographiques prédictifs de la récupération visuelle finale. Les données recueillies ont été saisies au moyen du logiciel Excel et analysées au moyen du logiciel SPSS version 18 pour Windows (IBM Corp., Armonk, NY). Pour tous les tests statistiques, le seuil de significativité a été fixé à p=0,05.

Résultats : L'acuité visuelle (AV) préopératoire moyenne était de 1,73 +/- 0 ,34 LogMAR. Elle était significativement corrélée au délai de prise en charge du DRR (p<0,001). L'AV postopératoire moyenne était de 0,61 +/- 0,43 LogMAR. D'un point de vue clinique une AV préopératoire ≥ 2 LogMAR, un délai de prise en charge > 15 jours (p<0,01), une prolifération vitréorétinienne (PVR) stade C ou plus (p=0,01) et un nombre de quadrants rétiniens décollés > 2 (p=0,05) représentent les facteurs de risque tomographiques pré-opératoires prédictifs d'une mauvaise récupération visuelle (AV<5/10). Les facteurs de risque tomographiques préopératoires de mauvaise récupération visuelle étaient : la hauteur du liquide sous rétinien > 800 µm (p < 0,001), la déstructuration de la membrane limitante externe et/ou de la ligne IS/OS (zone ellipsoïde) (p < 0,001), ainsi que la présence de cavitations dans les couches nucléaires externes et/ou internes (p = 0,002), et enfin l'absence d'amincissement de la couche des segments externes des photorécepteurs (p = 0.001).

Conclusion : Les facteurs cliniques préopératoires prédictifs de la récupération visuelle dans le DRR avec macula off sont principalement l'AV préopératoire, le délai de prise en charge opératoire, le nombre de quadrant décollé et le stade de PVR. L'OCT-SD permet d'objectiver des anomalies rétiniennes maculaires microscopiques spécifiques du décollement de rétine rhegmatogène. Ces anomalies seraient prédictives de la récupération visuelle postopératoire finale.

Mots clés : décollement de rétine rhegmatogène, pronostic, facteurs prédictifs, tomographie

Abstract

Aim: To determine the preoperative clinical and tomographic factors involved in the postoperative visual prognosis of macula-off rhegmatogenous retinal detachment.

Methods: We conducted a prospective analytical study of 90 eyes of 90 patients who suffered from macula-off rhegmatogenous retinal detachment and were treated in department "A" of "Hedi Raies Institute of Ophthalmology", Tunis. All the patients were examined prior and after the operation, with a thorough interrogation and complete ophthalmological examination. Also, we continued assessing their status for 6 months. We looked for the clinical factors predictive of postoperative visual recovery. The data collected was stored using Excel software and analyzed using SPSS version 18 for Windows (IBM Corp., Armonk, NY). For all statistical tests, the significance level was set at p=0.05.

Results: The mean preoperative visual acuity (VA) was 1.73 +/- 0.34 LogMAR. It was significantly correlated with management delay (p<0.001). Postoperative VA was 0.61 +/- 0.43 LogMAR. The various pre-operative clinical risk factors for poor final visual recovery (VA<5/10) were: preoperative VA ≥ 2 LogMAR, management delay > 15 days (p<0.01), proliferative vitreoretinopathy (PVR) stage C or greater (p=0.01), and number of detached retinal quadrants > 2 (p=0.05). Furthermore, we have found that the preoperative tomographic risk factors for poor visual recovery were: height of sub retinal fluid > 760µm (p < 0.001), disruption of the external limiting membrane and/or ellipsoid zone (p < 0.001), presence of cavitations in the external and/or internal nuclear layer (p = 0.002), and finally the absence of a thickening of the photoreceptor outer segments (p = 0.001).

Conclusion: Predictive preoperative clinical factors in macula off RRD are mainly preoperative visual acuity, the management delay, number of quadrants reached and PVR stage. Mastering these factors builds a better understanding of the functional recovery after macula-off retinal detachment and helps advise the patients who will consequently be more involved in the management of this serious disease. Spectral domain OCT allows detection of specific microscopic macular changes. These anomalies could be predictive of final postoperative visual outcome.

Key words: rhegmatogenous retinal detachment, prognosis, preoperative factors, tomography.

Correspondance
Sonya Mabrouk
Service A / Institut Hédi Raïs d'ophtalmologie/université el Manar/faculté de médecine de Tunis
mabrouksonya@yahoo.fr

INTRODUCTION

Rhegmatogenous retinal detachment (RRD) is a serious, sight-threatening condition with an incidence of 17.9 per 100.000 people per year (1). It is an accident that affects especially the young subjects. Its management, in emergency, is purely surgical (2).

Advancement in instrumentation and surgical techniques has widely improved the anatomical prognosis of RRDs. In fact, nowadays, anatomical success is guaranteed in more than 90% of cases, regardless of the type of surgery (vitrectomy or scleral buckling) (2,3). Despite complete anatomical reapplication, functional outcome and postoperative visual, recovery remain uncertain and difficult to predict, especially in cases with raised macula (macula off RRD). Many studies have focused on looking for postoperative damage, such as a macular epi-membrane, macular hole, folds, or macular edema to explain postoperative functional outcomes (4). Nevertheless, the postoperative fundus examination may be strictly normal, suggesting the intrusion of predictive preoperative clinical factors. These can significantly change the visual prognosis.

The aim of our study is to determine the preoperative clinical factors involved in the subsequent visual prognosis by analyzing the different data from the pre and postoperative clinical and tomographic examination.

METHODS

The study was carried out in accordance with the principles of the "Declaration of Helsinki" and was approved by the "Ethics Committee of Institute Hedi Raies of Ophthalmology"

We conducted an analytical, evaluative prospective study on 90 eyes of 90 patients who presented a macula off RRD and who had undergone surgical treatment in "Hedi Raies Institute of Ophthalmology", Tunis (Department A). These patients consulted our department for over a year between January 2013 and January 2014. We continued following up on the selected patients until June 2014.

Our study involved; patients with a macula off RRD and regular postoperative follow-up over 6 months. Criteria for non-inclusion included patients with a history of amblyopia of the affected eye or macular pathology affecting vision, diabetic subjects even in absence of diabetic retinopathy and glaucomatous subjects, RRD totally sparing the macula and retinal detachments (RD) due to macular hole, post-traumatic RD and tractional RD.

We excluded all patients with partial raised macula on postoperative examination, recurrence of RRD after silicone removal or gas resorption, and a follow-up under 6 months.

All candidates underwent a complete ophthalmologic examination before and after surgery as well as an Optical Spectral Coherence Domain Tomography (OCT-SD) examination.

Collected data:

Preoperatively, all our patients underwent a thorough interrogation to determine the age, general and ophthalmological history. On the functional level, we recorded the presence or not of a vitreous and/or macular syndrome. During the preoperative ophthalmological examination we measured the best corrected visual acuity (VA) in decimal fraction (Snellen scale) and converted it to LogMAR (logarithm of the minimum resolution angle). Also, we assessed the high and low luminance perceptions at the 4-quadrant level; a slit lamp examination before and after dilation specifying the condition of the anterior chamber and we measured the intraocular pressure.

The examination after maximum dilatation indicated: the state of the crystalline lens, the vitreous, the topography of the detachment, the number of raised quadrants, the character of the retinal tears (type, number, localization and size), the state of the macula (raised in all cases) and the existence of vitreoretinal proliferation (PVR). A diagram of the detachment was subsequently made to record the data based on the fundus examination.

Postoperatively, the data collected were: the delay of management (defined as the period between the date of the beginning of the vision loss in days (when the macula detached) and the date of surgery)); the kind of surgery performed: either 23 gauge vitrectomy, or scleral buckling surgery (sectoral and/or circumferential).

All our patients received regular postoperative follow-up every 7 days, 1 month, 3 months, 6 months and in some cases between 6 months and 12 months which included the measurement of the best corrected visual acuity (BCVA) in decimal fraction (Snellen scale) converted to LogMAR. Based on final visual acuity, patients were divided into three groups: Group A: VA between 1/100 and 1/10 (between 2 and 1 LogMAR); Group B: VA between

Table 1. Clinical profiles of patients according to their final visual acuity

	Group A (1/100-1/10) (between 2 and 1 LogMAR)	Group B (1,25/10-4/10) (between 0.9 and 0.4 LogMAR)	Group C (5/10-10/10) (between 0.3 et 0 LogMAR)	p value between: Group C versus Groups A and B
Patients number (n, %)	30 (30%)	36 (36%)	34 (34%)	
Preoperative VA*(LogMAR)	1.95	1.79	1.47	p<0.001
AVERAGE management delay (days)	29.66 +/- 20.8	18.83 +/- 12.9	11.94 +/ -4.5	p<0.001
PVR stage C (%)	26.66	16.66	5.88	p=0.01
Average number of detached retinal quadrants	2.86	2.33	1.88	p=0.005

VA: Visual Acuity. LogMAR: Logarithm of the Minimum Angle of Resolution. PVR: proliferative vitreoretinopathy

1.25/10 and 4/10 (between 0.9 and 0.4 LogMAR); and Group C: VA between 5/10 and 10/10 (between 0.3 and 0 LogMAR).

The rest of the examination involved intraocular pressure; lens and vitreous status and complete fundus exam.

Changes in neuro-retinal tissue as well as the persistence or not of sub-retinal fluid under the macula were investigated using OCT-SD at the same monitoring rate.

Statistical analysis:

Data collected were stored using Excel and analyzed using SPSS version 18 for Windows (IBM Corp., Armonk, NY). Simple frequencies and relative frequencies (percentages) were calculated for the qualitative variables. For quantitative variables, means medians and standard deviations were calculated, and the range was determined. The comparison of 2 independent series means were performed using "Student's t-test" for independent series. The comparison of the percentages on independent series was performed by "Pearson's chi-square" test, and in case of invalidity of this test, it was done using "Fisher's two-tailed exact" test. The comparison of 2 percentages on paired series was performed by the "Mac Nemar "test. The relationship between 2 quantitative variables was studied by the "Pearson correlation coefficient" (p). All tests were two-tailed and considered significant at $p < 0.05$ and highly significant at $p < 0.01$.

RESULTS

Demographics:

The follow-up average was 8.1 +/- 1.79 months (extremes between 6 and 12 months). The mean age's patients was 50 years (extremes ranging from 12 to 82 years), with male predominance, and a sex ratio M/F of 2.33. In our series, 14% of the patients had cataract surgery in the 12 months prior to the RRD.

Preoperative Clinical Features:

Preoperative VA (measured 48 hours before retinal detachment surgery), varied from 50 cm (well oriented light perception) (1/200 in the decimal scale); to 1/20 (1.73 +/- 0.34 LogMAR) with an average of 1/50 (counts fingers at 1 meter). Most patients had PVR stage B . The mean of quadrants detached was 2.35. Multiple retinal tears (≥2) was diagnosed in 32% of cases. They were majorly a flap tear (58%); atrophic holes in 28% and giant tears in 6%.

The management delay ranged from 4 to 90 days with an average of 20 +/-15.54 days. Thirty-two patients had undergone scleral buckling involving cryopexy, a 360° circular indentation with a strap in 100% of cases, combined with a radial sponge in 37.5% of cases. Sixty-eight patients had a vitrectomy associating: retinopexy with endolaser and/or cryopexy, then standard silicone oil tamponade in all cases.
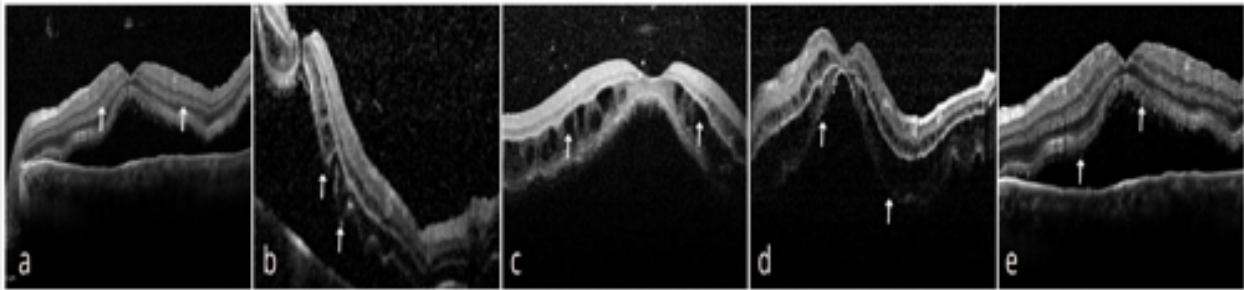
Figure 1: preoperative tomographic changes on rhegmatogenous retinal detachment (RRD) with raised macula: (a): thickening of the photoreceptor's outer segments (PROS); (b):undulation of the external retina; (c): cavitations on internal and external nuclear layers; (d): large disruption of the IS/OS line (e): multiple disruptions of the external limiting membrane and the IS/OS line.

Tomographic results:

Preoperative tomographic results had objected an average height of sub-retinal fluid of 766 ± 425µm; 97,6% showed a thickening of the photoreceptor's outer segments (PROS), 72% an undulation of the external retina, 66% showed cavitations on internal and external nuclear layers, 36,8% and 64 % showed respectively a disruptions of the external limiting membrane and the IS/OS line; then 2% had retinal atrophy (figure 1).

Final postoperative VA:

Final postoperative VA ranged from 1/100 to 10/10, with an average of 2.5/10 (0.61 +/- 0.43 LogMAR). We divided the patients according to postoperative VA into three groups:

Group A with VA ≤ 1/10 (≥1 LogMAR); Group B with VA between 1.25/10 and 4/10 (0.4 - 0.9 LogMAR); Group C with VA between 5/10 and 10/10 (0.3 - 0 LogMAR) (figure 2).

Analytic study:

On the one hand, we found that a low postoperative VA is statistically correlated with a prolonged management delay ($p < 0.001$) . Also, the higher is the preoperative VA, the better is the final postoperative BCVA. ($p < 0.001$).

On the other hand, we found that a poor final VA is related to an advanced PVR stage ($p = 0.005$) and several retinal quadrants lifted more than 2, with statically significant correlation (respectively $p = 0.005$ and $p = .001$) (figure 3).
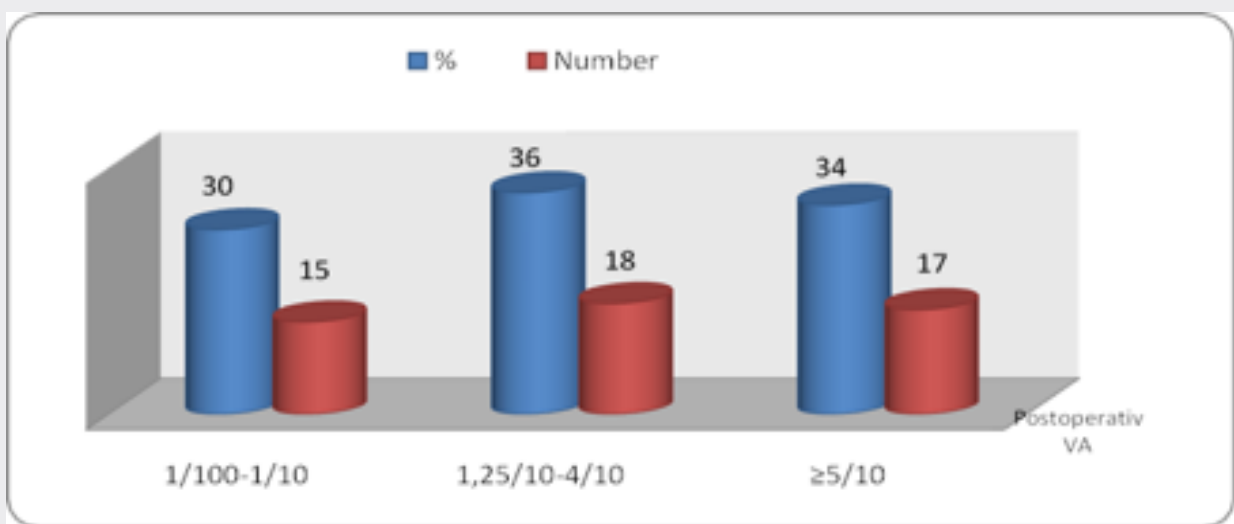

Figure 2 : Distribution of patients into 3 groups according to final postoperative visual acuity
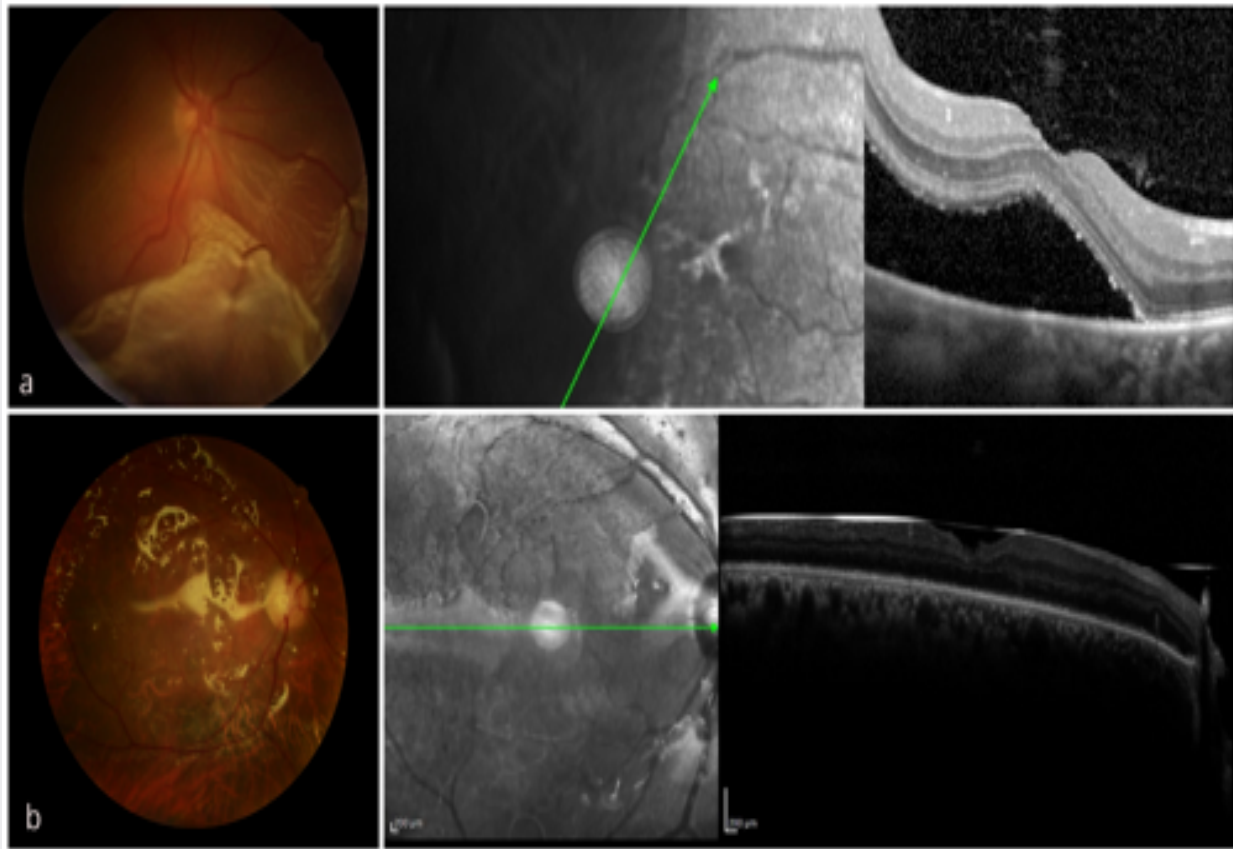
Figure 3 : pre and postoperative rhegmatogenous retinal detachment (RRD): (a) retinography and macular optical coherence tomography (OCT) of a recent RRD with raised macula (b) postoperative retinography and macular OCT showing total reapplication of the retina after vitrectomy and tamponade with silicone oil, the different retinal layers are restored ad integrum postoperatively.

Surgically, we found that patients who underwent scleral buckling had a significantly higher final VA (0.4 Log MAR) postoperatively than patients operated by vitrectomy (0.6 Log MAR) (p=0.048). There was no significant correlation between preoperative VA and preoperative lens status (p=0.395). Similarly, there was no significant difference in preoperative VA between the group with high myopia and the group with an axial length less than 26 mm (p=0.484).

According to our descriptive and analytical results, each group had a specific clinical profile with a significant difference between group C and the two groups A and B (Table I). We defined the factors of poor final visual recovery as those clinical elements whose presence was associated with a statistically significant risk of belong to groups A or B (final VA < 5/10). The greater was the number of risk factors for poor visual recovery, the greater will the likelihood of being in Group A.

At the OCT level, statistical analysis concluded that the presence, preoperatively, of cavitations in external and/or internal retinal layers as well as the disruption of the IS/OS line and the external limiting membrane were significantly correlated with poor preoperative VA (respectively p = 0.03, 0.001 and >0.001) (figure 6,7).

Furthermore, we have found that the preoperative tomographic risk factors for poor visual recovery were: height of sub retinal fluid > 760 μm (p < 0.001), disruption of the external and/or IS/OS line (p < 0.001), presence of cavitations in the external and or internal nuclear layer (p = 0.002), and finally the absence of a thickening of the PROS (p = 0.001) (figure 4).
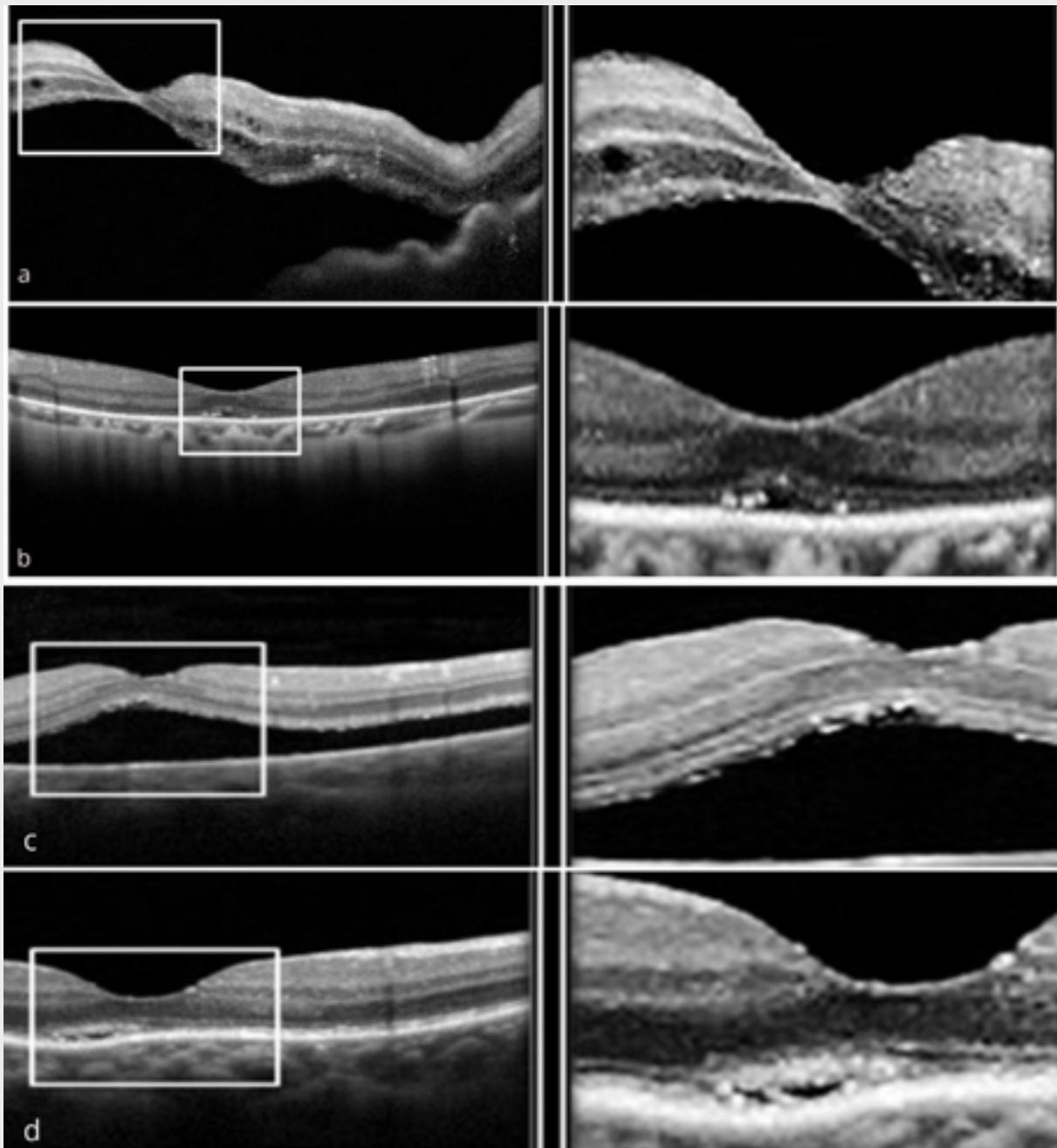
Figure 4 : Postoperative evolution of a rhegmatogenous retinal detachment with a discontinuous IS/OS line and a discontinuous external limiting membrane preoperatively: (a): Preoperative OCT showing neuroretinal detachment with 405 µm subretinal fluid height, thickening of the outer segments of the photoreceptors and neuroretinal undulation. The external limiting membrane is discontinuous as well as the IS/OS line. The visual acuity was 1/80. (b): A 6 months postoperative OCT: complete restoration of the external limiting membrane continuity, incomplete restoration of the IS/OS line with persisting central disruptions, the Verhoeff's membrane was absent at 6 months postoperatively. The postoperative visual acuity was 4/10.

DISCUSSION

The mean preoperative VA in our study was 1.73 +/- 0.34 LogMAR. It was significantly correlated to the management delay (p<0.001). The mean final postoperative VA was 0.61 +/- 0.43 LogMAR, with 30 patients (30%) between 2 and 1 LogMAR, 36 patients (36%) between 0.9 and 0.4 LogMAR and finally 34 patients (34%) between 0.3 and 0 LogMAR. After analysis of the different clinical profiles of the 3 groups (A, B and C) divided according to their final visual acuity, we were able to objectify the different preoperative clinical risk factors of poor final visual recovery (VA<5/10) as follow: a preoperative VA ≥ 2 LogMAR, a management delay exceeding 15 days, a PVR stage C or more and a number of detached retinal quadrants > 2.

Preoperative VA is a significant predictor of visual recovery (5). Doyle and al. in a multivariate analysis of 185 macula off RRDs showed that good preoperative VA was found to be the only factor strongly predictive of good visual outcome (6).

According to our results, the preoperative VA is related to changes in the detached retina itself. In fact, we found the same statistically significant correlation between pre and postoperative VA (p<0.001).

The period of retinal detachment seems to be another significant predictive factor. Although the exact delay of time after which the visual prognosis is compromised is still a matter of debate (7-9). A study of several hundreds of patients (10) showed that no patient recovered 20/20 VA if the duration of retinal detachment exceeded five days. The decrease in visual recovery appears to evolve exponentially with the time of detachment prior to surgery. Surgery can reasonably be planned within the first week after retinal detachment (11). According to Wilkinson and al. (12), this delay was set at 14 days. However, all the authors anonymously agreed that the longer the macula had been raised, the worse the final visual prognosis was.

According to our results, the final VA was significantly correlated with the delay of the intervention (p<0.001). And beyond 15 days, the chances of visual recovery (VA≥5/10) were minimal.

The number of detached retinal quadrants is also a preoperative factor in poor final visual recovery. According to the authors, it would be a cause of poor postoperative anatomical results (surgical failures) and therefore a poor final visual prognosis (13,14).

On the other hand, the preoperative PVR stage is a major factor in poor visual recovery after macula off RRD surgery. In our study we found the more advanced the PVR stage (stage C), the lower was the final VA. According to the literature, this is mainly related to anatomical results that are reserved (recurrence with sometimes more extensive re-detachment) (15,16).

Finally, Spectral domain OCT allows detection of specific microscopic, quasi-histologic macular changes in rhegmatogenous retinal detachment. These anomalies could be predictive of final postoperative visual outcome. In fact, OCT-SD on detached macula allowed an exact measurement of the height of the sub retinal fluid; thus, according to the authors, the greater the level of macular detachment, the lower the pre- and post-operative visual acuity, and the more cavitations were formed at the level of the external nuclear layer (17).

Our study has certain limitations. First, a relatively small sample size can influence analytical results. Second, the duration of macular uplift was measured subjectively (based on interrogatory data) and not by an objective measurement. Despite these limitations, our study objectively presents a good analysis of the various preoperative elements playing a role in the postoperative visual prognosis. In addition, we were able to specify the predictive clinical factors in the surgery of macula off RRD.

In conclusion, the predictive preoperative clinical factors in RRD, macula off are mainly summarized in preoperative VA, time to surgery, number of quadrants reached and stage of PVR. Knowing these factors allows the patient, according to his clinical data, to be warned about the postoperative prognosis, which would result in better cooperation on his part. On the other hand, this allows a control of certain factors dependent on the surgeon, namely the delay of surgical management.

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