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Research Article

The Classification of Vitreo-Macular Adhesion

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Abstract

Purpose: To study morphometric condition of vitreo-macular adhesion (VMA) in patients with concomitant macular pathology by optical coherence tomography and develop, on the basis of the received data own classification of vitreo-macular adhesion.

Methods: The observation of 430 patients with vitreo-macular adhesion was done. The mean age of patients was equal to 64,3 ± 2.7 years. Best corrected visual acuity was 0,21 ± 0,01, and the level of IOP - 10.8 ± 1.6 mm Hg.PT. In addition to standard ophthalmic examination, all the patients underwent optical coherence tomography, according to which we studied morphometric condition of the vitreo-macular adhesion.

Results: Clinical functional analysis allowed us to identify and study II group: patients with asymptomatic and symptomatic VMA (sVMA). In the group of patients with symptomatic VMA selected three levels of its linear length and three types of attachment to the macular surface. Studied the role and influence of vitreo-papillary adhesion (VPA) on pathological processes in the macular region.

Conclusion: Clinical and functional investigations of patients with vitreo-macular adhesion aimed at its identification, analysis of options and peculiarities of its development, type of fixation and degree of linear length has allowed us to offer our own classification of the VMA.

Keywords: *Optical Coherent Tomography; Vitreomacular Adhesion; Classification*

Introduction

The emergence in recent years of new information about the role of vitreo-macular adhesion (VMA) in the development of macular pathology was made possible through the use of latest technologies in optical coherence tomography (spectral OCT). This, in turn, was the impetus for ordering of the received data and developing a classification of VMA, which would be the basis for interpretation of information obtained during diagnostic studies and planning, vitreo-retinal interventions [1-5].

About ten years ago was made one of the first attempts to split the VMA for V - and J-shaped, based on data OCT. The division was based on the nature of the configuration of fixing of the posterior hyaloid membrane to the surface of the retina [6]. The author noted that the functional and anatomical results of surgical treatment were better in patients with diagnosed before surgery V-shaped detachment of the PHM. However, subsequent studies by other authors showed no direct correlation between the preoperative nature of the SCA and receive the functional results of treatment [2,7,8].

An attempt to classify the VMA depending on its length was made Koizumi H (2008), which divided the VMA at the local (≤ 1500 μm) and wide (≥ 1500 μm). But following this work, Johnson M (2010), and De Croos F (2012) showed that the majority of clinical forms of macular lesions occurs at a much narrower adhesion sVMA, and it did not fit and was not reflected in the classification Koizumi H. was not reflected in it.

Another attempt to develop a classification for organizing the SCA was undertaken in 2013 [3]. It was the definition of vitreo-macular adhesion and submitted its five forms: vitreo-macular adhesion, vitreo-macular traction, lamellar macular tear, full macular hole. VMA and VMT divided into local (≤ 1500 μm) and wide (≥ 1500 μm), which was taken from the classification Koizumi H (2008).

There are also works indicating the serious flaws in the classification of VMA Duker J:

- Classification was developed primarily under vitreolysis pharmacological (drug Oxaliplatin);
- Division of the VMA on the local and wide, as proposed in the 2008 classification Koizumi H., did not cover all clinical diversity of macular pathology;
- In this classification there is no information about symptomatic VMA; instead, it provides information about vitreo-macular traction (VMT), highlighting it in a separate form. However, according to Girach A (2014), VMT should be considered only as one of variants of development Suma;
- Because currently there is no way to measure the strength of vitreous traction, it is doubtful to allocate the VMT in a separate nosological form, and correctly, according to some authoritative researchers, to examine VMT as a component of the pathogenesis of macular pathologies associated with sVMA [5,10,11];
- Mechanical division full macular rupture for small (250 μm), medium (250 - 400) and large (> 400 μm) does not reflect the pathogenesis and the stage of development of macular gap described by Gass D (1987), and determines the tactics of modern surgical treatment depending on the stage of the disease;
- In the classification of VMA Duker J there is no definition and place epimacular fibrosis - one of the most common forms of vitreo-related macular disease, the pathogenesis of which is largely linked directly symptomatic VMA [10].

Thus, the classification of VMA Duker J of course, is a good tool for pharmacological vitreolysis, but currently a large part of the macular pathology associated with a tractional component that is eliminated by the use of microinvasive vitrectomy.

All of the above explains the relevance of the classification, vitreo-macular adhesion and related clinical forms of macular pathology requiring surgical correction.

Goal

To study the morphometric condition of vitreomacular adhesion in patients with concomitant macular pathology by optical coherence tomography and develop, on the basis of data obtained clinical classification of vitreomacular adhesion.

Material and Methods

Analyzed for VMA from 430 patients. Their average age was 64.3 ± 2.7 years. The sex ratio was about equal (43% men and 57% women). All patients complained of decreased visual acuity. Distortions in the field of view occurred in 80% of patients, metamorphopsia - 70%, diplopia - in 37%. Best-corrected visual acuity (BCVA was increased) were 0,21± 0,01, IOP 10,8 ± 1,6 mm Hg.St. All patients underwent standard ophthalmic examination, including visual acuity testing, refractometry, biomicroscopy, tonometry, reverse ophthalmoscopy, biomicroscopy of the retina with a lens Goldman, photographic recording of the fundus camera. All patients also performed OCT.

All patients were divided into two groups according to the nature of the adhesion: asymptomatic and symptomatic VMA.

Vitreo-macular adhesion (VMA)	Number of patients	%
Asymptomatic (aVMA)	110	26%
Symptomatic (sVMA)	320	74%
Total:	430	100

Table 1: *The distribution of the patients according to the nature of vitreo-macular adhesion (n = 430).*

Results and Discussion

Group with asymptomatic, vitreo-macular adhesion was 110 (26%) patients. This group included patients in whom vitreo-macular adhesion did not violate the anatomic profile of the macular area and did not cause intraretinal irregularities.

Clinical and functional studies of patients with asymptomatic, vitreo-macular adhesion (aVMA) showed that all patients had high visual acuity and almost had any complaints. A characteristic feature of the OCT was the almost complete detachment of the rear hyaloid, with the exception of local areas in the macular region. Dynamic monitoring of patients in terms from 6 months to 3 years showed different clinical course aVMA. In the majority of patients (95/110, 86%) anatomic and functional parameters were stable: retinal thickness was in average 250 +/- 53 microns, the amount of the retina of 8.71 ± 1,12 mm^3. These patients were under dynamic observation and did not require surgical treatment. Complete spontaneous detachment of the PHM from the retina in the macular region we observed in 9/110 (8%) patients in the period from 8 months to 1.5 years. The macular configuration profile according to the OCT remained stable, the volume of the retina was preserved and the average was from 8.59 ± 1,16 mm^3, Central retinal thickness was, on average, 243 +/- 44 μm, visual acuity remained stable at a high. Negative anatomical and functional changes observed in 6/110 (6%) patients who subjectively noted a significant reduction in visual acuity (from 0,98 +/- 0,02 to 0,24 +/- 0,02), the appearance of metamorphopsia and defects in the field of view. Dynamic analysis of OCT in these patients showed that the appearance and increase traction from the PHM brought five patients to develop a complete end-to-end macular holes and one patient - lamellar macular rupture with drastic changes in the macular profile in the negative direction.

The group with symptomatic vitreomacular adhesion amounted to 320 (86%) patients who were diagnosed with lesions of the macular profile of varying severity and intraretinal irregularities.

Among all we observed 320 patients with sVMA special subgroup consisted of 21 patients (6,6%); they are in the process of dynamic observation is that there was an independent detachment of the PHM, which led to the elimination of vitreomacular traction and the gradual improvement of the vitreomacular interface. None of these patients in the future has not undergone surgical treatment, and monitoring them allowed to state favorable anatomical and functional recovery.

The remaining 299 patients in the process of dynamic clinical observation and OCT - control, revealed a complication (sVMA) with the development of specific clinical forms of lesions of the macular region.

The patients were divided into 5 subgroups:

1. Sub-group (185 patients) - sVMA complicated traction by may (TM);
2. Subgroup (19 patients) - sVMA complicated lamellar macular breaks (LRM);
3. The sub-group (43 patients) - sVMA complicated epimacular fibrosis (EMF);
4. Subgroup (9 patients) - sVMA complicated myopic foveoschisis (MF);
5. The sub-group (64 patients) - sVMA complicated by primary full macular hole (MH).

Until recently, all these five forms of clinical lesions of the macular region was treated as a separate clinical disease. However, the dynamic monitoring of these patients for a long time and systematic OCT control have enabled us to establish a clear pathogenetic link between the development of specific clinical forms of lesions of the macular region and Suma. In each of the five subgroups of the clinical forms of lesions of the macular region we have traced and identified the various characteristics of the formation and flow sVMA and the study of its linear extent, the configuration of the fixing to the surface of the retina, the relationship with vitreo-papillary adhesion.

Examining the direct influence of the reference length sVMA on the nature and frequency of the formation of macular pathology, we identified the three most significant degree of linear length sVMA:

- I degree - a small degree the length of vitreomacular adhesion (< 500 μm)
- II degree - the average degree of the length of vitreomacular adhesion (500 - 1500 microns)
- III degree - high degree of extent of vitreomacular adhesion (> 1500 μm)

We selected three degrees sVMA allow us to predict the frequency and nature of progression of macular disease (Table 2).

Clinical forms of retinal lesion	Length linear sVMA		
	Small < 500 μm	Average 500 - 1500 μm	High > 1500 μm
Traction maculopathy	136	18	31
Lamellar tear	12	4	3
Epimacular fibrosis	0	9	34
Myopic foveoschisis	0	2	7
Primary full macular hole	60	3	1
Total (n = 320)	208	36	76

Table 2: *The distribution of patients with different clinical forms of retinal lesions, respectively sVMA linear length (μm).*

At low extension degree of vitreo-macular adhesion (less than 500 microns) vitreous traction was the strongest per unit area of the retinal tissue and often led to traction of maculopathy (136/208, 65% of patients) and primary complete macular holes (60/208, 29% of patients).

In mild cases, the length of vitreo-macular adhesion (500 - 1500 microns) vitreous traction was more evenly distributed throughout the retina and cause a tractional often may (18/36, 50% of patients) and epimacular fibrosis (9/36, 25% of patients).

With a high degree of length of vitreo-macular adhesion (more than 1500 microns) the process of formation of specific clinical forms of lesions of the macular region had a chronic indolent course and often equally led to the formation of epimacular fibrosis (34/76, 45% of patients) and tractional of maculopathy (31/76, 41% of patients), less myopic foveoschisis (7/76, 9% of patients).

In the monitoring process with the use of OCT for patients with sVMA we have identified and studied the most characteristic and the most frequent types of fixing PHM with macular surface, which was the basis for selection of the three main types of fixation:

- Type - A - monofocal fixation cortical parts of the vitreous in the macular region; in the case of location it only in the foveolar area may be considered as vitreo-foveolar fixation.
- Type - In - type multifocal fixation in the presence of 2 or more zones for fixation cortical parts of the vitreous in the macular region.
- Type - S - solid type of fixation in the presence of a single continuous zone of fixation of the cortical parts of the vitreous in the macular region.

Dependence of clinical manifestations of macular lesions in the retina the type of fixing sVMA presented in table 3.

Clinical forms of retinal lesion	Type of fixing sVMA		
	"A" type	"B" type	"C" type
Traction maculopathy	97	32	56
Lamellar tear	12	1	6
Epimacular fibrosis	2	8	33
Myopic foveoschisis	0	1	8
Primary full macular hole	55	0	9
Total (n = 320)	166	42	112

Table 3: *The distribution of patients with different clinical forms of lesions of the retina according to the type of fixation sVMA.*

Studies have shown that the type of fixation has a direct impact on the nature and frequency of changes to be macular profile.

When monofocal "A" type sVMA presented cone-like fixation of the PHM to the top of the inner macular elevation on a very small surface, which resulted in the local strong traction component and increasing the anterior-posterior vitreo-macular traction - to a marked protrusion of the retina. This type of fixing sVMA often led to the formation of traction maculopathy (97/166, 58%) and primary complete macular hole (55/166, 33%), less for lamellar macular rupture (12/166, 7%).

In multifocal "In" type sVMA was represented by two and more zones of fixation of the PHM to the macular region. This type of fixation has led to the formation of "saw-tooth" profile of the retina with two or more zones of elevation and the formation, as a rule, traction of maculopathy (32/42, 76%) and epimacular fibrosis (8/42, 19%).

With the continuous "S" type fixing PHM prelegal tightly to the surface of the retina throughout the macula, causing flattening or domed come forward. Solid fixation sVMA led often to the development of traction maculopathy (56/112, 50%) and epimacular fibrosis (33/112, 29%) and to a lesser extent to the primary full macular hole (9/112, 8%) or myopic foveoschisis (8/112, 7%).

In the presence of concomitant, vitreo-papillary adhesion (VPA) for the development of symptomatic, vitreo-macular adhesion was varied: the changing nature of traction, its strength and direction, thus complicating the flow and development Suma. Vitreo-papillary adhesion on OCT was a well-reflective membrane with a strong fixation to the edge of the optic disc. Connection powerful the peripapillary adhesion, vitreo-macular adhesion formed a new - Papillo-macular adhesion (PMA), which led to the formation of a new traction vector, which have a significant effect on the change in macular profile and the nature of intraretinal lesions of the macular region. The presence of PMA resulted in the formation of large areas of cystic lesions of the entire macular region, which were distributed in both the horizontal and vertical directions. This marked cystic lesion of the retina in the macular region led to a significantly higher thickening of the retina in the area of PMA, an average of 527 μm ± μm to 113.6. Another feature of retinal lesions in patients with PMA were more frequent lesions of the outer retinal layers of the macular area with a characteristic deformation and discontinuous lines ELM IS IS/OS, OS and Membrane Virchow.

According to our observations, formed Papillo-macular adhesion often had a negative influence on the clinical course of traction maculopathy and primary full macular hole, to a lesser extent in the macula lamellar tearing and epimacular fibrosis.

Thus, analyzing sVMA in its linear length, fixation type, the combination with VPA, it is possible to predetermine the progress and development of Suma, its impact on the development of specific clinical forms and stepwise formation of macular lesions. So, the combination of a small degree of vitreo-macular adhesion with monofocal fixation, complicated by WPA, more likely to develop TM and PPM, less LRM. On the contrary, to a wide extent, vitreo-macular adhesion with a solid type of fixation is more common the development of TM and EMF and MOF, as well as PMO and MT.

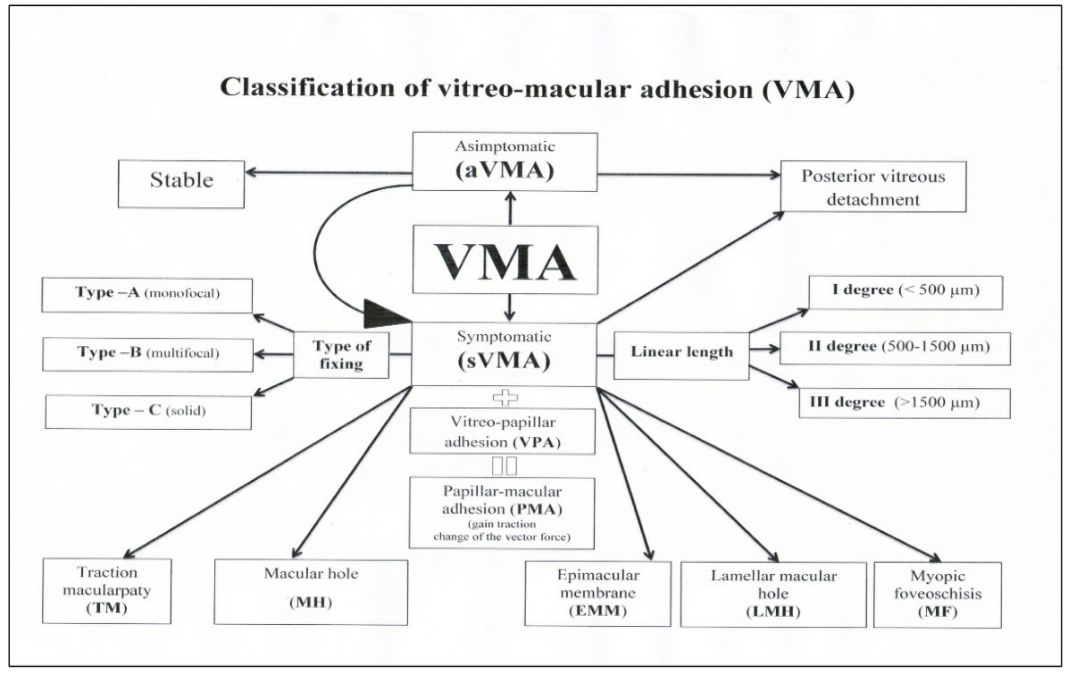
Held clinical-functional analysis sVMA patients, given current diagnostic capabilities of OCT, allows to organize the tactics of their conduct, to carry out timely monitoring (to determine the frequency and time period monitoring visits for diagnostic purposes). So, patients with the presence of sVMA and strong traction, complicated by a combination of the latter with WPA, justified more frequent monitoring. In case of negative dynamics it is advisable to offer the patient early surgical intervention, and when Suma with mild traction (chronic) dynamic monitoring is justified, and only in the presence of negative dynamics - the transition to surgery.

Conclusion

Clinical and functional analysis of the course of vitreo-macular adhesion in 430 patients revealed two possible trends: asymptomatic and symptomatic. For asymptomatic variant of the SCA stable flow is observed in 86%, resolution - 8%, negative for the transition to symptomatic VMA - 6% of patients. When symptomatic, the VMA resolution was observed in 7% of patients in 93% it progresses and is complicated by the development of macular pathology. Long-term monitoring of patients sVMA allowed us to identify three linear degrees of its length and the three main type of its attachment to the macular surface. Further observation of five subgroups of patients with specific clinical forms of lesions of the macular region has allowed to establish the pattern of development of these clinical forms in

connection with features of symptomatic VMA, namely, its linear length, type of fixation and combined with vitreo-papillary adhesion. This, in turn, allows to plan the optimal volume of surgical interventions on the basis of modern microinvasive vitreoretinal technologies.

All of the above research formed the basis of our proposed classification, vitreo-macular adhesion.



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Conflict of Interests

There is no conflict of interests.

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