OPHTHALMOLOGY

CHOOSING THE OPTIMAL METHOD FOR SURGICAL TREATMENT OF RHEGMATOGENOUS RETINAL DETACHMENT

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ABSTRACT

The problem of the structural and functional effectiveness of episcleral and endovitreal treatment methods of rhegmatogenous retinal detachment remains open to this day.
The aim of the study. *To assess the clinical effectiveness of surgical treatment of rhegmatogenous retinal detachment using episcleral and endovitreal methods.*
Material and methods. *An analysis of the electronic database and a detailed assessment of the treatment of 285 patients with rhegmatogenous retinal detachment for 2005–2022 were carried out. A comparative analysis was made in two groups: group 1 – patients after episcleral surgery (n = 155); group 2 – patients after endovitreal surgery (n = 130). The initial condition and the extent of surgery were comparable.*
Results. *From 2005 to 2009 in 65.9 % of cases, episcleral buckling predominated; from 2009 to 2021 – posterior closed vitrectomy (in 64.8–88.7 % of cases). The incidence of primary retinal reattachment was 74.2 % and 71.5 %. The number of relapses after vitreoretinal surgery slightly exceeded the values in the group 1 – 28.4 % versus 25.7 %, and in 20 % of cases the first relapse occurred before silicone aspiration as a result of subsilicone proliferation. The total number of surgical interventions per person, taking into account mandatory silicone aspiration, in the group 1 was 1.3, in the group 2 – 2.25 for the entire observation period. The visual acuity of patients in group 1 was 2 times higher than that of the comparison group – 0.21 ± 0.02 and 0.1 ± 0.03, respectively ($p < 0.05$).*
Conclusion. *Episcleral treatment methods of rhegmatogenous retinal detachment are characterized by better anatomical, reconstructive and functional effects with fewer re-operations.*

Key words: *rhegmatogenous retinal detachment, circular episcleral buckling, posterior closed vitrectomy, silicone oil tamponade*

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ВЫБОР ОПТИМАЛЬНОГО МЕТОДА ХИРУРГИЧЕСКОГО ЛЕЧЕНИЯ РЕГМАТОГЕННОЙ ОТСЛОЙКИ СЕТЧАТКИ

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РЕЗЮМЕ

Вопрос о структурной и функциональной эффективности эписклеральных и эндовитреальных методов лечения регматогенной отслойки сетчатки остаётся открытым до сих пор.

Цель исследования. *Оценить клиническую эффективность хирургического лечения регматогенной отслойки сетчатки с помощью эписклеральных и эндовитреальных методов.*

Материал и методы. *Проведены анализ электронной базы данных и детальная оценка лечения 285 пациентов с регматогенной отслойкой сетчатки за 2005–2022 гг. Сравнительный анализ проведён в двух группах: первая – после эписклеральной хирургии (n = 155); вторая – после эндовитреальных вмешательств (n = 130). Исходное состояние, объём хирургического вмешательства были сопоставимы.*

Результаты. *С 2005 по 2009 гг. в 65,9 % случаев преобладало эписклеральное пломбирование, с 2009 по 2021 г. – задняя закрытая витрэктомия (в 64,8–88,7 %). Частота первичного прилегания сетчатки составила 74,2 % и 71,5 %. Число рецидивов после витреоретинальной хирургии несколько превышало значения первой группы — 28,4 % против 25,7 %, и в 20 % случаев первый рецидив возник ещё до аспирации силикона в результате субсиликоновой пролиферации. Общее количество хирургических вмешательств на человека с учётом обязательной аспирации силикона в первой группе составило 1,3, во второй – 2,25 за весь период наблюдения. Острота зрения больных 1-й группы превышала значения группы сравнения в 2 раза – 0,21 ± 0,02 и 0,1 ± 0,03 соответственно (p < 0,05).*

Заключение. *Эписклеральные методики лечения регматогенной отслойки сетчатки характеризуются лучшим анатомо-реконструктивным и функциональным эффектом при меньшем количестве повторных операций.*

Ключевые слова: *регматогенная отслойка сетчатки, круговое эписклеральное пломбировние, задняя закрытая витрэктомия, тампонада силиконовым маслом*

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Surgical treatment of retinal detachment dates back to 1929, when J. Gonin first proposed blocking the retinal defect by draining the subretinal fluid and coagulating the sclera with a thermal cautery in the projection of the break [1, 2]. The method proposed by E. Custodis in 1953 involved local occlusion of the retinal break with a polyviol buckle and application of a series of coagulates to the depression ridge. The author assumed that after the retinal break was blocked, the pigment epithelium would adsorb the subretinal fluid and the retina would adhere. C. Schepens in 1953 and H. Arruga in 1958 increased the scleroretinal barrier to a circular buckle, on which extensive diathermocoagulation was performed [1, 3, 4].

The evolution of retinal detachment surgery is associated with the use of operations accompanied by tamponade of the gap by introducing air into the eye after diathermocoagulation and drainage of subretinal fluid. This method was proposed in 1938 by B. Rosengren. In 1972, R. Machemer developed a safe method for removing the vitreous body through small incisions in the pars plana of the ciliary body; this method was called "vitrectomy" and opened a new era in the treatment of diseases of the retina and vitreous body [5, 6].

Since then, both episcleral and endovitreal methods of treatment have been actively used in the surgical treatment of retinal detachment. The debate about their effectiveness continues to this day. If episcleral methods were used more often in the second half of the last century, then currently preference is given to endovitreal surgery [5]. The main reasons for the change in the ratio of these treatment methods, when the number of endovitreal interventions significantly exceeds the number of episcleral operations, are: technical complexity and conditional "traumatism" of episcleral surgery, difficulties in mastering and insufficient visualization of retinal changes using binocular ophthalmoscopy and the use of neutralizing lenses. In turn, the improvement of technology and the wide availability of microinvasive vitrectomy have led to a significant reduction in the time of this operation.

Despite the fact that many authors show a similar percentage of primary retinal reattachment using episcleral and endovitreal approaches, the question of functional effectiveness, duration of rehabilitation measures and economic costs in surgical treatment of rhegmatogenous retinal detachment using various methods remains open to this day [7–13]. These facts determined the relevance of this study.

THE AIM OF THE STUDY

To assess the clinical effectiveness of surgical treatment of rhegmatogenous retinal detachment using episcleral and endovitreal methods.

MATERIALS AND METHODS

The study included two stages. At the first stage, an analysis of the electronic database of the Irkutsk Branch of the S. Fyodorov Eye Microsurgery Federal State Institution was conducted in order to assess the number of episcleral and vitreoretinal interventions performed on patients with rhegmatogenous retinal detachment from 2005 to 2022. The search was performed using the following key words: "retinal detachment", "circular episcleral buckling", "vitrectomy", "silicone oil tamponade".

At the second stage, the treatment results of 285 patients were analyzed based on medical records. The main inclusion criteria were: the presence of rhegmatogenous retinal detachment involving the macular zone; proliferative vitreoretinopathy (PVR) at stages B to C1; the duration of retinal detachment from 2 weeks to 2 months. Axial length of the eye from 22 to 25 mm, extremely high and low anterior-posterior axis of the eye were exclusion criteria.

Depending on the method of surgical treatment, two groups were formed. The first group included 155 patients after episcleral surgery, and 130 of them underwent circular episcleral buckling using a silicone sponge, and in 25 cases, circular buckling was supplemented with a radial buckle. The second group consisted of 130 patients after endovitreal intervention. All patients in this group underwent standard three-port posterior closed vitrectomy (PCV) 25G with endolaser coagulation of the retinal break and silicone endotamponade with subsequent silicone aspiration for a period of 3 to 6 months. The study included patients aged 23 to 67 years; the proportion of women was 41.4 %, men – 58.6 %. The duration of observation was from 5 to 7 years. The clinical characteristics of the patients are presented in Table 1.

The criteria for assessing the effectiveness of treatment were: primary reattachment of the retina; the number and timing of relapses of retinal detachment; the dynamics of changes in visual acuity after surgical treatment.

RESULTS

It was found that in 2005, episcleral buckling was predominantly used, in 2008, the number of episcleral and endovitreal interventions was equal. Starting from 2009, the obtained trend indicated the predominant use of PCV with silicone oil tamponade of the vitreous cavity in the treatment of retinal detachment. In 2021, this type of surgery was already used in the overwhelming majority of cases – 88.7 %, episcleral buckling was performed only in 11.3 % of patients (fig. 1).

In our opinion, the data on the timing and frequency of relapses with different methods of treating retinal detachment are important. A detailed analysis of the treatment results of 285 patients based on medical records showed that primary retinal reattachment in patients of group 1 was achieved in 74.2 % of cases and was comparable with the number of successfully treated patients in group 2 – 71.5 %. Consequently, the first relapse of retinal detachment occurred in almost every fourth patient in both groups – 25.8 % and 28.5 % of cases, respectively. In most cases, relapses occurred in the first 6 months after surgery, and their number in both groups was

TABLE 1

CLINICAL CHARACTERISTICS OF PATIENTS AND TREATMENT METHODS

	Indicators	Group 1 (*n* = 155)	Group 2 (*n* = 130)
Episcleral method	Circular scleral buckling	130	–
	Circular scleral buckling with a radial buckle	25	–
PCV with endolaser coagulation	Oxane 1300 silicone oil tamponade	–	68
	Oxane 1300 + Densiron silicone oil tamponade	–	62
Age		45.3 ± 0.07	44.2 ± 0.07
Sex	Female	64	54
	Male	91	76
PVR	B	134	117
	C1	21	13
APA		23.7 ± 0.04	23.5 ± 0.04
Duration of existence of retinal detachment	2 weeks	67	65
	4 weeks	51	39
	6 weeks	26	18
	8 weeks	11	8

Note. APA – anterior-posterior axis of the eye.

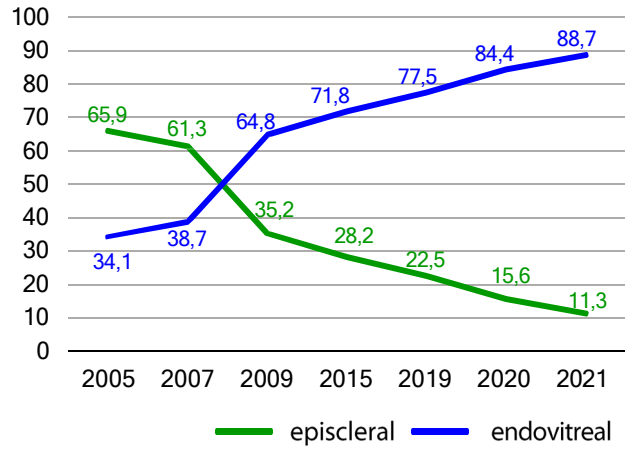

FIG. 1.
Dynamics of change in the number of episcleral and endovitreal interventions in retinal detachment surgery (%)

comparable – 17.4 % and 20 %, respectively. In the period from 6 to 12 months, the first relapse occurred in 2.5 % and 6.9 % of cases, in the late postoperative period of more than 12 months – in 5.8 % and 1.5 % of cases after episcleral and vitreoretinal surgery, respectively. It should be noted that in patients with endovitreal interventions, the first relapse in 20 % of cases occurred before silicone aspiration and was due to the development of subsilicone proliferation.

The frequency of the second and third relapses was calculated relative to the total number of operated patients in each group. Comparative analysis of repeated relapses of retinal detachment showed that after endovitreal interventions they occurred in 11.5 % of cases, and after episcleral surgery – only in 5.8 % of patients. Such distribution of the frequency of retinal detachment relapses can most likely be explained by the slower progression of proliferative vitreoretinopathy after episcleral interventions. The frequency of the third relapse of retinal detachment was almost the same in both groups and did not exceed 3 % of the total number of operated patients (Table 2).

In order to treat recurrent retinal detachment, radial buckles were additionally installed in the patients of the 1st group, and vitreous cavity revision with silicone oil retamponade was performed in the patients of the 2nd group. An important criterion for the effectiveness of surgical treatment of retinal detachment is not only the anatomical and reconstructive effect, but also the ability to improve the visual functions of patients. The best corrected visual acuity of patients in both groups before

TABLE 2

THE NUMBER AND TIMING OF RECURRENT RETINAL DETACHMENT IN PATIENTS OF TWO GROUPS

Indicators	Time of occurrence of recurrent retinal detachment	Group 1 (*n* = 155)		Group 2 (*n* = 130)	
% of primary retinal attachment		115 (74.2 %)		93 (71.5%)	
1st relapse	Up to 6 months	27 (17.4%)	25.8%	26 (20%)	28.5%
	6-12 months	4 (2.5%)		9 (6.9%)	
	Over 12 months	9 (5.8%)		2 (1.5%)	
2nd relapse	Up to 6 months	4 (2.6%)	5.8%	4 (3.1%)	11.5%
	6-12 months	3 (1.9%)		5 (3.8%)	
	Over 12 months	2 (1.3%)		6 (4.6%)	
3rd relapse	Up to 6 months	0 (0%)		0 (0%)	
	6-12 months	0 (0%)		0 (0%)	
	Over 12 months	4 (2.6%)		4 (3%)	

surgery varied from 0.01 to 0.09. After surgery, the visual acuity of patients in the 1st group exceeded the values of patients in the comparison group by 2 times, averaging 0.21 ± 0.02 compared to 0.1 ± 0.03 in the 2nd group ($p < 0.05$) (fig. 2).

Distribution of patients depending on the obtained best corrected visual acuity demonstrated that after episcleral surgery in 59.4 % of cases the visual acuity was from 0.05 to 0.3, in 16.1 % – 0.3 and higher. After endovitreal intervention, patients with the corresponding visual acuity were 46.2 % and 12.3 %, respectively (fig. 1).

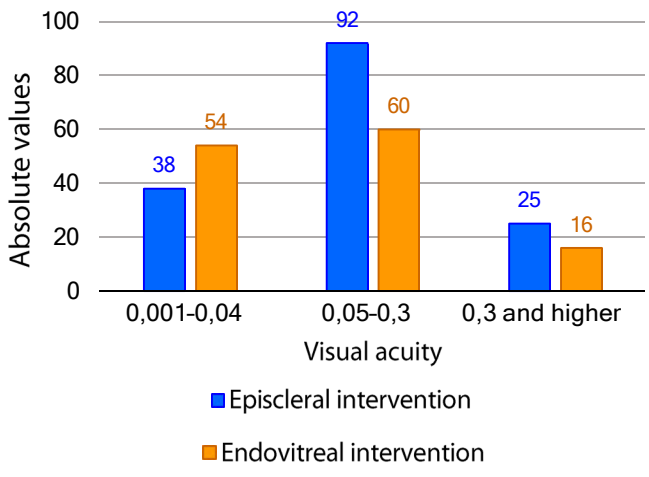

FIG. 2.
Distribution of patients depending on the maximum corrected visual acuity in the early postoperative period

DISCUSSION

Currently, various methods of treating retinal detachment are available. The choice of method is individual and should be made considering the patient's initial condition and the risk of recurrent detachment. Current data provide some information about the advantages and disadvantages of various methods.

W. Park et al. in 2023 published a work devoted to the development of criteria for predicting the recovery of visual acuity and the development of recurrent retinal detachment after removal of silicone oil. A retrospective analysis of the treatment of 1017 eyes of patients with retinal detachment who underwent vitrectomy with silicone endotamponade was conducted [14]. In this study, recurrent retinal detachment after silicone removal occurred in 8.2 % of patients. Several studies show that the cause of recurrence after silicone removal is proliferative vitreoretinopathy. G.W. Abrams et al. in their study reported that 19 % of patients experienced recurrent retinal detachment, 14 % of whom had PVR [15]. According to studies, most often (69 %) PVR occurs within the first 6 months after vitreectomy and silicone oil tamponade. A retrospective analysis showed that the risk of developing recurrent PVR is higher in patients with PVR stage C and above [15].

In 2021, M. Bunajem et al. compared the anatomical and functional results in patients after treatment of rhegmatogenous retinal detachment using two different methods. 68 eyes were examined after episcleral buckling and 64 eyes in the group after vitrectomy with silicone endotamponade. In eyes after vitrectomy,

the likelihood of developing recurrent retinal detachment requiring reoperation was higher than in patients after episcleral surgery. The functional results of the two groups were comparable [16].

In 2022, A.S. Dhoot et al. conducted a comprehensive meta-analysis of the treatment of 15,947 eyes with rhegmatogenous retinal detachment to compare the effectiveness of posterior closed vitrectomy with silicone oil tamponade with the episcleral method of treatment [5]. According to the study, the rates of primary and reattachment of the retina were similar. Primary reattachment with episcleral surgery was achieved in 86.5 % of cases, with vitrectomy – in 84.8 % (p = 0.13). Reattachment was achieved in 96.7 % and 97.7 % of cases, respectively (p = 0.12). However, the final best corrected visual acuity was statistically significantly better in patients after episcleral buckling (0.38 ± 0.53 vs. 0.33 ± 0.53 (20/48 vs. 20/43 on the Snellen chart). This is consistent with the data obtained in our study: when using episcleral treatment techniques, patients received a more stable anatomical result over many years of follow-up and visual acuity that was 2 times higher than in patients after endovitreal treatment of retinal detachment.

CONCLUSION

The vector of development of surgical interventions for rhegmatogenous retinal detachment is directed towards improving primary vitrectomy and substances used for tamponade of the vitreous cavity. However, episcleral techniques, despite their apparent invasiveness, are characterized by a better anatomical-reconstructive (percentage of primary adhesion) and functional effect (increased visual acuity) with a smaller number of repeated operations. Therefore, the choice of the optimal method of retinal detachment surgical treatment should not exclude episcleral approaches, which will minimize the number of postoperative relapses and achieve a good functional effect.

Conflicts of interest

No potential conflict of interest relevant to this article reported.

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