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NƏHƏNG MAKULYAR YIRTIQ ZAMANI TORLU QİŞANIN AUTOTRANSPLANTASİYASI (KLİNİK HAL)

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XÜLASƏ

Məqsəd – makulanın nəhəng yırtığı olan xəstənin müalicəsində torlu qişanın autotransplantasiyasının tətbiqi üzrə təcrübəmizi nümayiş etdirmək.

Material və metodlar
54 yaşlı pasiyent görmə itiliyinin əhəmiyyətli dərəcədə azalması, əşyaların formasını qəbul etməkdə çətinlik və mərkəzi skotomanın olması ilə müraciət etdi. Əməliyyata qədər maksimal korreksiya olunmuş görmə itiliyi 0,02 idi. Optik koherent tomoqrafiya (OKT) 1248 mikrometr diametrli nəhəng makula yırtığını aşkar etmişdir. Pasiyentə perftororganik mayedən istifadə etməklə nəhəng makulanın yırtığı sahəsinə bimanual torlu qişa autotransplantasiyası aparıldı və ardınca silikon yağı ilə tamponada icra olundu.

Nəticələr
Perftororganik maye ilə aparılmış bimanual torlu qişa autotransplantasiyası həm anatomik, həm də funksional baxımdan uğurlu oldu. Bu, obyektiv müayinələrin nəticələri ilə təsdiqləndi və metodun nəhəng makulanın yırtığının müalicəsində effektiv ola biləcəyini göstərdi. Makula zonasının perimetriyası müsbət dinamikanı göstərdi. Əməliyyatdan sonrakı ilk gündə maksimal korreksiya olunmuş görmə itiliyi 0,3-ə qədər artdı. Bir ay sonra fundus mənzərəsi sabit qaldı, transplantatın dislokasiyası müşahidə olunmadı. OKT transplantatın davamlı yapışmasını təsdiqlədi və perimetriya nəticələri müsbət dinamikanı qorudu. Görmə itiliyi əldə edilmiş səviyyədə qaldı ki, bu da metodun yüksək effektivliyini və görmə reabilitasiyası üçün əlverişli proqnozu göstərir.

Yekun
Torlu qişanın autotransplantasiyası üzrə təcrübəmiz bu metodun nəhəng makulyar yırtıqlarının müalicəsində effektiv olduğunu, həm anatomik, həm də funksional nəticələrin əhəmiyyətli dərəcədə yaxşılaşdırılmasına imkan verdiyini göstərir.

Açar sözlər: *vitreoretinal cərrahiyyə, makula, nəhəng makulyar yırtıq, tor qişanın autotransplantasiyası*

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OUR EXPERIENCE OF AUTOLOGOUS RETINAL TRANSPLANTATION IN A PATIENT WITH A GIANT MACULAR HOLE (CLINICAL CASE)

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SUMMARY

Purpose – to demonstrate our experience in the application of autologous retinal transplantation in a patient with a giant macular hole.

Material and methods

A 54-year-old patient presented with complaints of a significant decrease in visual acuity, difficulties in the perception of object shapes, and the presence of a central scotoma. Before surgery, the best corrected visual acuity was 0.02. Optical coherence tomography (OCT) revealed a giant macular hole with a diameter of 1248 micrometers. The patient underwent bimanual autologous retinal transplantation into the area of the giant macular hole using perfluorocarbon liquid, followed by tamponade with silicone oil.

Results

The performed bimanual autologous retinal transplantation in a giant macular hole with the use of perfluorocarbon liquid was successful both anatomically and functionally, as confirmed by objective examination data. This suggests that the technique can be effectively applied in the treatment of giant macular holes.

Perimetry of the macular zone demonstrated positive dynamics. On the first day after the surgery, the best corrected visual acuity improved to 0.3. One month later, the ophthalmoscopic picture remained stable without any signs of autograft dislocation. OCT confirmed persistent attachment of the flap, and the perimetry results maintained positive dynamics. The best corrected visual acuity remained at the achieved level, indicating the high effectiveness of the method and a favorable prognosis for visual rehabilitation.

Conclusion

Experience with autologous retinal transplantation suggests that this method is effective in the treatment of giant macular holes, allowing significant improvement of both anatomical and functional outcomes.

Key words: *vitreoretinal surgery, macula, giant macular hole, autologous retinal transplantation*

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Relevance

A giant macular hole is a pathological condition of the vitreomacular interface characterized by a full-thickness defect of all retinal layers, including the photoreceptor layer and the internal limiting membrane, in the central macular area [1]. According to the modern classification, giant macular holes are defined as those with a minimal diameter exceeding 1000 micrometers [2]. This condition is most commonly observed in patients over 50 years of age, with epidemiological data indicating a significant predominance among women, with a gender ratio of approximately 1:3 [3, 4].

Until the end of the twentieth century, macular holes, particularly those of large and giant size, were considered irreversible, leading to permanent loss of central vision. However, advances in vitreoretinal surgery and the development of new surgical techniques have significantly changed the approaches to the treatment of this disease [5].

Modern surgical technologies make it possible to achieve favorable anatomical and functional outcomes in most patients with macular holes of medium size. The most widely used techniques include internal limiting membrane peeling, application of platelet-rich plasma, vacuum aspiration, and edge massage of the defect [6 - 8]. Nevertheless, when the diameter of the hole exceeds 1000 micrometers, the effectiveness of these methods decreases substantially due to the high likelihood of edge failure and insufficient reparative activity.

Giant macular holes represent a specific category in which conventional treatment methods are not sufficiently effective. Therefore, there is a need to explore more promising surgical solutions [9].

Autologous retinal transplantation is a promising technique that involves transplanting the patient's own healthy retinal tissue into the area of the giant macular hole. Clinical studies demonstrate significant anatomical and functional improvements in the treatment of giant macular holes. The use of autologous tissue minimizes the risk of graft rejection, ensuring both safety and efficacy of the method. Ongoing research continues to confirm the potential of this approach in the management of complex cases [10].

Purpose – to present the experience in the application of autologous retinal transplantation in a patient with a giant macular hole.

Material and methods

A 54-year-old patient was admitted to the Ophthalmology Center of the N.I. Pirogov National Medical and Surgical Center with complaints of a significant decrease in visual acuity, difficulties in the perception of object shapes, and the presence of a central scotoma. Preoperative best corrected visual acuity was 0.02, intraocular pressure measured by the Goldman applanation tonometer was 18 millimeters of mercury, and optical coherence tomography revealed a giant macular hole with a minimal diameter of 1248 micrometers.

Based on the clinical findings and diagnostic data, the diagnosis of a stage IV macular hole was established. Fundus photographs, OCT images, and perimetry results obtained at admission are presented in **Figures 1-3.**

A bimanual autologous retinal transplantation was performed using 25-gauge minimally invasive vitreoretinal instruments. A central vitrectomy was carried out, followed by the removal of the posterior hyaloid membrane. Subsequently, a circular maculorhexis was performed with the use of the dye Membrane Blue to visualize the internal limiting membrane.

Then, in the peripheral fundus at the 12 o'clock position, after diathermocoagulation of the peripheral vessels, a retinal flap of neuroepithelium was created by detaching the retina with a balanced saline solution. The size of the flap exceeded the diameter of the macular hole by 150 micrometers (**Figures 4 and 5**). Thereafter, barrier laser coagulation was applied around the donor site of the neuroepithelial flap.

Figure 1. *Fundus photograph of the patient with a stage IV giant macular hole.*

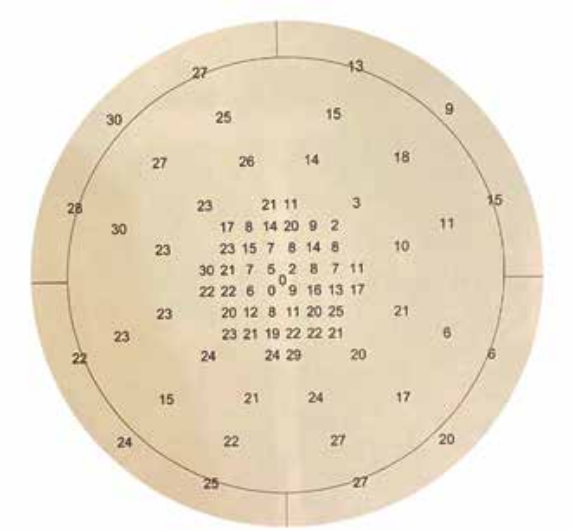

Figure 2. *Preoperative perimetry data of the macular area.*

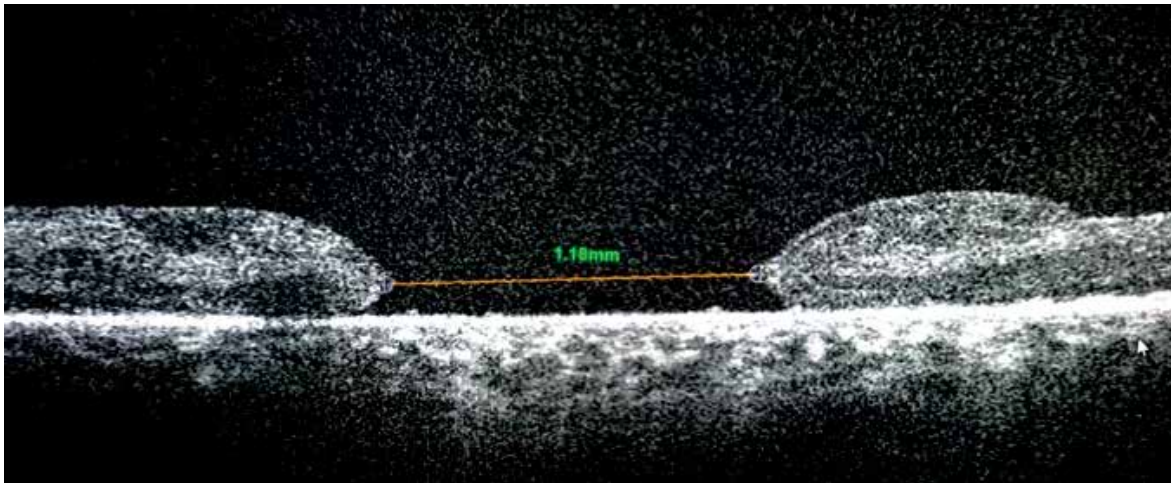

Figure 3. *Preoperative OCT of the stage IV macular hole.*

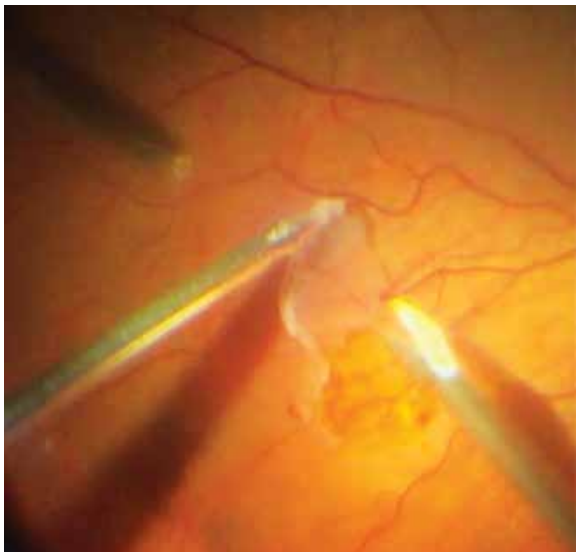

Figure 4. *Injection of balanced saline solution.*

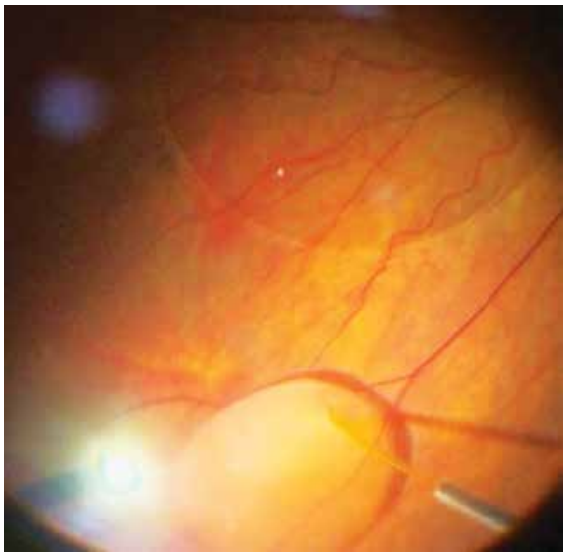

Figure 5. *Formation of the neuroepithelial flap.*

The final stage of the surgery included the translocation of the neuroepithelial flap under perfluorocarbon liquid into the lumen of the macular hole, followed by the replacement perfluorocarbon liquid with silicone oil RS-OIL 2000 (manufactured by Alchimia, Italy). The patient was advised to maintain a face-down position for two weeks following the autologous retinal transplantation.

Results

In the postoperative period (two hours after surgery), ophthalmoscopic examination revealed correct attachment of the flap in the area of the giant macular hole.

On the following day, visual acuity was 0.05 with correction Spherical +5.5, which corresponded to 0.3, and the intraocular pressure was 14.5 millimeters of mercury. Dynamic observation indicated restoration of the structural integrity of the retina in the area of the giant macular hole, which correlated with functional recovery and improvement of visual function.

Adequate attachment of the neuroepithelial flap, confirmed by OCT, as well as the positive dynamics of perimetry of the macular zone, point to the possibility of a favorable visual prognosis **(Figure 6).**

One month after the surgical intervention, the ophthalmoscopic picture remained stable, without any signs of dislocation or migration of the autologous transplant **(Figure 7)**. The best corrected visual acuity before the removal of silicone oil was 0.3 with correction Spherical +5.5. Intraocular pressure measured by the Goldman applanation tonometer was 14.5 millimeters of mercury. According to OCT, complete attachment of the autologous transplant in the area of the giant macular hole was preserved. Perimetry indicators of the macular zone demonstrated sustained positive dynamics, and the achieved level of visual function remained stable.

The removal of silicone oil was performed one month after autologous retinal

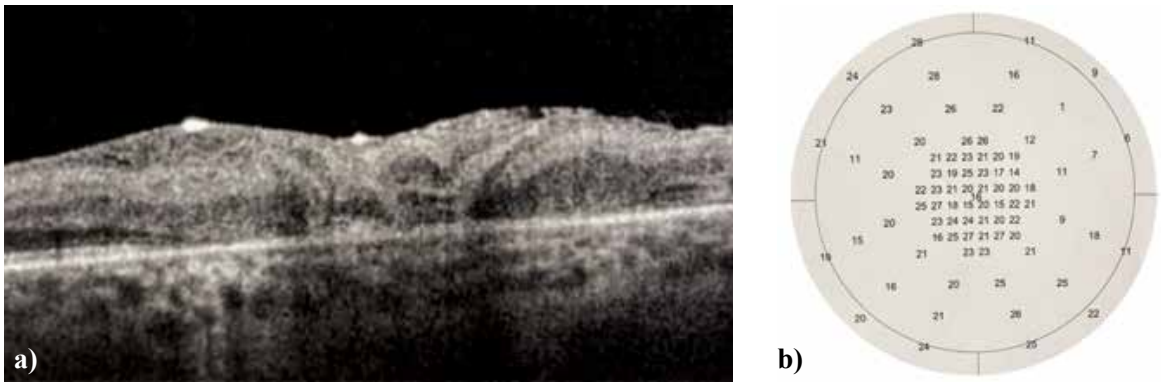

Figure 6. *Postoperative findings of the patient on the first day after surgery: a) OCT of the retina; b) perimetry data of the macular area.*

Figure 7. *Postoperative findings of the patient one month after surgery: a) OCT of the retina; b) perimetry data of the macular area.*

transplantation, and the vitreous cavity was tamponaded with sterile air. No signs of cataractogenesis were observed, and the condition of the lens was assessed as stable. The postoperative period proceeded without complications.A follow-up examination fourteen days after the removal of silicone oil confirmed the stability of anatomical and functional parameters, the absence of complaints, and no signs of a complicated postoperative course. The best corrected visual acuity was 0.4 without correction, and the intraocular pressure measured by the Goldman applanation tonometer was 16.0 millimeters of mercury. The patient was referred for further dynamic follow-up by an ophthalmologist at the place of residence.

Discussion

Autologous retinal transplantation is an innovative technology of vitreoretinal surgery, which consists in transplanting a fragment of the patient's own neurosensory retina into the area of a persistent giant macular hole. According to summarized data from the literature, anatomical closure of the macular hole with this method is achieved in 66 to 100 percent of cases. In most patients, a significant improvement in visual acuity is observed, confirmed by the results of microperimetry and multifocal electroretinography. Partial anatomical and, presumably, functional integration of the graft with the surrounding retinal layers has also been reported.

One of the hypothetical mechanisms of visual function restoration is considered to be the formation of new synaptic connections between the photoreceptors of the graft and the bipolar cells of the recipient retina. It is assumed that this process may be realized through ectopic synaptogenesis. At the same time, functional activity recorded by microperimetry and multifocal electroretinography is more often observed at the periphery of the graft rather than in its central zone, which requires further study [11].

However, experimental studies conducted on a porcine model of macular hole allow for a critical assessment of the potential of neuronal integration of the graft. In that study, macular holes were artificially created in ten animals, and autologous fragments of neurosensory retina were implanted into the defect area. Closure of the hole was achieved in nine out of ten cases, and the graft remained in place in six animals. In four of them, optical coherence tomography visualized the outer layers of the graft, and in two animals there were signs of possible integration with the adjacent tissues.

Nevertheless, histological analysis showed that the inner layers of the transplanted tissue underwent marked degeneration in all cases, and the formation of structural or functional neuronal connections between the graft and the recipient retina was not observed. Thus, the transplanted fragment performed mainly a mechanical role, facilitating centripetal movement of the hole edges due to the tension of the surrounding intact retinal areas. This led the authors to conclude that the clinically observed improvement in visual function may be caused not by the restoration of neuronal transmission, but by redistribution and migration of viable photoreceptors from adjacent areas of the retina [12].

Despite the lack of convincing morphological evidence of neuronal integration under experimental conditions, numerous clinical observations demonstrate the high effectiveness of autologous retinal transplantation in the treatment of giant macular holes. According to Shin Tanaka and co-authors (2020), the application of autologous transplantation makes it possible to achieve both anatomical closure of the defect and significant improvement of visual function in patients with chronic giant macular holes [13]. Similar results were reported in the works of D.V. Petrachkov, where positive dynamics of functional indicators in the early postoperative period were emphasized, especially in the treatment of large and refractory macular holes [14].

Thus, autologous retinal transplantation can be considered a promising direction in the surgical treatment of macular holes, particularly in cases of giant size or in situations where traditional techniques prove ineffective. At the same time, questions remain regarding

the mechanisms of functional recovery, which necessitates further experimental and clinical research.

Conclusion

Autologous transplantation of neurosensory retina represents a promising approach in the surgery of giant macular holes, providing anatomical restoration and significant improvement of visual function. This method demonstrates high clinical effectiveness and can be recommended for the treatment of patients with macular holes, particularly in complex cases where traditional approaches prove to be less effective.

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