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## COMBINED TREATMENT OF MACULAR EDEMA IN POST-THROMBOTIC RETINOPATHY

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**Abstract. Relevance.** Currently, thanks to the development of laser technologies in ophthalmology, there is an active introduction of various methods of subthreshold laser exposure in retinal diseases, including post-thrombotic retinopathy. **Purpose.** To study the effectiveness of the method of combined treatment of macular edema as a result of post-thrombotic retinopathy (PTR) using subthreshold laser exposure. **Material and methods.** Under supervision there were 18 patients (19 eyes) with PTR. Patients were divided into 2 gender- and age-homogeneous representative study groups: in the first study group (n=9, 9 eyes), patients received combined treatment using anti-VEGF therapy and subthreshold diode micropulse laser exposure using a 577NM yellow diode laser, the second comparative group (n=9, 10 eyes) patients were treated only with anti-VEGF therapy. **Results.** Within the indicated periods, patients of the study group showed positive dynamics in all studied functional and morphometric parameters. Laser treatment made it possible to stabilize the state of the retina after preliminary antiangiogenic therapy using micropulse laser exposure as well as to reduce the risk of neovascular complications using continuous laser exposure. **Conclusion.** The results of the study show that combined treatment, including subthreshold micropulse laser exposure, is quite effective and safe in cases of macular edema in post-thrombotic retinopathy.

**Key words:** retinal vein thrombosis; post-thrombotic retinopathy; subthreshold laser exposure.

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## КОМБИНИРОВАННОЕ ЛЕЧЕНИЕ МАКУЛЯРНОГО ОТЕКА ПРИ ПОСТТРОМБОТИЧЕСКОЙ РЕТИНОПАТИИ

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**Аннотация. Актуальность.** В настоящее время благодаря развитию лазерных технологий в офтальмологии, происходит активное внедрение различных методов субпорогового лазерного воздействия при заболеваниях сетчатки, в том числе при посттромботической ретинопатии. **Цель исследования.** Изучить эффективности комбинированного лечения посттромботической ретинопатии (ПТР) с использованием микроимпульсного лазерного воздействия. **Материал и методы.** Под наблюдением находилось 18 пациентов (19 глаз) с ПТР. Пациенты были разделены на 2 однородные по полу и возрасту репрезентативные группы исследования: в первой исследуемой группе (n=9, 9 глаз) пациентам осуществлялось комбинированное лечение с использованием anti-VEGF терапии и метода субпорогового диодного микроимпульсного лазерного воздействия с использованием желтого диодного лазера 577НМ, во второй сравнительной группе (n=9, 10 глаз) пациентам осуществлялось лечение только с использованием anti-VEGF терапии. **Результаты.** В указанные сроки у больных основной группы отмечена положительная динамика по всем изучаемым функциональным и морфометрическим показателям. Лазерное лечение позволило стабилизировать состояние сетчатки после предварительной антиангиогенной терапии при помощи микроимпульсного лазерного воздействия, а также уменьшить риски развития неоваскулярных осложнений, используя непрерывное лазерное воздействие. **Заключение.** Комбинированное лечение, включающее субпороговое микроимпульсное лазерное воздействие, достаточно эффективно и безопасно при макулярном отеке при посттромботической ретинопатии.

**Ключевые слова:** тромбоз вен сетчатки; посттромботическая ретинопатия; субпороговое лазерное воздействие.

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## ПОСТТРОМБОТИК РЕТИНОПАТИЯДА МАКУЛЯР ШИШНИ КОМБИНАЦИЯЛАШГАН ДАВОЛАШ

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**Аннотация. Долзарблик.** Ҳозирги вақтда офтальмологияда лазер технологияларининг ривожланиши туфайли тўр парда касалликларда, шу жумладан посттромботик ретинопатияда лазер таъсир қилишининг турли усуллари фаол жорий этилмоқда. **Тадқиқот мақсади.** Микроимпульс лазер таъсиридан фойдаланган ҳолда посттромботик ретинопатияни (ПТР) комбинациялашган даволаш усулининг самарадорлигини ўрганиш. **Тадқиқот материали ва усуллар.** ПТР бўлган 18 бемор (19 кўз) кузатув остида эди. Беморлар 2 жинси ва ёши бўйича бир ҳил вакиллик тадқиқот гуруҳига бўлинган: биринчи тадқиқот гуруҳида (n= 9, 9 кўз) беморлар анти-VEGF терапияси ва 577НМ ёрдамида пастки субчегара диодли микроимпульс лазер таъсиридан фойдаланган ҳолда комбинациялашган даволанишни олдилар, иккинчи қиёсий гуруҳда (n= 9, 10 кўз), беморлар фақат анти-VEGF терапияси билан даволанган. **Натижалар.** Кўрсатилган шартларда асосий гуруҳ беморлари барча ўрганган функционал ва морфометрик параметрларда ижобий динамикани кўрсатдилар. Лазер билан даволаш микроимпульс лазер таъсиридан фойдаланган ҳолда дастлабки антиангиогеник терапиядан сўнг тўр парданинг ҳолатини барқарорлаштиришга, шунингдек доимий лазер таъсиридан фойдаланган ҳолда неоваскуляр асоратлар хавфини камайтиришга имкон берди. **Хулоса.** Тромбоздан кейинги ретинопатияда макула шиши учун комбинациялашган даволаш усули, шу жумладан микроимпульс лазер таъсири жуда самарали ва хавфсиздир.

**Калит сўзлар:** ретинал вена тромбози; посттромботик ретинопатия; чегарадан паст лазер таъсири.

### Иқтибос учун:

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**Introduction.** A complication of retinal vein occlusion (RVO) is the development of post-thrombotic retinopathy (PTR), a complex of pathological changes in the retina caused by prolonged ischemia after acute circulatory disorders in the venous bed of the retina and consisting of dilated intraretinal capillaries, vascular shunts, microaneurysms, extravasation and neovascularization. As a rule, it develops 1–3 months after the episode of occlusion. The main factor in reducing vision in PTR is macular edema (ME) [3,4].

Currently, various conservative treatment methods as intravitreal administration of angiogenesis inhibitors, corticosteroids, and various laser therapy methods are used to treat PTR. Despite the variety of existing methods for the treatment of PTR, they are not sufficiently effective and do not provide the necessary level of recovery of visual functions [1,2,7].

Classical panretinal coagulation (PRC) was considered as the traditional method of laser treatment for RVO and PTR, which, in the presence of ischemia and neovascularization zones, provides stabilization of the pathological process, regression of newly formed vessels, blocking of ischemic areas, and improvement of blood circulation in the retina. However, at present, many experts note that PRC often leads to a worsening of the course of MO and a decrease in visual functions. At the same time, this method is limited by the impossibility of using it in the avascular macular zone of the retina, since it can

cause a destructive effect on the microstructures of the chorioretinal complex [5,6,8].

Recent developments in the field of laser treatment of retinal diseases have led to a significant expansion of the use of lasers. One of the achievements is the introduction of micropulse modes of laser radiation into clinical practice. Pathogenetically substantiated in the treatment of MO due to PTR is the impact of yellow spectrum laser radiation (with a wavelength of 577 nm) in the micropulse mode. It is the most selective in relation to retinal pigment epithelium cells, it is maximally absorbed by melanin and does not cause damage to a functionally significant area of the retina, which is ensured by the absence of absorption of radiation of this spectrum by the xanthophyllic pigment of the macular zone [1,9,10].

In this regard, the task of finding more optimal methods of treating PTR is relevant and needs to be addressed.

**Purpose of the study.** To evaluate the effectiveness of the method of combined treatment of macular edema as a result of post-thrombotic retinopathy using subthreshold laser exposure.

**Material and methods.** The study was carried out in the laser department of RSNPMCEM. Under supervision there were 18 patients (19 eyes) with PTR, including 10 male and 8 female. The mean age of the patients was 51±4,7 years. The duration of an episode of RVO was 3–6 months.

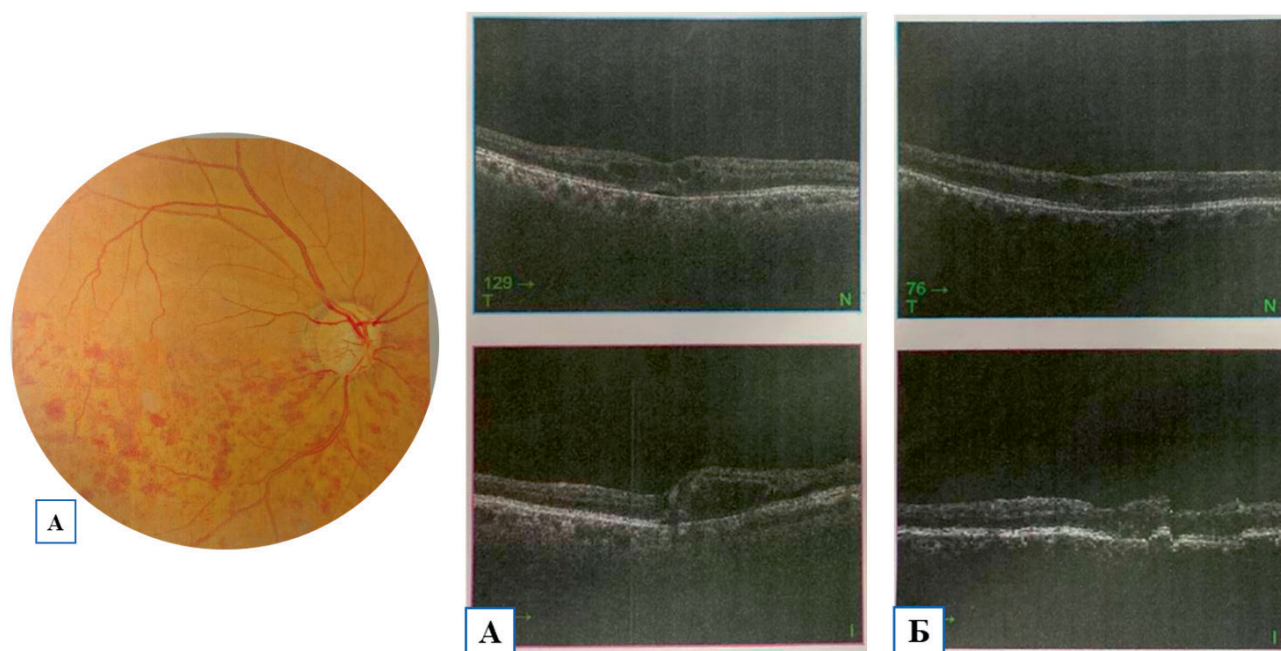
Patients were divided into 2 gender- and age-homogeneous representative study groups: in the first study group (n=9, 9 eyes), patients received combined treatment using anti-VEGF therapy and subthreshold diode micropulse laser exposure using a 577NM yellow diode laser, the second comparative group (n=9, 10 eyes) patients were treated only with anti-VEGF therapy.

Before and after treatment, all patients underwent a complete ophthalmological examination, which included visometry, tonometry, visual fields, and retinal OCT.

Before the start of treatment, the resulting coagulate was tested in the sup/scan mode to determine the subthreshold mode of laser exposure. Micropulse laser treatment was performed on

after 1 month, best corrected visual acuity (BCVA) – 0,78±0,06; central retinal thickness (CRT) in the fovea – 295,5±16,5 μm; mean sensitivity (MS) – 20,4±1,24 dB; after 3 months: BCVA – 0,82±0,08; CRT in the fovea – 265,4±26,2 μm; MS – 21,6±2,1 dB; after 6 months: BCVA – 0,85±0,04; CRT in the fovea – 254,5±18,4 μm; MS – 23,3±2,2 dB.

Within the indicated periods, patients of the comparative group also showed positive dynamics in all studied functional and morphometric parameters: after 1 month, best corrected visual acuity (BCVA) – 0,71±0,07; central retinal thickness (CRT) in the fovea – 299,7±12,8 μm; mean sensitivity (MS) – 19,8±1,42 dB; after 3 months: BCVA – 0,79±0,06; CRT in the fovea – 275,5±20,5 μm; MS – 20,8±2,2 dB; after 6 months: BCVA – 0,81±0,06; CRT in the fovea –



**Figure 1. Clinical case. Patient L., born in 1955 D/S: OD: RVO. Post-thrombotic retinopathy. A: fundus picture and macular OCT before treatment. The patient received anti-VEGF treatment according to the scheme, which was supplemented with micropulse laser therapy (577 NM, power 250–300–400 W, exposure 0.03 ms, duty cycle 10–12%, spot diameter 300–350 μm). B: OCT image of the macular area 1.5 months after treatment.**

a Supra 577 nm laser device (Quantel medical). The parameters of laser radiation in this group of patients were: power 250–300–400 W, exposure 0.03 ms, duty cycle 10–12%, spot diameter 300–350 μm. The choice of laser radiation parameters depended on the transparency of the optical media of the eye and the degree of pigmentation of the fundus.

**Results and discussion.** As a result of the treatment, in all cases, an improvement in visual acuity was recorded, according to OCT data: a decrease in the height of macular edema, an improvement in the cytoarchitectonics of the retina, and a decrease in the number of cystic cavities.

Within the indicated periods, patients of the study group showed positive dynamics in all studied functional and morphometric parameters:

266,6±14,5 μm; MS – 21,7±1,8 dB.

Thus, the proposed technology for the combined treatment of ME due to RVO, using two different types of interventions, provided the possibility of influencing several links in the pathogenesis of this disease. Intravitreal administration of angiogenesis inhibitors contributed to a decrease in the height and area of the ME due to a decrease in the production of VEGF and a decrease in vascular permeability; during the course of therapy, gradual resorption of hemorrhages occurred, which improved conditions for adequate focusing and targeted application of laser applications. Laser treatment made it possible to stabilize the state of the retina after preliminary antiangiogenic therapy using micropulse laser exposure (stimulation of the production of PEDF,

which is the most pronounced natural inhibitor of angiogenesis), as well as to reduce the risk of neovascular complications using continuous laser exposure.

**Conclusion.** The results of the study show

that combined treatment, including subthreshold micropulse laser exposure, is quite effective and safe in cases of macular edema in post-thrombotic retinopathy.

#### ЛИТЕРАТУРА/REFERENCES

1. Buyru Özkurt Y, Akkaya S, Aksoy S, Şimşek MH. Comparison of ranibizumab and subthreshold micropulse laser in treatment of macular edema secondary to branch retinal vein occlusion. *European journal of ophthalmology*. 2018;8(6):690–696. <https://doi.org/10.1177/1120672117750056>
2. Eng VA, Leng T. Subthreshold laser therapy for macular oedema from branch retinal vein occlusion: focused review. *Br J Ophthalmol*. 2020 Sep;104(9):1184–1189. <https://doi.org/10.1136/bjophthalmol-2019-315192>
3. Ip M & Hendrick A. Retinal Vein Occlusion Review. *Asia-Pacific journal of ophthalmology (Philadelphia, Pa.)*. 2018;7(1):40–45. <https://doi.org/10.22608/APO.2017442>
4. Gawęcki M. Subthreshold Diode Micropulse Laser Combined with Intravitreal Therapy for Macular Edema-A Systematized Review and Critical Approach. *J Clin Med*. 2021 Mar 31;10(7):1394. <https://doi.org/10.3390/jcm10071394>
5. Hayreh SS. Photocoagulation for retinal vein occlusion. *Progress in retinal and eye research*. 2021;85:100964. <https://doi.org/10.1016/j.preteyeres.2021.100964>
6. Moore SM, Chao DL. Application of subthreshold laser therapy in retinal diseases: a review. *Expert Rev Ophthalmol*. 2018;13(6):311–320. <https://doi.org/10.1080/17469899.2018.1555035>
7. Parodi MB, Iacono P, Bandello F. Subthreshold grid laser versus intravitreal bevacizumab as second-line therapy for macular edema in branch retinal vein occlusion recurring after conventional grid laser treatment. *Graefes Arch Clin Exp Ophthalmol*. 2015 Oct;253(10):1647–51. <https://doi.org/10.1007/s00417-014-2845-6>
8. Patel A, Nguyen C, Lu S. Central Retinal Vein Occlusion: A Review of Current Evidence-based Treatment Options. *Middle East African journal of ophthalmology*. 2016;23(1):44–48. <https://doi.org/10.4103/0974-9233.173132>
9. Sabal B, Teper S, Wylegała E. Subthreshold Micropulse Laser for Diabetic Macular Edema: A Review. *Journal of clinical medicine*. 2022;12(1):274. <https://doi.org/10.3390/jcm12010274>
10. Terashima H, Hasebe H, Okamoto F, Matsuoka N, Sato Y, Fukuchi T. Combination therapy of intravitreal ranibizumab and subthreshold micropulse photocoagulation for macular edema secondary to branch retinal vein occlusion: 6-month result. *Retina*. 2019 Jul;39(7):1377–1384. <https://doi.org/10.1097/IAE.0000000000002165>