DOI: https://doi.org/10.57231/j.ao.2024.11.5.023 УДК 617.7-007.681: 362.147

ОЦЕНКА 5-ЛЕТНЕГО РИСКА РАЗВИТИЯ ПЕРВИЧНОЙ ОТКРЫТОУГОЛЬНОЙ ГЛАУКОМЫ ПРИ МОНИТОРИНГЕ С ИСПОЛЬЗОВАНИЕМ ТЕЛЕМЕДИЦИНЫ

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Аннотация. Актуальность. Одной из наиболее значительных проблем для пациентов с глаукомой может быть отсутствие специализированных офтальмологических учреждений или их удалённость, а также недостаток квалифицированных специалистов. В этом отношении телемедицина предлагает эффективное решение данной проблемы, помогая устранить эти барьеры. **Цель исследования.** Оценить пятилетнюю вероятность развития первичной открытоугольной глаукомы (ПОУГ) у пациентов с офтальмогипертензией на основе дистанционных обследований. **Материалы и методы.** В исследование были включены клинические случаи пациентов старше 40 лет с повышенным внутриглазным давлением (ВГД) и/или глаукоматозными изменениями диска зрительного нерва (ДЗН), имеющих подозрение на ПОУГ. Для расчета пятилетнего риска развития глаукомы использовалась специально разработанная онлайн-платформа. **Результаты и заключение.** Оценка пятилетнего риска развития ПОУГ у пациентов с офтальмогипертензией помогает прогнозировать вероятность заболевания в ближайшие пять лет. Средний показатель 1,9 указывает на умеренное влияние ВГД на общий риск, тогда как показатель 3,8 демонстрирует значительное влияние PSD на развитие заболевания. Использование математической системы для расчета пятилетнего риска ПОУГ у пациентов с офтальмогипертензией может стать эффективным средством для мониторинга состояния глаз в этой группе, что позволит вовремя начать медикаментозное лечение для стабилизации ВГД и профилактики прогрессирования глаукомы.

Ключевые слова: глаукома; первичная открытоугольная глаукома; офтальмогипертензия.

Для цитирования:

Юсупов А.Ф., Джамалова Ш.А., Асадов Д.А. Оценка 5-летнего риска развития первичной открытоугольной глаукомы при мониторинге с использованием телемедицины. Передовая Офтальмология. 2024;11(5):101-105.

EVALUATION OF THE 5-YEAR RISK OF DEVELOPING PRIMARY OPEN-ANGLE GLAUCOMA USING TELEMEDICINE MONITORING

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Abstract. Relevance. One of the most significant challenges for glaucoma patients can be the lack of or distance from specialized ophthalmology facilities and qualified specialists. In this regard, telemedicine offers an effective solution to this problem, as it helps address these barriers. **Purpose of the study.** To determine the five-year risk of developing primary open-angle glaucoma (POAG) in patients with ocular hypertension based on remote examinations. **Materials and methods.** The study included clinical cases of patients over 40 years of age with elevated intraocular pressure (IOP) and/or glaucomatous changes in the optic nerve head (ONH) suspected of having POAG. A specially developed online platform was used to

calculate the five-year risk of developing glaucoma. **Results and conclusion.** The evaluation of the five-year risk of POAG in patients with ocular hypertension aids in predicting the likelihood of the disease within the next five years. An average score of 1.9 indicates a moderate impact of IOP on overall risk, while a score of 3.8 demonstrates a significant influence of pattern standard deviation (PSD) on disease progression. The application of a mathematical system for calculating the five-year risk of POAG in patients with ocular hypertension may serve as an effective tool for monitoring eye health in this group, allowing timely initiation of pharmacological treatment to stabilize IOP and prevent glaucoma progression.

Key words: glaucoma; primary open-angle glaucoma; ocular hypertension.

For citation:

Yusupov A.F., Djamalova Sh.A., Asadov D.A. Evaluation of the 5-year risk of developing primary open-angle glaucoma using telemedicine monitoring. Advanced Ophthalmology. 2024;11(5):101-105.

TELEMEDITSINANI QO‘LLASH ORQALI MONITORINGDA BIRLAMCHI OCHIQ BURCHAKLI GLAUKOMANI 5 YILLIK RIVOJLANISH XAVFINI BAHOLASH

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Annotatsiya. Dolzarbligi. Glaukoma bilan og’rigan bemorlar uchun eng muhim muammolardan biri bu maxsus oftalьmologiya muassasalari yo’qligi yoki ularning olis joylashganligi, shuningdek, malakali mutaxassislar yetishmasligidir. Shu jihatdan, telemeditsina ushbu muammoni hal qilish uchun samarali yechimni taklif qiladi, chunki u bu to’siqlarni bartaraf etishga yordam beradi. **Tadqiqot maqsadi.** Oftalmogipertenziyali bemorlarda birlamchi ochiq burchakli glaukomaning (BOBG) 5 yillik rivojlanish ehtimolini masofaviy tekshiruvlar asosida baholash. **Material va usullar.** Tadqiqotga 40 yoshdan oshgan, ko'z ichidagi bosim (KIB) yuqori bo'lgan va/yoki koruv nervi diskining (KND) glaukomatoz o'zgarishlari mavjud bemorlarning klinik holatlari kiritildi, ularning BOBGga shubhalari bor. Glaukoma rivojlanishining 5 yillik riskini hisoblash uchun maxsus ishlab chiqilgan onlayn platforma ishlatildi. **Natijalar va xulosa.** Bemorlarda 5-yillik rizkni baholash, bojg boyicha glavkomaning rivojlanish ehtimolini prognozlashga yordam bera oladi. O'rtacha ko'rsatkich 1,9 KIBning umumiy riskka o'rtacha ta'sirini ko'rsatadi, 3,8 esa PSDning kasallik rivojlanishiga sezilarli ta'sirini ko'rsatadi. Bemorlarda bobgning 5 yillik riskini hisoblash uchun matematik tizimni foydalanish uchun ta'sirli instrumentga aylantirishi mumkin, bu ko'zlar holatini monitoring qilishga yordam beradi, bu ko'z bosimini stabilizatsiya qilish va glavkomaning rivojlantirishini oldini olish uchun dorivor taniqlashni o'z vaktida boshlashga yo'q oltiradi.

Kalit so’zlar: glaucoma, birlamchi ochiq burchakli glaucoma, oftalmogipertenziya.

Iqtibos uchun:

Yusupov A.F., Djamalova Sh.A., Asadov D.A. Telemeditsinani qo‘llash orqali monitoringda birlamchi ochiq burchakli glaukomani 5 yillik rivojlanish xavfini baholash. Ilg'or Oftalmologiya. 2024;11(5):101-105.

Relevance. Glaucoma is the second leading cause of blindness worldwide, affecting an estimated 76 million adults in 2020 [1,2]. Experts predict that by 2050, over 7 million people in the United States will be diagnosed with primary open-angle glaucoma [3,4]. Both globally and in Uzbekistan, glaucoma ranks among the leading causes of irreversible blindness. The average incidence rate of primary glaucoma in Uzbekistan is 39.8±0.4 per 100,000 adults, which is slightly higher than the average prevalence rates in the CIS and Central Asian countries [5,6].

Glaucoma is a condition that requires early detection, careful monitoring of intraocular pressure (IOP), assessment of the optic nerve and visual fields, as well as medication management and adjustment. One of the most significant challenges for glaucoma patients can be the lack of or distance from specialized ophthalmology facilities and qualified specialists [2,7]. In this regard, telemedicine offers an effective solution to this problem, as it helps address these barriers.

Purpose of the study. To determine the five-year risk of developing primary open-angle glaucoma (POAG) in patients with ocular hypertension based on remote examinations.

Material and methods. The study was conducted between 2021 and 2023 at the Republican Specialized Scientific-Practical Medical Center for Eye Microsurgery and its regional branches. The study included clinical cases of suspected POAG in individuals over 40 years old with elevated IOP and/or glaucomatous changes in the optic nerve head (ONH). Another inclusion criterion was the patient's informed consent to participate in the study.

The study was based on clinical guidelines from the European Glaucoma Society Terminology and Guidelines for Glaucoma, 5th Edition.

Close Window

POINT SYSTEM FOR ESTIMATING 5-YEAR RISK OF DEVELOPING POAG

The estimated risk displayed below is a projection of the patient's likelihood of developing early glaucoma in at least one eye within 5 years, based on the information entered, and using the Point System developed by the OHTS-EGPS Collaboration and published in Ophthalmology: (in press).

FACTORS	Points for Factors				
	0	1	2	3	4
Age (years)	☐ <45	☐ 45 to < 55	☑ 55 to <65	☐ 65 to <75	☐ ≥75
Intraocular Pressure (mm Hg) Mean (3 measurements per eye and average of 2 eyes)	☑ <22	☐ 22 to <24	☐ 24 to <26	☐ 26 to <28	☐ ≥28
Central Corneal Thickness (μ) Mean (3 measurements per eye and average of 2 eyes)	☐ ≥ 600	☐ 576-600	☐ 551-575	☐ 526-550	☑ ≤525
Vertical Cup/Disc Ratio by Contour Mean (1 measurement per eye and average of 2 eyes)	☐ <0.3	☑ 0.3 to <0.4	☐ 0.4 to <0.5	☐ 0.5 to <0.6	☐ ≥0.6
Visual Field: Humphrey Pattern Standard Deviation (dB) Mean (2 measurements per eye and average of 2 eyes)	☐ <1.8	☑ 1.8 to <2.0	☐ 2 to <2.4	☐ 2.4 to <2.8	☐ ≥2.8
- OR - Octopus Loss Variance Mean (2 measurements per eye and average of 2 eyes)	☐ < 3.24	☐ 3.24<4.0	☐ 4.0<5.76	☐ 5.78<7.84	☐ ≥7.84
Sum of Points and Estimated 5-Year Risk of Developing POAG					
Sum of Points	0-6	7-8	9-10	11-12	>12
Estimated 5-Year Risk of Developing POAG	≤4.0%	10%	15%	20%	≥33%

Total Points: 8 Estimated Risk: 10% The patient's estimated 5-year risk (%) of developing early glaucoma in at least one eye.

Print Reset

Figure 1. View of the online system for calculating the five-year risk of developing primary open-angle glaucoma (POAG).

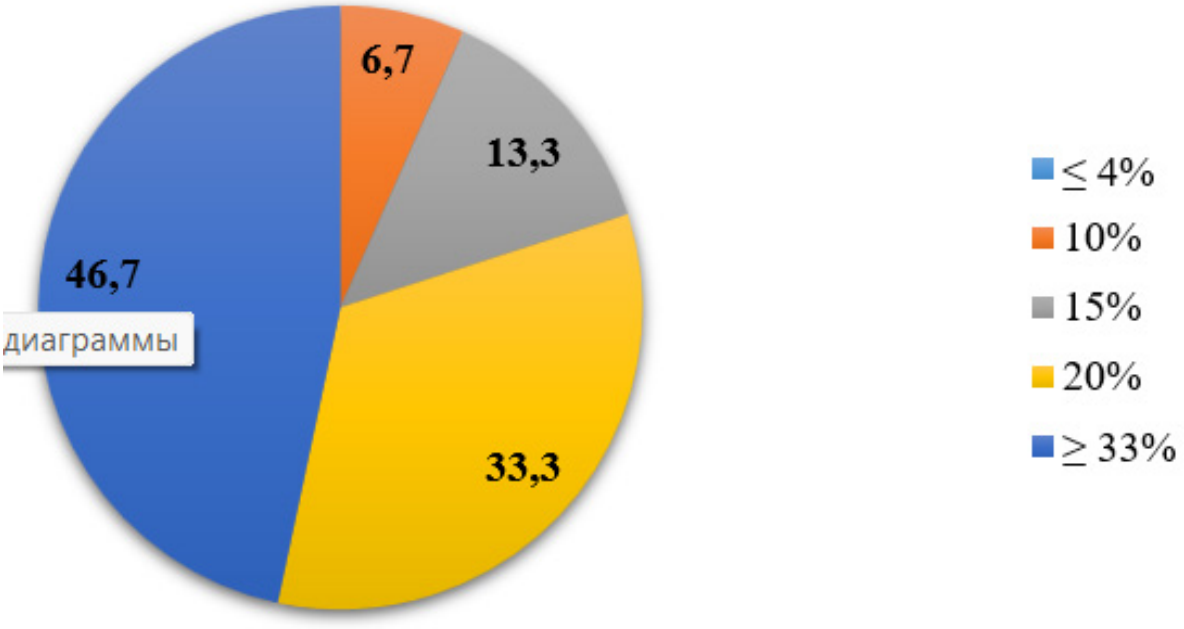

Figure 2. Five-year risk of developing primary open-angle glaucoma (POAG) in patients with ocular hypertension.

Ocular Hypertension: IOP > 21 mm Hg (without hypotensive eye drops), normal visual field, normal ONH or RNFL appearance, open anterior chamber angle based on gonioscopy, anterior OCT, or UBM, and the absence of other ophthalmopathies or corticosteroid use, as well as the absence of other risk factors.

Method for Determining the Five-Year Risk of Developing POAG. During the study, the five-year risk of developing POAG in patients with ocular hypertension was calculated. A specially developed online system, which is freely available at https://ohts.wustl.edu/risk/, was used for this purpose.

Barcha bemorlarda davolanishdan oldin va keyin nisbiy akkomodatsiyaning negativ qismi (NAN), binokulyar akkomodatsion moslanuvchanlik (BAM) va monokulyar akkomodatsion moslanuvchanlik (MAM) baholandi.

NAN- nisbiy akkomodatsiyaning negativ qismini aniThis system was developed based on the results of the Ocular Hypertension Treatment Study (OHTS) and the European Glaucoma Prevention Study (EGPS). The predictive model is based on the following information: age, cup/disc ratio, results of three measurements of intraocular pressure (IOP) using the Goldman applanation method, central corneal thickness (CCT) obtained through ultrasound pachymetry (three measurements), and the pattern standard deviation (PSD) determined using Humphrey full threshold 30-2 or 24-2, SITA standard 30-2 or 24-2, or Loss variance from Octopus 32-2 (two measurements).

Results and discussion. A total of 30 cases of true ocular hypertension were identified in the examined sample based on the results of remote and in-person consultations. Calculations for the five-year risk of developing POAG were performed for these patients using the online risk assessment system. The results of these calculations were as follows. This research was conducted as part of a telemedicine consultation format.

The average severity of each clinical parameter used to calculate the five-year risk of developing primary open-angle glaucoma (POAG) in patients with ocular hypertension can serve as an important tool for assessing the likelihood of disease development and implementing appropriate preventive and management measures.

Age plays a crucial role in the development of glaucoma. The older the patient, the higher the risk of the disease. The average score of 2.4 indicates a moderate contribution of age to the overall risk score for developing POAG. Elevated intraocular pressure (IOP) is a key risk factor for glaucoma. An average score of 1.9 indicates a moderate to moderately significant contribution of IOP to the overall risk. Corneal thickness is also important, as a thicker cornea may lead to an underestimation of IOP. The average score of 3.3 suggests a significant contribution of this factor to the overall risk. The cup-to-disc ratio (CDR) is used to assess the condition of the optic nerve and is an important clinical indicator in the diagnosis of glaucoma. An average score of 2.5 indicates a moderate contribution of CDR to the overall risk. The pattern standard deviation (PSD) measures the unevenness of visual field sensitivity distribution and may be associated with deterioration in visual function. An average score of 3.8 indicates a significant contribution of PSD to the overall risk. The total score represents a comprehensive assessment of the risk of developing POAG and can be used to identify patients at high risk for the disease who require further medical monitoring and treatment.

Calculating the five-year risk of developing primary open-angle glaucoma (POAG) in patients with ocular hypertension allows for determining the likelihood of developing this condition within the next five years (fig. 2). The following risk categories are presented in this context:

≤ 4% risk: Zero risk of developing POAG in the next five years.

10% risk: Low risk of developing POAG.

15% risk: Moderate risk of developing POAG.

20% risk: Significant risk of developing POAG.

≥ 33% risk: High risk of developing POAG.

Based on the data from the graph:

6.7% of patients have a 10% risk of developing POAG.

13.3% of patients have a 15% risk of developing POAG.

33.3% of patients have a 20% risk of developing POAG.

46.7% of patients have a ≥ 33% risk of developing POAG.

These results can be used in clinical practice to assess the risk of developing POAG in patients with ocular hypertension and guide decisions about additional monitoring, screening, or preventive measures. Moreover, this data helps identify risk groups, allowing for personalized management and treatment strategies. In the context of our study, it is noteworthy that the risk assessment was based on telemedicine consultations, highlighting the potential for early diagnosis and remote patient management.

Conclusion. The use of a mathematical system to assess the five-year risk of developing POAG in patients with ocular hypertension can serve as an effective tool for monitoring eye health in this patient population. It can also enable timely initiation of medical treatment to compensate for intraocular pressure and prevent the development of clinical and functional manifestations of glaucoma.

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