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DATA ON IMPROVING THE ORGANIZATION OF OPHTHALMOLOGICAL CARE FOR PATIENTS WITH DIABETIC RETINOPATHY

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Abstract

Diabetic retinopathy (DR) is one of the vascular complications of diabetes mellitus (DM) and is one of the leading causes of complete loss of vision. Timely detection and treatment in the early stages of diabetic retinopathy make it possible to stop the progression of vascular changes in the fundus. In patients with diabetes mellitus with pronounced or severe vascular changes in the retina, it is not always possible to prevent the progression of the process and a sharp decrease in vision, which leads to decreased ability to work and profound disability. The risk of developing diabetic retinopathy depends mainly on the type, duration and compensation of diabetes mellitus. Risk factors affecting the incidence of retinopathy also include: arterial hypertension, nephropathy and hyperlipidemia. This problem is relevant for all ophthalmologists in the world, including Uzbekistan. The problem of early diagnosis and treatment of diabetic retinopathy continues to be one of the pressing problems of modern ophthalmology, this is due to the late presentation of patients with diabetic retinopathy.

Keywords: Diabetes, Diabetic Retinopathy, Patients, Statistics, Laser Coagulation.

INTRODUCTION

As defined by the World Health Organization (WHO), diabetes mellitus is a chronic condition of elevated blood glucose levels due to insufficient insulin secretion. The term "diabetes" comes from the word "diabetes". The main symptoms are extreme thirst and frequent urination. In diabetes, glucose is excreted in the urine, making it taste sweet. In ancient times, doctors diagnosed “diabetes mellitus” based on the taste of urine, and some observant healers determined it by the patients’ shoes, on which the dried sweet urine formed white crystals. [2]

Diabetes is often called a non-communicable epidemic. The number of people suffering from this disease is constantly growing, and according to recent data, in developed countries it ranges from 5 to 10% of the adult population. According to statistics, every 10 seconds one person in the world dies from complications of diabetes. [2]

Type 1 diabetes mellitus (T1DM) is caused by the death of beta cells in the pancreas, which are responsible for producing insulin. This type of diabetes is usually diagnosed in children and adolescents, and its incidence is approximately 30-50 cases per 100,000 people. More common is type 2 diabetes mellitus (T2DM), which is often inherited and usually develops in overweight adults. It is estimated that for every identified case of type 2 diabetes, there are 3-4 unrecognized cases of diabetes.[2]

Diabetes mellitus is an insidious disease that damages the cardiovascular system, affecting the eyes, kidneys and legs. The prevalence of diabetes is higher in middle- and low-income countries. The first global report from the World Health Organization (WHO) on diabetes was presented in 2016. According to this report, 422 million people worldwide already have diabetes. This represents 8.5% of the population, and the

number of patients is increasing every year. WHO epidemiologists forecast in 2009 that by 2030 the number of people with diabetes could reach 7.7%, representing 439 million adults. However, as can be seen, these forecasts were almost at the level of data before 2014. Also, experts from the World Health Organization (WHO) estimated that in 2021, 529 million people in the world had diabetes, and by 2050 the number of such patients will increase to almost one and a half billion. Predicting the prevalence of diabetes mellitus presents significant difficulties for specialists. [6, 7]

Diabetic retinopathy (DR) is one of the serious vascular complications of diabetes mellitus (DM) and often leads to vision loss. Timely detection and treatment in the early stages can prevent the progression of changes in the fundus. However, in patients with significant vascular changes, it may be difficult to prevent visual impairment, which greatly affects their quality of life and work performance. Hyperglycemia plays a key role in the development of oxidative stress in diabetes mellitus. This occurs due to autoxidation of glucose, glycosylation of proteins and activation of sorbitol metabolism, which promotes the formation of free radicals and reactive oxygen species. Oxidative stress occurs due to an imbalance between the production and inactivation of reactive oxygen species. Prolonged hyperglycemia leads to capillary damage, pericyte loss, and microaneurysm formation. It also causes changes in endothelial cells, red blood cell clumping and increased retinal capillary permeability, which promotes the formation of exudates and fibrin deposition.

The progression of diabetic retinopathy usually occurs sequentially from small initial manifestations, which are characterized by increased permeability of the retinal vessels (nonproliferative retinopathy), to changes associated with vascular occlusion (preproliferative retinopathy), and then to the most severe stage of diabetic retinal damage, which is characterized by proliferation of newly formed vessels and fibrous tissue (proliferative retinopathy)[1].

Occlusion and edema are the main pathological manifestations of the process of diabetic retinal damage, and occlusion mainly affects the peripheral parts of the retina, and edema predominates in the central part of the retina, in the macular zone.

In Tashkent, 16,356 patients with diabetes are registered, of which 7.5% have type 1 diabetes and 92.5% have type 2 diabetes. There are 1,225 patients with type 1 diabetes registered in the city. Among patients with type 1 diabetes, diabetic retinopathy was diagnosed in 813 (66.4%), cataracts - in 111 (9.1%). Blindness (one or both eyes) was detected due to retinopathy in 21 (1.7%) patients and due to cataracts in 9 (0.7%) patients. There are 15,131 registered patients with type 2 diabetes. Among patients with type 2 diabetes, diabetic retinopathy was diagnosed in 7,615 (50.3%), cataracts in 123 (14.0%). Blindness (one or both eyes) due to retinopathy was detected in 89 (0.6%) patients and due to cataracts - in 60 (0.4%) patients.

An unequal distribution of personnel and technical resources for eye care was found between the regions of Uzbekistan and its capital, Tashkent. To address this problem, it is recommended to reduce the gap in access to personnel, equipment and health facilities, and to focus on eye health as a key factor in achieving the World Health Organization target of reducing the number of people with visual impairments by 25 percent. Each region of Uzbekistan, including the Republic of Karakalpakstan, has at least one secondary or tertiary level medical institution providing ophthalmological care. However, most of these facilities are concentrated in Tashkent, where there are

two specialized tertiary eye care facilities and nine specialized and non-specialized medical institutions providing secondary eye care. The uneven distribution of medical facilities throughout the country creates differences between the capital and the regions.

Classification and clinic of diabetic retinopathy. When examining and dynamically monitoring patients with diabetes, it is advisable to distinguish the following stages of diabetic retinopathy [5]:

- Non-proliferative retinopathy;
- Preproliferative retinopathy;
- Proliferative retinopathy.

At the stage of non-proliferative retinopathy, the following are ophthalmoscopically detected:

- Micro aneurysms – local expansions of retinal

Vessels associated with excessive permeability in the macula area, leading to macular edema;

- hemorrhages, which can be of different shapes depending on the layers of the retina they are located in (line-shaped - in the superficial layers, in the form of small dots or rounded spots - in the deep layers of the retina);
- “Hard” exudates – yellowish lipid deposits, localized, as a rule, along the border of retinal edema and leading (if they are located in the center of the macular zone) to a significant decrease in vision;
- “Soft” exudates – represent a zone of focal retinal ischemia;
- Retinal edema is the most important element of nonproliferative retinopathy, which is responsible for the loss of central vision in patients with diabetes.

At the stage of preproliferative retinopathy, intraretinal microvascular anomalies (shunts that open in response to retinal ischemia) and venous anomalies (pronounced dilation of the veins, unevenness of their caliber, tortuosity, vascular loops) are additionally detected. The severity of these pathological elements is directly related to the risk of developing proliferative diabetic retinopathy.

Patients with diabetic retinopathy also experience decreased regulation of retinal blood flow. This results in increased systemic blood pressure, which increases perfusion pressure and damages the retinal vessels, which may result in macular edema and vision loss. Given the widespread prevalence of diabetes mellitus in developed countries (4-5% of the general population), a further increase in the incidence and number of patients with diabetic retinopathy is expected. Numerous studies confirm that the development of diabetic retinopathy depends on several factors, such as age, gender, age of onset of the disease, its duration and type. For example, a study by A. Charles (1992) showed that retinopathy was found in 2-7% of patients with type 1 diabetes during the first two years of the disease, and after 10-15 years, this percentage increased to 50%, and after 20 years - up to 75%. A study by R. Klein et al (1994) also confirmed the relationship between the duration of diabetes and the development of retinopathy, finding that after 10 years of follow-up, diabetic retinopathy developed in 89% of patients with type 1 diabetes under the age of 30

years, while the proliferative form was thirty%. In patients with type 2 diabetes mellitus, diabetic retinopathy is detected in 20% of cases with a disease duration of up to two years. The classification of vascular changes in the fundus associated with diabetes mellitus has a long history of development, starting with the work of Hirschberg in 1890. Currently, the classification proposed by the World Health Organization (WHO) is widely used, which includes non-proliferative, preproliferative and proliferative diabetic retinopathy.

To identify diabetic retinopathy, it is recommended to conduct an eye examination in patients with type 1 or 2 diabetes mellitus, as well as in children with type 1 diabetes mellitus, regardless of their age and duration of the disease, at least once a year. Patients with diabetic retinopathy should be monitored every 4-6 months. During repeated examinations, fundus photographs are compared and the dynamics of progression or regression of the pathological process are assessed. Damage to the organ of vision in diabetes mellitus is of serious importance, since it significantly affects the quality of life of patients. Among all the clinical manifestations of diabetic eye damage, the most dangerous is retinopathy, which is the main cause of progressive and irreversible vision loss. Blindness in patients with diabetes mellitus develops 25 times more often than in the general population. After the adoption of the St. Vincent Declaration in 1989, with the support of the World Health Organization (WHO) and the International Diabetes Federation, the development and implementation of comprehensive programs for the detection and treatment of diabetes mellitus and its complications began in Europe and Russia. This declaration focused health care workers on the priority of practical clinical diabetology and set specific goals that could be achieved based on existing scientific knowledge about diabetes and using proven methods. One of these goals was to reduce the number of new cases of blindness due to diabetes by one third or more. [9, 10]

The best way to detect diabetic retinopathy is through stereoscopic photography of standard areas of the retina, which provides objective information about the condition of the eye. This process is carried out by technical staff, and the photographs are evaluated by an ophthalmologist who specializes in retinal pathology. Although this method is the most sensitive, it is also expensive. Direct ophthalmoscopy is less effective, but when optimized, it can help prevent missed diagnoses of retinopathy. In patients with diabetes mellitus, it is recommended to perform ophthalmoscopy only when the pupil is dilated. Invaluable information in diabetic retinopathy can be obtained using optical coherence tomography (OCT) and fluorescein angiography (FA), which reveals pathological changes that are indistinguishable with conventional ophthalmoscopy. Optical coherence tomography is a test that allows you to evaluate the thickness and topography of the different layers of the retina in the central (macular) region. It provides very important information about the severity and nature of macular edema. The procedure is not harmful to the patient and has no side effects. The technique is based not on x-ray examination, but on the principle of interferometry. Fluorescein angiography is a technique based on the phenomenon of fluorescence - the ability to cause a substance introduced into the bloodstream (fluorescein sodium salt) to glow in response to light exposure. To perform FA, devices (retinal cameras or angiographs) are used that are designed to photograph the fundus of the eye. Fundus image recording begins immediately after its insertion.

It is important to remember that changes in the fundus of patients with diabetes can occur while maintaining high visual acuity. These changes often go unnoticed by the patient until their vision deteriorates or their eyes are examined by an ophthalmologist. Therefore, patients with diabetes should undergo regular examination by an ophthalmologist according to the following principles:

- An initial examination by an ophthalmologist should be scheduled immediately after the diagnosis of diabetes mellitus is made or as early as possible.
- If the initial examination does not reveal diabetic changes in the eyes, further examinations should be performed at least once a year.
- In the presence of non-proliferative retinopathy, examinations are recommended every 6-8 months.
- In the presence of pre- and proliferative retinopathy - examination every 3-4 months (after panretinal laser coagulation).
- In the presence of clinically significant macular edema, examination every 3 months (after focal laser coagulation or grid-type coagulation).
- In case of sudden deterioration in vision or the appearance of any visual complaints, an examination should be carried out immediately, regardless of the planned date of the next visit to the ophthalmologist.

The only effective treatment for diabetic retinopathy at present is laser coagulation of the retina. Only its timely use can stop the progression of diabetic retinopathy and prevent blindness.

The principle of laser coagulation of the retina is that with precisely dosed laser irradiation, energy is absorbed by the retinal structures. The heat released during this process leads to an increase in temperature until local burn areas form, followed by inflammation, which over the next few days turn into limited scar areas. Laser photocoagulation for diabetic retinopathy is aimed at turning off areas of retinal ischemia, suppressing neovascularization and obliterating vessels with increased permeability. For the treatment of retinopathy, currently in our country, argon (blue-green - 488–514 nm), solid-state yttrium aluminum garnet lasers with double frequency (wavelength of the green part of the spectrum - 532 nm) and diode (infrared - 810 nm) are mainly used. nm) lasers.

There are three main laser photocoagulation methods used to treat diabetic retinal lesions:

- Panretinal laser coagulation is used to treat proliferative retinopathy and preproliferative diabetic retinopathy. It involves causing burns over almost the entire area of the retina, with the exception of the macular area. This method is aimed at destroying areas of the retina with impaired blood supply, preventing the growth of new vessels and reducing existing ones.
- Focal laser coagulation is used to treat macular edema with local vascular permeability.
- Laser coagulation of the "grid" type is used for diffuse macular edema.

Panretinal laser coagulation of the retina can cause certain side effects, so its use is determined by the presence of newly formed vessels or a high risk of their appearance. Although this method does not improve vision, it does help prevent further deterioration. Side effects associated with laser photocoagulation may include decreased peripheral vision, low-light vision, and blurred vision, which is usually temporary. Focal treatment treats individual points of leakage that are detected on examination or by fluorescein angiography.

A laser beam is used to specifically target a vessel or microaneurysm. If blood vessels leak throughout the central region, and not just in certain areas, then laser burns are applied over the entire surface of the edematous macula, in the crosshairs of an imaginary lattice (hence the name for this type of retinal coagulation). The “lattice” type effect gives a good result in terms of the reverse development of macular edema and maintaining stable visual acuity. It is also possible to perform a combined effect - coagulation of the “lattice” type and focal.

It must be emphasized that for ischemic maculopathy, laser treatment is not indicated due to its low effectiveness.

The basic principles of treatment of diabetic retinopathy include the most stable compensation of diabetes mellitus and treatment of the affected retina. According to the World Health Organization, there are no medications that can prevent the development and progression of diabetic retinopathy, with the exception of laser photocoagulation of the retina. However, modern understanding of the pathophysiology of this disease allows us to consider several directions in conservative therapy, including the use of angiogenesis blockers.

Recently, in the world practice of ophthalmology, intravitreal injections of crystalline corticosteroids and angiogenesis inhibitors have been widely used for the treatment of diabetic retinal lesions in combination with laser coagulation, which increases the effectiveness of the latter. However, the use of these drugs in isolation is temporary, and extensive studies are currently being conducted to evaluate their effectiveness. The only effective treatment for diabetic retinopathy at the moment is laser coagulation of the retina. Only timely use of this method can prevent the progression of the disease and avoid the development of blindness.

Data show that in children with type 1 diabetes mellitus, the average actual prevalence of diabetic retinopathy detected by screening is 2.2 times higher than that recorded (6.16±0.12% and 2.77±0.07%, respectively, p ≤0.001), in adolescents by 1.97 times (14.5±0.17% and 7.34±0.08%, respectively, p≤0.001) and in adult patients by 1.25 times (46.58±0 .12% and 37.26±0.06%, respectively, p≤0.001).

It should be noted that 80–90% of the identified cases represent the early stages of DR (preproliferative stage DR-1). Similar data were obtained in a number of foreign studies. More pronounced differences were obtained in adult patients with type 2 diabetes. Thus, the average actual prevalence of DR according to screening data was 38.4.23±0.11%, according to the register - 26.23±0.06% (p≤0.001), which is 1.46 times lower. The latter indicates insufficient examination and treatment of patients with this type of diabetes.

In the field of diagnosis and treatment of diabetic retinopathy, the following significant results have been achieved:

- An algorithm for the early diagnosis of diabetic retinopathy has been developed and implemented throughout Russia, which includes mandatory and additional examination methods for diagnosing eye damage in diabetes mellitus.
- An algorithm has been developed for screening and follow-up of patients with diabetes by ophthalmologists, depending on the stage of diabetic retinopathy.
- Methods of laser coagulation of retinal vessels (RLV) have been improved and introduced in regional centers as the most effective method of treating diabetic retinopathy and preventing vision loss.

The danger of diabetic retinopathy is that changes in the blood vessels and retina of the eye can continue undetected for a long time. Patients often do not notice visual impairment in the early stages of the disease. Only in more serious stages, when lesions affect the central area or hemorrhages occur, patients begin to experience blurred vision, distortion of objects, or the appearance of a dark spot in front of the eyes. Timely detection and treatment in the early stages of diabetic retinopathy can prevent the progression of vascular changes in the eyes.

Since the issuance of the Decree of the President of the Republic of Uzbekistan “On healthcare reform” in 1998, as well as in 2017 the Decree “On measures to improve the efficiency of providing primary health care to the population,” fundamental changes have occurred in the system of providing medical care to the population of the republic. The new model of healthcare organization, operating in the republic for the second decade, stipulates that it is in primary care, providing outpatient treatment and preventive care to the population, that the bulk of medical services should be provided (the priority role of primary healthcare). At this stage, it becomes relevant to analyze the results of the implemented reforms, in particular, to assess the effectiveness and correctness of the organization of care for patients with DR. At the same time, the problem of disability due to ophthalmological complications of diabetes, the peculiarities of its formation and structure in Uzbekistan, which can serve as an integral indicator of the severity of the disease and the effectiveness of therapeutic and preventive care for it, have not been sufficiently studied.The basic principle of medical care for patients with diabetes mellitus in the field of ophthalmology is to divide the treatment and diagnostic process into stages depending on the degree of retinal damage. Only those patients with clinically significant retinal changes are referred to subsequent stages of treatment, which allows optimizing the use of resources, including time and financial costs for patients and the state. After an initial ophthalmological examination performed by an endocrinologist, the patient is assigned to one of four dispensary observation groups, depending on the degree of development of the pathology and the required level of specialized care.

- Patients without diabetic retinal changes continue to be monitored by an ophthalmologist at the clinic.
- Patients with diagnosed diabetic retinopathy, but without the threat of vision loss (20-35 level on the ETDRS scale without damage to the macular area), should be referred to an ophthalmologist at the regional diabetes center for further dynamic monitoring.

- Patients with signs of diabetic retinal damage indicating possible vision loss (less than 47 level on the ETDRS scale with clinically insignificant macular edema or 43–47 level on the ETDRS scale without damage to the macular area) are referred to an ophthalmologist at the interdistrict (city) diabetes center for further dynamic observation.
- Patients with retinal changes indicating a high risk of visual impairment (any ETDRS level with clinically significant macular edema or more than 47 ETDRS level without macular involvement) requiring laser retinal coagulation or vitreal surgery are referred to ophthalmology hospitals.

Currently, the main focus of efforts to prevent blindness caused by diabetes is in two main areas: detection of retinopathy and its laser treatment. Laser coagulation of the retina is the main treatment method for diabetic retinopathy, allowing timely prevention of the development of blindness in approximately 80% of cases. However, it should be noted that with an advanced process, the effectiveness of laser treatment is significantly reduced. Therefore, a diabetic retinopathy screening program should be aimed at identifying patients with those degrees of damage for which effective care can be provided. Thus, diabetic retinopathy meets all the criteria that justify the organization and implementation of a screening program. Laser coagulation of the retina is currently the only effective treatment for diabetic retinopathy. A significant number of cases of severe forms of this disease indicate the need for mass laser interventions, such as panretinal laser coagulation. Therefore, timely and adequate use of laser technologies in the treatment of diabetic retinopathy can prevent disability in 800 people out of every 1000 patients treated. In advanced stages of diabetic retinopathy, surgical intervention is required. Vitreal surgery is the only method that can preserve vision in severe forms of this disease, successfully used in approximately 70% of cases.

Vitrectomy. With proliferative retinopathy, changes can form in the vitreous body that grossly violate its anatomical structure, and therefore transparency. In this case, surgical intervention – vitrectomy – may be effective. In this case, through incisions - punctures (usually there are three of them) in the sclera and the flat part of the ciliary body, a number of instruments are introduced into the eye cavity. An infusion cannula is inserted into the first hole, through which saline solution is supplied to maintain the tone of the eyeball when the vitreous is removed. The second hole is used for introducing the light guide, and the third is for special surgical instruments, the main one of which is the tip of the vitreotome. It is used to cut off and remove the altered vitreous body. Vitrectomy (in combination with removal of the internal limiting membrane of the retina) is also actively used in the treatment of diabetic macular edema. The problem of preventing blindness in diabetes is mainly organizational in nature and requires:

- Clear interaction between doctors of various specialties in the management of patients with diabetes mellitus;
- Timely referral of the patient to an ophthalmologist;
- Adequate ophthalmological examination;
- Assessing the degree of risk (in the presence of diabetic retinopathy) of progression and deterioration of vision;
- Timely start of treatment.

Blindness caused by diabetic retinal damage is already a serious economic problem. Given the expected increase in the incidence of diabetes (the number of patients increases by 5-7% annually and doubles every 12-15 years), vision loss due to diabetic retinopathy may become an even greater economic burden for most countries. [3,4,9] The level of general disability due to ophthalmological complications of diabetes in Tashkent is generally low: in 2003–2006. It fluctuated between 2.3–2.0 per 100 thousand population, gradually decreasing by 2009 to 0.9. By 2012, the number of disabled people increased slightly - to 1.1, and on average for the period under study it was 1.5 per 100 thousand population. This decrease can be explained by two factors: on the one hand, an increase in the effectiveness of the prevention of ophthalmological complications, and on the other, (and to a greater extent) the streamlining of the system of examination of persons undergoing medical and social examination carried out in the country.

CONCLUSIONS

According to the World Health Organization, there are no drugs that can prevent the development and progression of diabetic retinopathy in humans, therefore, when developing and implementing screening strategies, no therapeutic interventions other than laser photocoagulation of the retina should be considered.[8,9] At the same time, modern understanding of the pathophysiology of diabetic retinal damage allows us to identify a number of directions in the conservative treatment of diabetic retinopathy, the main of which are angiogenesis blockers. Recently, intravitreal injections of crystalline corticosteroids and angiogenesis inhibitors have become widely used in world ophthalmological practice. Their use in the treatment of diabetic retinal lesions in combination with laser coagulation of the retina has increased the effectiveness of the latter. Unfortunately, this cannot be said about the isolated use of these drugs, since they have a temporary effect. Large and detailed studies are currently underway to evaluate the effectiveness of these drugs.

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