Opinion

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Opinion: Blindness for the Blind or for Those Who Don't Want to See?

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ABSTRACT

Abbrevations: SAH: Systemic Arterial Hypertension; HR: Hypertensive Retinopathy; PDR: Proliferative Diabetic Retinopathy; ME: Macular Edema; MA: Microaneurysms; IMA: Intraretinal Microvascular Abnormalities; NVZ: Neovascularization; VH: Vitreous Hemorrhages; VA: Visual Acuity;BP: Blood Pressure; T2D: Type 2 Diabetes

Opinion

The concept of blindness and its different meanings are part of human history. In a historical context, it is marked by a feeling of rejection, prejudice, and intolerance. The historical bases ranging from the Code of Manu, drawn up in 200 a. C., making inheritance impossible for the blind, to the mystical period of the Middle Ages, where it was considered a disgrace, to the current one, which is based on the dichotomous binomial of science and ignorance, reformulating itself as the "age of inclusion" from the 1990s. Is the blind really those who cannot see or those who do not want to see? The demographic, dietary, epidemiological, and even social transitions that took place throughout the 20th century, modified the population profile, both in developed and in developing countries. Changes in population profiles promoted sine qua non conditions for the establishment of chronic diseases such as diabetes and systemic arterial hypertension (SAH), mainly due to their increased prevalence. His investigations and detailed studies, robust and with consistent methodologies, estimated that in 2007, there would be 180 million diabetics worldwide and that they would increase to 380 million by 2025, because of longevity, obesity, population growth and sedentary lifestyle, conditions that started in the previous century and have an important current impact. The same occurs with cardiovascular diseases, which have already become the greatest cause of morbidity and mortality worldwide [1].

The magnitude of the problem and its prevalence in the world population, associated with high morbidity and mortality, make them important in public health guidelines. The main morbidity agenda for the area of ophthalmology in both is based on the prevention of

blindness caused mainly by retinopathies, whether diabetic or hypertensive and referring to their complications. When the main cause of blindness among socially active individuals is evidenced, diabetic retinopathy (DR) continues as the main cause, while hypertensive retinopathy (HR), in addition to promoting visual disturbances, also signals the existence of other systemic diseases and their consequences of importance in public health. Several countries have developed screening programs, producing important evidence on efficiency, cost, and impact on population health data. Although there is no international consensus on screening programs for diabetes and SAH, the guidelines recommend selective screening, that is, screening individuals with potential risk factors, associated with primary prevention strategies and population education, to reduce their socioeconomic impacts. Even with this scenario and with a progressive volume of research, there is a perspective of stagnant blindness prevalence, since the number of patients correctly monitored and/or guided is far below the desired [2].

Diabetic Retinopathy

The presence of DR, even in the mildest forms, is associated with a 2- to 3-fold increased risk of stroke, ischemic heart disease, and heart failure. Its severe form does not usually start before the first five years of diagnosis in insulin-dependent types, suggesting that after ten years, 70-90% of these patients will present the disease, unlike the non-dependent, which approximately 67% of them will be affected after the same period. The risk of visual loss increases due to the appearance of complications, in proliferative diabetic retinopathy (PDR) after 2 years it is 3.2% and in the presence of macular edema (ME), 30-50%. Thus, they are clinically classified into two distinct stages: non-proliferative diabetic retinopathy and PDR, based mainly on occlusive, exudative findings or related to events triggered by them. The picture begins with the appearance of microaneurysms (MA), passing through microhemorrhages (MH), hard and cotton-wool exudates and venular dilation, in addition to intraretinal microvascular abnormalities (IMA) and continuing with large areas of capillary non-perfusion. MA result from thickening of the capillary basement membrane and loss of pericytes. Their evolution, due to the rupture, form MH, which, due to their format, allow us to assume their location in the retina, insofar as, when they are rounded or oval, they are found deeper, in the inner nuclear layers and/or external plexiform, on the other hand, when they present with a fusiform or "candle flame" pattern, they are found in the layer of nerve fibers, following their paths [3].

During follow-up, hard exudates, which accumulate close to MA or around regions of capillary non-perfusion, are arranged in a "circinate" pattern, while cotton-wool exudates, anomalous veins and regions of non-perfusion are important signs and consecutive episodes of severe hypoxia. In the case of cotton-wool exudates, their formation occurs due to the occlusion of the pre-capillary arteries, due to the interruption of the axoplasmic flow in the nerve fiber layer. When isolated, they are not significant risk factors, but when associated with IMA, MH or venous abnormalities, they indicate the future development of a proliferative phase. As for venous anomalies, it presents as a "rosary bead", due to the presence of slow flow, severe and extensive hypoxia, which may also indicate vitreous traction. Next, IMA present as capillary dilations that function as shunts, very similar to neovascularization (NVZ). There is a unique and continuous process of "dismantling" the vascular structures and all the anatomy related to this phase, preparing for the final milestone, which is NVZ, the hallmark of hypoxia and the beginning of the proliferative phase. With the growth of disc, iris and/or retinal neovessels, a new phase begins, also associated with the formation of: preretinal and vitreous hemorrhages (VH), fibroglial tractions with retinal detachment, retinoschisis and macular heteropia. The process continues with the appearance of neovessels in the venous territory, initially as thin, disordered channels, forming loops and skeins and crisscrossing with each other and with normal vessels, accompanied by collagen tissue, composing the fibrovascular set. They are, in fact, markers of the ischemic response and in 90% of cases bilateral. There is also a vitreous contraction, originating VH, retinoschisis or retinal detachment, tractional or mixed. Following the same evolutionary pattern of the physiology of retinal involvement by DR, the association of hard exudation with macular edema (ME) becomes an important actor in the promotion of low visual acuity (VA), which, if not treated, leads to blindness. It is worth emphasizing that ophthalmoscopy is still the most used resource in screening and in cases of suspected hypoxia. These edemas can be focal or diffuse, coexisting with the "cystoid" or ischemic pattern.

The leaks come from MA and anomalous vessels, whereas the decrease in VA occurs because of the accumulation of intraretinal fluid and lipids, producing different interfaces of light refraction, deformation in the cellular arrangement, reduction in light translucency and blurring of the RPE and pachychoroid, mainly due to failure in retinal self-regulation, breakdown of the blood-ocular barrier, lack of metabolic control and vitreoretinal traction. The emergence of OCT allowed for an evolution in the treatment of ME and the proliferative phase, also associated with the use of intravitreal medications such as corticosteroids and anti-VEGF, and vitrectomy via pars plan, however, even with this new therapeutic scenario, the Laser photocoagulation continues to be widely used, especially panphotocoagulation. Even so, it is of fundamental importance to control the disease and concomitant factors, such as SAH and dyslipidemia. It is in this context, of basic control and education, that adequate blood pressure control is important for both RD and HR.

Hypertensive Retinopathy

SAH is one of the most prevalent diseases in our environment and the alteration of retinal circulation occupies a prominent place in ocular pathology, promoting what is called HR. Its signs are more observed in individuals over 40 years old, with a prevalence between 2-17%. It can be divided into four phases: vasoconstrictive, exudative, sclerotic and complications of the sclerotic phase. In the first one,

the sudden increase in blood pressure (BP) causes the retinal vessel to increase its tone by self-regulation and, if the BP is not treated, it can lead to a continuous increase in vascular tone, promoting a great reduction of the vascular lumen, with leakage of plasma inside of the vessel wall, causing its dilation, with consequent rupture of the blood-retinal barrier and development of the exudative phase. As the barrier is dysfunctional, extravasation of plasma and blood components occurs, mainly to the macular region, developing candle-flame hemorrhage and cotton-wool spots that can form a macular star. In this way, the development of ME may occur, mainly due to the following events: exudative phenomenon and ischemia, both due to barrier failure. It is worth remembering that the choroidal vasculature will often be more compromised than the retinal, mainly due to anatomy. However, in the case of ischemic regions, after a certain period, these atrophic regions will form Elshnig's spots. HR is not common in SAH and its fundoscopic findings may vary according to: the state of the retinal vessels when the SAH starts, its severity and duration, as well as the presence or absence of other comorbidities and, mainly, efficiency in its control. In any case, the initial ophthalmoscopic signs are a reduction in the diffuse or generalized arterial caliber, which may alter the brightness of these vessels, with their reduction, turning into a copper and silver hue or, due to arteriosclerosis, they may become more rectilinear and rigid or lengthen and develop a tortuous course. There are also crosses with changes in caliber and direction.

More chronic signs, with consequent more severe SAH, develop in the presence of MH and cotton-wool exudates, indicating an accelerated hypertensive process. In most cases, the hemorrhages are multiple, superficial, like candle flames or discs and disappear when blood pressure is controlled. When the rupture of the blood-retinal barrier persists, hard exudates develop, appearing as well-defined white or yellowish spots, located at the posterior pole, behind the retinal vessels, and may be circumcinated in the fovea. Optic disc edema may also occur, with superficial hemorrhages like candle flames, bilateral and symmetrical. The classification of HR is popularly used clinically due to its practicality and currently the descriptive and topographic forms are more used. What matters most is that the onset of HR is a poor systemic prognosis for other diseases and for possible ophthalmological complications, and SAH should be treated as soon as possible. Studies have shown that retinal neurodegeneration is preceded by vascular changes in DR, which draws attention to cases in children and adolescents. It is important to note that the prevalence of DR in pediatric type 1 diabetes (T1DM) has decreased, in contrast to cases of type 2 diabetes (T2D). Risk factors for DR are well established and include glycemic control, duration of diabetes, hypertension, and hyperlipidemia, while use of diabetes technology, including insulin pumps and continuous glucose monitors, has been shown to have protective effects. Screening for DR is recommended for youth with T1DM once they are ≥ 11 years old or puberty has begun and the duration of diabetes is 3 to 5 years. Pediatric patients with T2D are advised to undergo screening at or shortly after diagnosis, and annually thereafter, due to the insidious nature of T2D. Recent advances in DR screening methods, including point-of-care and artificial intelligence technology, have increased access to DR screening, while saving costs for patients and being cost-effective for healthcare systems.

Conclusion

In view of so many important funduscopic findings, but above all, in view of the most varied technologies and innovative studies, with regard to the stagnation of the prevalence of blindness due to preventable causes, such as DR and HR, so common in our societies, one inevitably asks if: What's missing? Although the prevalence of DR in young people with T1DM has declined in recent decades, there has been a significant increase in the prevalence of DR in young people with T2DM. Improving access to DR screening using new screening methods could help improve early detection and treatment of DR. Recognize that we have entered the era of digital inclusion, but not the inclusion of human beings as humans per se? Would it be this? Perhaps then, yes, we should include the blind, as the only one who can really see today.

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