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EDITORIAL

The present and future in paediatric ophthalmology care[☆]



Presente y futuro de la atención oftalmológica pediátrica

Luis Porfirio Orozco-Gómez*

Jefatura del Servicio de Oftalmología, Centro Médico Nacional 20 de Noviembre, Instituto de Seguridad y Servicios Sociales para los Trabajadores del Estado, Ciudad de México, Mexico

Visual function is one of the most complex brain activities. More than 50% of the brain takes part in this, and a large part of brain learning functions, and even memory, in turn, depends on a healthy visual activity. For this reason, its failure will be to the detriment of different visual-motor activities.

The recent reform of Article 61 of the General Health Law (*Ley General de Salud*¹), which makes an ophthalmology examination obligatory in the fourth week of life of all term or premature newborns, for the early detection of diseases that would otherwise be diagnosed when they became evident, which usually occurs around the first five years of life or when they go to school, where the children show a frank incapacity, and the teachers become responsible for insisting that the parents take them for an ophthalmology check-up. This must be radically changed. With the aforementioned law change, the ophthalmological assessment of all newborns must be in the 4th week of life. This will bring about a change in ophthalmological practice in general, as well as from an ophthalmology training point of view. In

its most recent modification, the Ophthalmology speciality studies programme within the Single Medical Specialities Plan of the Post-Graduate Studies Division of the Faculty of Medicine of the Autonomous University of Mexico, contains the guidelines for providing the knowledge, abilities, and skills associated with the early and timely detection of retinopathy of the premature and eyeball malformations, as well as for the management of amblyopia. Thus, they now form part of the profile of the general ophthalmologist, as these were almost exclusively of the ophthalmologist highly specialised in paediatric ophthalmology, retina, and strabismus.

The health sector must consider employing qualified ophthalmologists, in order to carry out these assessments in all hospitals where babies are born, as well as to provide the necessary equipment for this purpose.

According to the dynamic population Tables, 2,463,420 children were born in Mexico in the year 2014.² Thus, this is the number of assessments that should have been made in the fourth week of life. Of these births, 44.6% are concentrated in the following states in decreasing order: Estado de México, Veracruz, Ciudad de México, Puebla, Jalisco and Guanajuato. Of the total annual births, 6.4% of children (157,659) were premature, and required strictly supervised care with oxygen support by neonatologists and nurses, experts in the pathophysiology of oxygen and in the genesis of retinopathy of the premature, were attended in an intensive care unit, and from the 4th week of life were included in weekly ophthalmology screening programmes, specially designed to assess retinopathy of the premature and its possible treatment in referral centres.

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* Correspondence to: Servicio de Oftalmología, Centro Médico Nacional 20 de Noviembre, Instituto de Seguridad y Servicios Sociales para los Trabajadores del Estado, Av. Félix Cuevas 540, Col. del Valle, C.P. 03100 Delegación Benito Juárez, Ciudad de México, Mexico. Tel.: +52 55 5335 0176.

E-mail address: luisporozco@prodigy.net.mx

It must be pointed out that not all health departments have these screening programmes available. In 2007, only 11 states in the country had at least one ophthalmologist trained in retinopathy of the premature. These programmes were implemented in the majority of the capitals of the states in the country for the year 2014, with the exception of Zacatecas, Tlaxcala, and Durango. However, around 500 children are blind annually, due to the lack of early detection and treatment of this disease. Thus, we can be sure that the problem is not resolved and there is still much to do.

The use of the transpupillary laser is the universally accepted treatment for retinopathy of the premature. Treatments have been added that include intravitreal anti-angiogenic injections in combination or for specific stages of the disease, and have shown to be useful in stopping its progression.³ Vitrectomy with small calibres is the choice in advance stages for treating retrolental fibroplasia (stage V of retinopathy of the premature), which leads to blindness.

On the other hand, the obligatory ophthalmology assessment should improve the early detection of malignant eye tumours, such as retinoblastoma, a very serious problem that used to confront us, and which still occurs sporadically when patients are referred to a specialist hospital, already with leucoria due to the considerable size of the tumour that often requires enucleation, usually bilateral, with a poor survival prognosis, instead of using a treatment to preserve the organ and its function.

Diseases, such as congenital cataracts could be detected and treated early, since current surgical techniques allow very successful surgery to be performed using micro-incisions with intra-ocular lens implants at a very early age, which will enable the visual rehabilitation of these patients in order to prevent their eyes from becoming amblyopic. Other changes in the formation or development of the eye-ball will be able to be detected earlier, and we should have confidence in the future visual development of the child.

Amblyopia and strabismus are a separate topic.

The visual pathway part of 2 receptors, which are the eyes, and that send the corresponding image via a nerve tract, which is the optic nerve, to end up in the specialised areas of the sight, where it will be shaped into an integrated three-dimensional image with colour, luminosity, texture, contrast, and a sensation of distance and depth. Strabismus is one of the main causes of loss of vision in children and adolescents. It is for this reason that its diagnosis and treatment must be early, since the fixation movements start from the second month of life, and in the 3rd month gross fusional movements can already be demonstrated. In the second month, eye-hand coordination starts to be developed for the conception of subjective space, and in the 5th month, grasp is achieved, a precise motor response required by stereoscopic vision.⁴

In order to achieve stereopsis, the information coming from both eyes towards V1 must contain a certain degree of horizontal disparity, since this area contains the cells that are sensitive to disparity (distant, near, intermediate), which achieve the perception of depth and the alignment of the eyes for the corresponding distance.⁵ This implies similar visual acuity in both eyes.

The dominance columns are practically complete at birth. The neurons of the lateral geniculate body grow until 2 years old, while the synapse of the striate cortex continues for several years more, but the density of the dendrites achieves its maximum at 8 months.^{6,7}

The lack of stimulus after birth, as usually occurs in the child with strabismus, can lead to damage of all these connections. Adequate visual stimulation is necessary in the critical period after birth, so that a normal visual pathway is developed and maintained. The correct connections not only depend on the activity in the afferent routes, but also on an adequate equilibrium between both eyes. Early monocular deprivation is an important cause of atrophy of the ocular dominance columns in the striate cortex. The occluded or squint eye does not make an adequate synapse, and the non-occluded eye makes a synapsis greater than normal. Secondly, there are fewer cells in the lateral geniculate body corresponding to the squint eye, as they have to support a lower amount of terminals in the 4C layer of the striate cortex. These alterations will trigger a cascade of neurological lesions that will finally affect the function of both hemispheres, as well as the brain activities that depend on binocular function.⁸⁻¹²

In Mexico the treatment of amblyopia and strabismus as a lesion directly secondary to that function is not adequately regulated, and it is carried out in very few institutions of the health sector.¹³ In the general population, and even among doctors, the lack of knowledge of the cortical effects that can occur in strabismic amblyopia leads to serious damage to child health.

We have achieved a great advance with the creation of the National Health Services List of 2007,¹⁴ in which it specifies that; "Each time that you take your son or daughter to a medical unit, ask the medical or nursing staff that they: inform you on the actions to prevent diseases, and to perform detection tests in accordance with the age". On Page 13, in the Section of Disease Detection, the date on which the visual function examination was performed must be completed, as well as at a recommended age, between 6 and 8 months, and this activity must be exclusively carried out by a doctor.

This measure, although a good one, is insufficient, since it does not include the binocular sensory examination, nor does it mention that it must be performed by an ophthalmologist.

In the last 20 years, the World Health Organisation (WHO) has been working with a network of international associates and with the private sector, in order to guarantee access by persons with a visual disability to health services all over the world, due to countries and regions formulating strategies. In 2013, the World Health Assembly approved the Action Plan for the Prevention of Blindness and Visual Disability 2014-2019, in the style of a roadmap for WHO member states,¹⁵ being centred on coordinating and reinforcing the efforts deployed, with the aim of achieving a measurable reduction in visual disability, avoidable in 25%, from now until 2019.

The WHO directs several international government alliances, as well as with the private sector and civil society organisations that have as their aim to contribute to the eliminating diseases that cause blindness. Likewise, it provides technical leadership for activities carried out by

its associates, or in the private sector, against particular diseases with a focus on their elimination, promoting appropriate, updated, and good quality ophthalmology solutions.

By strengthening the health system, eye diseases will be able to be detected and treated, and widening access to ophthalmology services and expanding rehabilitation activities for individuals with residual visual disability.

For all that mentioned, the interdisciplinary work of the neonatologist, the intensive care nurse, paediatrician and ophthalmologist will have to be strengthened from the Health Secretariat, with the providing of the necessary equipment and human resources to provide an adequate examination and, in this way, in the short-term to have ophthalmologically healthy children, who will be adult Mexicans who will direct the future of our country. Since we now have a law, we will each do our part to achieve it.

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