Amblyopia

Slabovidnost

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Izvleček

Slabovidnost je enostransko ali obojestransko zmanjšanje vida na enem ali obeh očesih zaradi motenega nevronskega razvoja v še nerazvitem vidnem sistemu.

Slabovidnost se pojavi zaradi dveh vzrokov – nenormalne binokularne interakcije (npr. škiljenje) in zamegljene ali popačene slike zaradi nekorigirane refraktivne motnje ali motnih očesnih medijev. Vidna ostrina pri slabovidnih očeh lahko zajema vse, od blagega znižanja vidne ostrine do hude izgube vida.

Zdravljenje slabovidnosti vključuje korekcijo refraktivne motnje ali motnih očesnih medijev in spodbujanje uporabe slabovidnega očesa s preprečevanjem uporabe boljšega očesa. Pediatric Eye Disease Investigator Group (PEDIG) študije kažejo, da lahko pokrivanje boljšega očesa za krajši ali daljši čas daje podobne rezultate pri očeh s hudo slabovidnostjo in da je lahko pokrivanje boljšega očesa za 2 uri na dan primerno začetno zdravljenje pri zmerni slabovidnosti. Študije so pokazale tudi, da sta lahko dnevno dajanje atropina in pokrivanje za 6 ur na dan enakovredni možnosti za zdravljenjein da je, če je pri zdravljenju uporabljena farmakološka terapija, lahko aplikacija atropina v času konca tedna primerno začetno zdravljenje pri zmerni slabovidnosti.

Slabovidnost lahko vodi v trajno izgubo vida, zato je pomembno izvajanje presejanja tekom otroštva z namenom zgodnjega odkrivanja in zdravljenja slabovidnosti.

Abstract

Amblyopia is a reduction of vision in one or both eyes due to a failure of normal neural development in the immature visual system.

Amblyopia occurs due to two basic conditions – abnormal binocular interaction (e.g., strabismus) and blurring or distortion of visual image due to uncorrected refractive errors or media opacities. Best-corrected visual acuities in amblyopic eyes range from mild deficits to severe vision loss.

The principle of treating amblyopia involves clearing any image blur and encouraging use of the amblyopic eye with occlusion of the better-seeing eye. Paediatric Eye Disease Investigator Group (PEDIG) studies show that both part-time and full-time occlusions can produce similar results in the eye with severe amblyopia and occlusion can be prescribed initially at 2 hours per day for the moderate amblyope. Studies show that daily atropine and patching for 6 hours/day can be equivalent treatment options and that if pharmacologic blurring is used for treatment, initial treatment can begin with just weekend use of atropine for moderate amblyopia.

Amblyopia can lead to permanent loss of vision; therefore vision screening is strongly recommended over the course of childhood to detect amblyopia early enough to allow successful treatment.

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1 Introduction

Amblyopia is a reduction of vision in one or both eyes due to a failure of normal neural development in the immature visual system (1). It is the most common cause of monocular visual impairment in both children and young to middle-aged adults, affecting 1 %–5 % of the population (2-4). Amblyopia can lead to permanent loss of vision with the impact on the quality of life. But with vision screening and early detection, amblyopia can be treatable (1,3,5).

2 Etiology

Normal visual development is based on clear and equal images transmitted from the eyes to the central nervous system (1). The brain`s visual centres (striate cortex and lateral geniculate nucleus) and neuronal connections develop until 8 years of age or older (1,6-8). Significant disruption of the visual image can result in permanently decreased vision (1). Studies show that also other important aspects of vision, including global processing, colour, motion, and contour perception, are abnormal in amblyopia (7,9).

3 Classification

Amblyopia occurs due to two basic conditions – abnormal binocular interaction (e.g., strabismus) and blurring or distortion of primarily central visual image due to uncorrected refractive errors or media opacities (1,6,10). Strabismic and refractive aetiologies account for 90 % of all amblyopia cases (8).

Strabismic amblyopia is the most common type of amblyopia, occuring in up to 50 % of cases (2,3,6). Constant, non-alternating or unequally alternating tropias (typically esodeviations) are likely to cause amblyopia. Non-fusible inputs from the two eyes in strabismic amblyopia are thought to lead to domination of cortical vision centres by the fixating eye and reduced responsiveness to input by nonfixating eye (6,11,12).

Refractive amblyopia can be divided into anisometropic and high bilateral refractive errors. Isoametropic amblyopia occurs usually in children with hyperopia > 3.50 diopters (1,13,14), with myopia > 3.00 dipoters and anisometropia > 1.5 diopters (1,14-16). Amblyogenic factor is also astigmatism > 1.5 diopters at 90 ° or 180 °, or > 1.0 diopters in oblique axis (1,14,16).

Visual deprivation amblyopia is caused by complete or partial obstruction of the ocular media. Amblyogenic factor is any media opacity > 1 mm in size or ptosis ≤ 1 mm margin reflex distance (1,11,14).

4 Clinical characteristics and diagnosis

The accepted definition of clinically significant amblyopia is best-corrected visual acuity ≤ 20/40 or a difference of 2 lines of Snellen acuity between the amblyopic eye and the normal eye. Although best-corrected visual acuities in amblyopic eyes range from mild deficits (20/25) to severe vision loss (≤ 20/400) (1,11). The most severe amblyopia can be found in cases of untreated deprivation during the first few months of life (1,3,6).

A more accurate assessment of monocular visual acuity is obtained with the presentation of a line of optotypes, as single optotype or picture tests may overestimate visual acuity (1,2,11,17). In less mature children, the visual acuity can be tested with single optotypes with the use of »crowding bars« to surround the op-

totype for better detection of amblyopic vision loss, symbols and preferential looking techniques. Observation of unequal or poor fixation behaviour with or without a manifest strabismus can also be an evidence of amblyopia (1,2,6).

5 Treatment

Amblyopia treatment can be highly successful with ~75 % of children, less than 7 years of age achieving resolution of the amblyopia (8). The principle of treating amblyopia involves clearing any image blur and encouraging use of the amblyopic eye through preventing use of the better-seeing eye (1). In the setting of residual visual disparity following the maximum improvement in visual acuity with spectacles, the treatment options for the remaining amblyopia include patching or atropine penalization of the fellow eye (8). Children with a visually significant anatomic abnormality must be approached on an individual basis.

Occlusion therapy has long been the accepted standard for treatment of unilateral amblyopia, but the details of how long to patch were often debated. Paediatric Eye Disease Investigative Group (PEDIG) amblyopia studies tested part-time versus full- time occlusion (6 hours per day versus all day) for severe strabismic, anisometropic/refractive, or combined mechanism amblyopia (20/100 to 20/400) in children 3 to 7 years of age. There was no difference in response to treatment between the 2 groups (1,8,18).

PEDIG researchers also evaluated 2 hours versus 6 hours per day patching regimen for moderate amblyopia (20/40 to 20/80) in children between 3 and 7 years of age with anisometropic/refractive, strabismus, or combined-mechanism amblyopia. No difference in efficacy was observed (1,19). But several authors have questioned the results of this study because compliance was monitored by self--reporting (8,20,21).

PEDIG study also compared the efficacy of daily atropine penalization (1 drop of 1 % atropine sulfate) to patching (6 hours per day) in children 3 to 7 years of age with strabismic and/or anisometropic amblyopia. After 6 months, 2 years and 10 years no significant difference was found (1,8,22).

Another PEDIG study evaluated daily versus weekend atropine for moderate amblyopia from 20/40 to 20/80. After 4 months, no difference in visual improvement was found between the 2 groups (1,8,23).

In children less than 8 years of age, who were treated successfully with atropine or patching, 24 % of children had recurrence of amblyopia within 1 year of treatment cessation (24). The recurrence after cessation of treatment can be over 60 % (8,25). For patients treated with 6 or more hours of daily patching, data suggest that the risk of recurrence is greater when patching is stopped abruptly (24). It is suggested that long term monitoring of visual acuity following cessation of treatment is needed in all children to detect and treat potential recurrence (8,24).

Studies show that even older patients where residual plasticity is present can show improvement in visual acuity in the amblyopic eye (26-28). Treatment should be attempted also in older children, especially in those without previous treatment because up to 47 % of these patients had improvement in visual acuity (27).

Despite all the evidence concerning the efficacy of treatment, non-compliance remains a major obstacle to successful treatment. Although both atropine and patching treatments were well tolerated by the child and family, atropine was more favourable (1,29).

A wide range of other treatments for amblyopia has become available, where the patient is also actively involved, e.g. near activities like completing word puzzles, dot- to-dot drawings or colouring-in parts of patterns and pleoptic exercises that were devised with the aim of encouraging the use of the fovea in amblyopes (6,30,31). Medical treatments, which stimulate availability of a variety of neurotransmitters and modulators, including dopamine, have also been used (3,32,33).

Finally, it is important to prevent vision loss in the sound eye through appropriate monitoring for reverse amblyopia and the prescription of protective glasses for protection from trauma (1).

6 Screening

Vision screening is strongly recommended over the course of childhood to detect amblyopia early enough to allow successful treatment (1,6,34). The prevalence of amblyopia is approximately 3 %, but with the detection and treatment of amblyogenic condition by five years of age, the prevalence of clinically significant amblyopia is reduced to around 2 %, and with detection and treatment before three years of age, the prevalence is reduced vto around 1 % (3).

A positive family history for amblyopia or strabismus combined with a high hypermetropia indicates a possible risk for amblyopia (6,16) as well as prematurity and neuro-developmental delay where prevalence of amblyopia is four to six times higher than in healthy, full-term infants (3).

Early in the childhood paediatricians check newborns for optical media clarity. Parents are often the first to raise concerns about abnormalities such as difficulty seeing, an eye that drifts or a head tilt. Irritability in a child while the good eye is covered suggests amblyopia, because the child receives no visual input from the weak eye and therefore cannot see (6,35).

If no abnormalities were revealed earlier, a systematic check-up at three years of age is very important when visual acuity is assessed (6). For younger children we can use preferential looking technique (36), since children prefer to watch a certain pattern over a homogenous stimulus. Visual acuity at the age of three years is determined mainly in a playful manner with the help of devices based on the Snellen principle, such as matching letters showed to the child at certain distances with those in the child`s hands. "E" test or any other test, based on the orientation of the optotype, are usually difficult to perform for children aged three years, because they have more difficulty determining the direction than differentiation of details (2,6). For slightly older children visual acuity is assessed at 5 meters with Snellen optotypes. When determining visual acuity, care must be taken that each eye is correctly and completely covered so that child cannot peek with the non-tested eye. Eyeball motility is also tested, and cover test is performed (6,35).

If the paediatrician detects poor visual acuity on a systematic check-up, the role of an ophthalmologist is to perform the refraction, fundus examination, determine the fixation and carry out further necessary investigations (6).

7 Conclusion

Amblyopia can lead to permanent loss of vision. Therefore, vision screening is very important to detect amblyopia early enough to allow a successful treatment based on clearing image blur and encouraging the use of the amblyopic eye.

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