

Impact of Gadgets on Amblyopic Therapy and Risk of Astigmatism Development: A Prospective Case Report of a 5 years old

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Abstract:

This prospective case report was carried out to investigate the effect of electronic gadget use during amblyopic therapy in a 5-year-old child with monocular hyperopia of +6DS. The child received glasses and underwent patching therapy for the amblyopic left eye while using electronic devices. The therapy successfully improved visual acuity over two years, an unexpected development of with-the-rule astigmatism in the left eye raised concerns about the role of gadget use in astigmatism development. This prospective case report highlights the efficacy of patching therapy combined with gadget, but suggests the need for further investigation of the potential risks of developing astigmatism. *Al-Shifa Journal of Ophthalmology 2023; 19(3): 128-130. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Originally Received: 8 April 2023

Revised: 29 April 2023

Accepted: 1 May 2023

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Introduction:

Amblyopia, often referred to as "lazy eye," is a common vision disorder in the absence of any organic pathology occurred in children that can lead to irreversible vision impairment if not treated promptly.¹ Decreased visual acuity in one or both eyes is a symptom of aberrant binocular interaction that occurs during the critical time of neurodevelopment in the visual cortex.² If one eye has a BCVA that is two lines lower than the other, this is considered clinically to be monocular amblyopia. In children, amblyopia is the leading cause of monocular vision loss in one eye, making it an important public health concern.³ Previous estimates of the worldwide prevalence of amblyopia have varied widely, from 0.2% to 5.3% of the population, depending on factors like the definition of amblyopia, the location of the studies, and the heterogeneity of the studies themselves.⁴ Among the world's populations, Europe has the highest incidence of amblyopia, with a global pooled prevalence estimate of 1.36 percent in 2022 and 1.75 percent in 2018.⁵

Case Report:

A case of 5-year-old child with monocular hypermetropia of +6.0DS in left eye, presented to the eye OPD of a tertiary care hospital in Islamabad. His other eye was emmetropic. Cycloplegic refraction was done using 1 % cyclopen. The patient was diagnosed with monocular ametropic amblyopia in left eye. Presenting visual acuity was 1.0 Log MAR, that improved to 0.96 log MAR after refraction. The patient was assessed for varying degree of visual acuity and refractive errors in both eyes and was followed closely for two years. The glasses were prescribed and parents were instructed to patch the eye 4-6 hours a day and the child was allowed to use smartphone/tab for games and other activities during patching time. Visual acuity and refractive errors were assessed every six months. A comprehensive eye examination, including assessment of astigmatism, was performed at each follow-up. Informed consent was taken from the guardians. All steps were followed according to Helsinki Declaration.

Visual acuity and refractive errors were monitored regularly. The results revealed a significant improvement in visual acuity from 0.96 Log MAR to 0.1 Log MAR in the amblyopic left eye over two years of treatment, demonstrating the efficacy of patching therapy combined with gadget use. However, an unexpected outcome was the development of with the rule astigmatism (-2.0 D) in the left only eye during this period, which prompted further investigation. Treatment often includes correcting refractive errors with glasses and patching therapy to encourage the use of the amblyopic eye. Over the two-year follow-up period, visual acuity in the left eye improved significantly from 0.96 Log MAR to 0.6 Log MAR in first six months without inducing any astigmatism. However, in next 3 visits the VA of the child was improved from 0.6 to 0.1 Log MAR but the child gets monocular with the rule astigmatism in amblyopic eye with a magnitude of 2D. Although the results

indicating successful amblyopic therapy in monocular ametropia, but the occurrence of monocular astigmatism raised question regarding used of electronic gadgets in early life and development of astigmatism.

Discussion:

Refractive error correction has been proven to enhance visual acuity (VA) in both unilateral and bilateral amblyopia. Approximately one-third of cases of anisometric, mixed, and strabismic amblyopia resolve without further intervention after 10-30 weeks of optical treatment alone, demonstrating a significant improvement in VA of 2 logMAR lines or more.³

Our case report revealed that in monocular amblyopia gadget assisted patching had a significant role in improvement of visual acuity. Previously published studies showed that positive impact of gadget-assisted patching therapy on amblyopia treatment, as evidenced by the significant improvement in visual acuity.^{3,5} Video games have gained substantial attention as a possible amblyopia treatment due to the rapid development of technology. The visual demands and stimuli of action video games can translate to real-world situations involving, for example, crowding, light sensitivity, contrast sensitivity, visual attention, and many components of visual short-term memory. The possible reason for that will be the release of dopamine a hormone that enhance the neuroplasticity of the brain and as a result improvement in visual acuity in amblyopic Eye.³ The first strategy involves, playing video games usually in a monocular fashion with the non-amblyopic eye occluded. This method is predicated on the idea that engaging in such activities can assist alleviate visual distractions and improve a variety of spatial vision skills that can aid in the detection of things. We followed the modality of using electronic gadgets during the amblyopic therapy period for the child. However, the emergence of astigmatism during the treatment period raises questions about the

potential influence of gadget use on refractive development. Prolonged screen time and close-up focusing could potentially contribute to changes in ocular physiology, including corneal curvature and axial length. Understanding the underlying mechanisms behind the progressive increase in corneal astigmatism that occurs with screen time exposure is crucial for the development of effective strategies for its treatment. Studies showed that with the rule astigmatism is highly correlated with the position and pressure exerted by the upper eyelid.⁶ Studies revealed that extended periods of downward gazing while using electronic screens can result in a sustained application of force on the vertical corneal meridian, which in turn causes an increase in the curvature of the cornea.^{6,7} Despite the lack of evidence in this study, further research is necessary to examine the suggested mechanism and its correlation with the pattern of astigmatism over an extended period of time.

Conclusion:

This case highlights the effectiveness of gadget-assisted patching therapy in improving visual acuity in amblyopic children. However, clinicians should remain vigilant for potential side effects, such as the development of astigmatism. Further research is needed to better understand the relationship between gadget use and refractive changes in pediatric patients undergoing amblyopia treatment, allowing for the optimization of therapy protocols and long-term visual outcomes.

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