Evaluation of Efficacy of Low Vision Aiding Devices in Pediatric Cases

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ABSTRACT

Objective: To determine the etiology of low vision in school-age children, to define telescopic system preferences, and to determine the best corrected visual acuity (BCVA) with and without these systems and compare between them.

Methods: Forty cases referred between December 2014 and December 2015 were included. Sex, age distribution, and the etiology of these cases were evaluated. Distance best corrected visual acuity (BCVA) was determined using the ETDRS scale with and without the telescopic system and converted to the logMar unit. Distance BCVA with and without telescopic system use was statistically compared.

Results: Sex distribution of the cases was equivalent (males, 50% and females, 50%). The mean age of cases was 9.40±2.34 years. The most frequent case group was the hereditary retinal dystrophy group, whereas the least frequent case groups were the optic disc hypoplasia and high myopia groups. The most preferred telescopic system by the cases was 2.5x Galilei system. A statistically significant difference was found in the increased vision in terms of distance BCVA.

Conclusion: Various diseases are included in the etiology of vision deficits in school-aged children. It is important to refer these school-age children with vision deficits to clinics that help and/or rehabilitate individuals with vision deficits to provide education of such children to the same level as normal children of the same age group and to develop their social communication skills.

Keywords: Albinism, low vision, nystagmus

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INTRODUCTION

The definition of a "person with low vision" was formulated in the report published by the World Health Organization in 1992 (1). According to this definition, persons whose best visual acuity and the feeling of seeing light is between 20/63 despite treatment and/or applying standard refractive correction; further, those whose visual field is narrowed up to 10° from a fixed point are considered as "persons with low vision" (1, 2).

According to the survey conducted by the State Statistical Institute in 2002, there are approximately 300,000 people with low vision in our country (2). In the same research, 0.33% of the total population between 0 and 9 years and 0.33% of the total population between 9 and 18 years of age were found to be visually impaired (2).

Aid and rehabilitation for school-age children with low vision is very important to increase their social communication skills and to ensure that they receive education of the same caliber as healthy children (3, 4).

The aim of our study is to investigate the etiology of low vision in childhood, type of assisting devices for those with low vision, and the effect of these devices on distant visual acuity.

METHODS

Our study is a retrospective study, and it ha s been prepared in accordance with the Declaration of Helsinki. A verbal consent form was received from the families of patients included in our study.

Here, 40 out of 162 patients who were between 6 and 15 years of age and were referred to the low vision unit from the other units with different etiologies between December 2014 and December 2015 were included in this study.

The genders, ages, and diagnoses of the patients were recorded. The best-corrected visual acuity (BCVA) values for both the eyes were taken along with the ETDRS scale from a distance of 1 m and/or 4 m. All the patients and their parents were informed about low vision devices. Informed consent was received from the parents of all the patients for the use and prescription of telescopic glasses. Subsequently, Galilei 2.1×, Galilei 2.5×, Galilei 2.7×, Keppler 3×9, and Keppler 4×10 telescopic glasses were

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Table 1. Etiologic distribution

	HRD	Albinism	Idiopathic INS	Congenital Glaucoma	OD Hypoplasia	High Myopia
n	16	12	7	3	1	1
%	40	30	17.5	7.5	2.5	2.5

HRD: Hereditary retinal dystrophy; INS: Infantile nystagmus syndrome; OD: optical disc

Table 2. Telescopic systems that patients preferred

	2.1x G	2.5x G	2.7x G	3x9 K	4x10 K
n	2	19	2	7	10
%	5	47.5	5	17.5	25

G: Galilei-type telescopic system; K: Kepler-type telescopic systemm

tried in all the patients. Galilei telescopic glasses were binocularly tested by placing the Keppler telescopic glasses on the eye that sees well.

Using the telescope type and telescopic glasses through which patients could see the best, distant BCVA values of both the eyes were determined with the help of the ETDRS scale and recorded. Later, the visual acuity values obtained with the ETDRS scale were converted to logMAR units and compared as an effect of the telescopic glasses on visual acuity.

Statistical Analysis

Power analysis of the patients included in this study was conducted using the G*Power 3.9.2® program. When calculated using 80% efficacy and number of samples, the power for our study was calculated to be 97%. In order to determine the distribution of our patients, the Shapiro-Wilk distribution test was applied with SPSS® (Statistical Package for the Social Sciences Inc.; Chicago, IL, USA) v. 16 for Windows: this value was calculated to be +1.1, which was concluded as normal distribution. The distant BCVA value of the patients was parametrically measured using the paired sample t-test with the SPSS program before and after the use of telescopic glasses. A value of $p<0.05$ was considered statistically significant.

RESULTS

Twenty (50%) out of the 40 patients were male and 20 (50%) were female. The mean age of the patients was 9.40±2.34 years (min: 6 years; max: 15 years).

The etiologies of the patients are given in Table 1. While the patients with hereditary retinal dystrophy (HRD) (38%) who were referred to our unit were in the most frequent group, the least frequently encountered cases were those with congenital glaucoma (7%), optic disc (OD) hypoplasia (2%), and high myopia (2%).

The types and ratios of telescopic glasses given to the patients, which provided the best visual acuity, are listed in Table 2. While the patients benefited the most from 2.5× Galilei-type telescopes, the subsequent most beneficial was the 4×10 Keppler-type telescope. This was followed by 3×9 Keppler-, 2.7× Galilei-, and 2.1× Galilei-type telescopic glasses.

Although it was not possible to perform a comparative statistical evaluation, as a clinical observation, it was confirmed that the group that benefited the most were patients with HRD and albinism. While the group that benefited the least was the congenital glaucoma group: OD hypoplasia was the case that revealed the least benefit.

While the mean distant BCVA value before the use of telescopic glasses was 1.10±0.40 logMAR (min: 1.30 logMAR; max: 0.70 logMAR), it was determined as 0.54±0.16 logMAR (min: 0.72 logMAR; max: 0.30 logMAR) after the use of telescopic glasses. A statistically significant difference was found in the statistical evaluation (parametric paired sample t-test; $p=0.003$). When the distant BCVA difference before and after the use of telescopic glasses was examined, the mean difference was found to be −0.56±0.25 logMAR. The largest difference was observed in patients with albinism (−0.76 logMAR) and the least difference was observed in those with OD hypoplasia (−0.14 logMAR).

DISCUSSION

In the conducted studies, when the gender distribution of children with low vision was examined, it was observed that boys consulted to low vision centers more frequently (between 55% and 67%) (5-8). In the study conducted by Tunay et al. (8) in our country, this ratio has been shown as 58.7%. In our study, the female-male ratio was found to be equal (50% each). We think that this is related to the fact that our unit did not receive direct applications, but all the children sent from the other units of our hospital were included in this study.

When we examine the distribution of diagnosis in our study, it is evident that the most common cause is HRD (38%). This is followed by albinism (28%) and idiopathic INS (15%) diagnoses. Diagnostic distributions in the literature varied depending on the region and/or country where the study was conducted. While the most common reason was HRD in a study conducted in India, optic atrophy was the most common in Nigeria and congenital cataract was the most common cause in China (7, 9, 10). In the studies conducted across the continents of Europe and America, the most common causes were found to be premature retinopathy and cortical blindness (5, 11, 12). Other studies conducted in our country reveal that the most common cause is HRD (8, 13). We consider that the frequent incidence of hereditary diseases such as HRD or albinism in our country is a result of frequent consanguineous marriages in our country (14).

Telescopic systems are the most helpful devices for distant vision (3, 4). In the study of Tunay et al. (8), the benefit rate from telescopic glasses was reported to be 91.3%. In our study, all the patients under consideration benefited from the telescopic system. The proportions were close to each other and the difference between them was thought to be due to the differences in etiology. The patient with OD hypoplasia (2%) benefited the least from the telescopic system. In the same study, the number of cases with OD hypoplasia and atrophy was 15 (10%).

Particularly in the school-age group, when selecting a telescopic system that best supports vision, factors such as comfortable usage at school, ease of carrying, and durability should be considered. Keppler telescopic systems have been reported as the best systems for supporting vision at this age (3, 4). We have found that the most preferred system is the 2.5× Galilei telescopic system in our study. We assume that this is caused by the fact that monocular use is a necessity in Keppler telescopic systems, such that it is somewhat heavier and more difficult to transport than Galilei telescopic systems and the enlarged area in Keppler telescopic systems is smaller.

The small number of patients who were included in this study is the greatest limitation of our study. The fact that near vision was not evaluated and that the etiology and increase in benefits from telescopic systems were evaluated observationally and not statistically are the other limitations of our study.

CONCLUSION

Improvements in vision can be effected with devices to counter low vision as well as rehabilitation programs for school-age children. By promoting success in schools, this may possibly enable children to become self-sufficient, productive, and independent individuals in the future. For this reason, we think that it is important to direct these patients to clinics where help and/or rehabilitation is provided for persons with low vision.

Ethics Committee Approval: Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", (amended in October 2013).

Informed Consent: Verbal informed consent was obtained from the parents of the patients who participated in this study.

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