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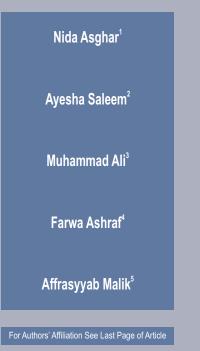
Clinical Effectiveness of Low Vision Devices (LVDs) Among Advanced Glaucoma Patients

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Purpose: To assess the clinical effectiveness of low vision devices among advanced glaucoma patients having low vision.

METHODS: A descriptive cross-sectional study was conducted among people having advanced glaucoma. A total of 30 patients having advanced glaucoma presenting to Mayo Hospital Lahore were examined. Data were collected by self-designed proforma after taking consent from the patients. Visual Acuity of all glaucoma patients was assessed on the logMAR visual acuity chart at 4m. The magnifier, telescope and other low vision aids were given to the glaucoma patients.

RESULTS: The results showed that magnification of 2.8x, 3x and 4x were dispensed to subjects of visual acuity 0.6, 0.7 and 0.9 respectively. The worse the visual acuity the greater was the magnification power of low vision devices needed for visual rehabilitation. Visual acuity with low vision devices and glasses were compared. Mann-Whitney U test was applied. There was a marked improvement in visual acuity with glasses and with low vision devices (p=0.01). The mean visual acuity with glasses and low vision devices were 0.813 ± 0.1852 (SE: 0.0338) and 0.213 ± 0.0860 (SE: 0.0157), respectively. Shapiro-Wilk test was applied to check the normal distribution of data. A comparison of visual acuity was done with and without spectacles and LVD's.

CONCLUSION: From the results of this study, it was concluded that worse the visual acuity, the greater magnification of low vision devices is needed for visual rehabilitation. After dispensing LVD, there was a marked improvement in the patient's visual acuity and they became able to maintain their daily life activities.

KEYWORDS: Low vision, advanced glaucoma, low vision devices.

Introduction:

Visual acuity is defined as how a person can see an object. But in low vision patients, visual acuity assessment depends upon the design of the Bailey Lovie letter chart which describes the principle of its design and improvement in log MAR units. It also explains how the progression of the size of optotypes occurs and accurate letter to letter scoring is significant for the evaluation of visual acuity in low vision clinics. So it is decided to measure visual acuity in terms of logarithms of the minimum angle of resolution as log MAR unit. The design of Bailey-Lovie chart has become the 'gold standard chart' for the measurements of visual acuity.[1]

There are many treatable causes of low vision but some diseases may also cause low vision. These diseases should be treated first but residual visual impairment should be represented as "low vision" and could benefit from low vision rehabilitation services. Therefore the term "moderate visual impairment" is proposed which is less severe than the level of blindness.[2]

People with low vision have to face difficulties to perform their daily life activities. As they have worse visual acuity binocularly so these people cannot be treated medically and surgically. For this purpose, we need low vision services that are available for the rehabilitation of patients by providing them low vision aids. There are some major causes of low vision like glaucoma, cataract, corneal opacity, macular degeneration, diabetic retinopathy, etc.

Low vision is an impairment of vision or constriction of field of vision in the better eye even after standard treatment (visual acuity of less than 6/18 to light perception or a visual field of less than 10 degrees from point of fixation) but who uses vision for planning of task. Low vision devices are made to improve the visual performance and help people to use their sight to better advantage, thus enabling social and academic modification and providing enhancement of daily activities.[3]

Advanced glaucoma patients have near-total cupping of optic nerve within 10 degrees of fixation with or without severe visual field loss, i.e. encroachment of scotoma or splitting fixation has a worse visual prognosis.[4]

Age is one of the main risk factors which is responsible for low vision in cases of glaucoma, diabetic retinopathy, age-related macular degeneration, and optic neuropathies.[5] Glaucoma patients have reduced field of view and they are not able to use high magnification that they need according to their visual acuity.[6]

Contrast sensitivity is reduced in glaucoma patients as is stereo acuity.[7] Contrast is very important in daily tasks. The measurements of contrast sensitivity are useful and beneficial to detect the early stage of vision loss.[8] In glaucomatous patients, color vision is also affected and patients have to face blue-yellow defect[9] and the defect is not correlated to fluctuations in Intraocular pressure.[10] Due to this important impairment of colour and contrast sensitivity in glaucoma patients driving inability is increasingly becoming common.[11,12]

According to the World Health Organization, glaucoma is the second leading cause of irreversible blindness in the world. Some studies showed that approximately 60.5 million people were suffering from open-angle glaucoma and angle-closure glaucoma in 2010 and their ratio will increase to 79.6 million by 2020.[13]

Blindness and visual impairment deleteriously disturb the value of life and visual functioning of the person.[14] Low vision aids can be specifically valuable for patients of glaucoma. Although magnification devices are beneficial in early glaucoma, the use of contrast improving filters and other solutions often prove very helpful. The basic principle of working of low vision aids is magnification of things.[15]

In the clinical management of glaucoma, glare assessment should be done and steps should be taken to reduce glare. Absorptive lenses are used to reduce glare. According to patients, yellow absorptive lenses were more efficient in reducing glare as compared to orange absorptive lenses.[16]

Visual functions which include color, glare, and contrast, may hamper normal daily activities and functioning of patients having glaucoma or any other disease is primarily obvious by their absence in the low vision definition.[17]

Materials and Method:

Ethical clearance to conduct the study was obtained from the College of Ophthalmology and Allied Vision Sciences, King Edward Medical University Lahore. The descriptive cross-sectional study design was utilized. From the patients presenting at Mayo Hospital eye OPD low vision clinic, a study sample of 30 patients having advanced glaucoma who needed low vision devices to improve their vision was selected. The participants who were mentally challenged and/ or having other ocular problems were excluded from the study. A consent form in English (verbally explained in Urdu by the researcher) containing information related to purpose, significance and intended procedures of the research study was completed and signed by each participant. A proforma was filled by collecting data through clinical examination from patients. According to the complaint of the patient and after complete history, each step was recorded clinically before prescribing devices. Then devices were prescribed to patients of glaucoma according to their needs and, after 15 days, follow up was conducted to check the effectiveness of prescribed devices.

Data were collected using SPSS Version 20. The

clinical effectiveness of low vision devices among advanced glaucoma patients was derived from the data. A descriptive cross-sectional study was done using non-parametric tests, with a probability of p < 0.05 to evaluate the effectiveness of low vision devices among advanced glaucoma patients. To maintain confidentiality the use of code rather than the participant's name was employed.

Results:

Table:1: Tests of normality of variables

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
VA without glasses in the right eye	0.191	30	0.007	0.911	30	0.016
VA without glasses in the left eye	0.195	30	0.005	0.929	30	0.047
VA with glasses in the right eye	0.167	30	0.033	0.871	30	0.002
VA with glasses in the left eye	0.199	30	0.004	0.851	30	0.001
Magnification of LVD	0.292	30	0.000	0.773	30	0.000
Improvement in VA after prescribing LVD	0.21	30	0.002	0.855	30	0.001
Better eye visual acuity	0.229	30	0.000	0.859	30	0.001
Poor eye visual acuity	0.21	30	0.002	0.865	30	0.001

Table 2: Descriptive statistics of glasses and low vision devices.

Visual Acuity with	N	Mean	SE	SD
Glasses	30	0.813	0.0338	0.1852
LVD	30	0.213	0.0157	0.086
Mann Whitney U Test; p-value = 0.01.				

In table 1, the Shapiro-Wilk test was applied to check the normal distribution of data. As the p<0.05, therefore non-parametric tests were applied to this data.

In table 2, Visual acuity with low vision devices and glasses were compared. Mann-Whitney U test was applied. The results showed that there was a marked improvement in the visual acuity measured with glasses and low vision devices (p=0.01). The mean visual acuity with glasses and low vision devices were 0.813± 0.1852 (SE:0.0338) and 0.213±0.0860 (SE: 0.0157), respectively.

Visual acuity with and without glasses was compared. Mann-Whitney U test was applied. The results show that there was a marked improvement in visual acuity measured with and without glasses (p=0.01). The mean visual acuity with and without glasses was 0.813± 0.1852 (SE:0.0338) and 1.080±0.2007 (SE:0.0366), respectively.

Discussion:

This study explained the relationship between the effectiveness of low vision aids in advanced glaucoma patients. In these patients' visual acuity and contrast sensitivity testing was done in different age groups. People with low vision had difficulties in daily life activities. As they had worse visual acuity binocularly and could not be treated medically and surgically, they need special care and there are many low vision rehabilitation services that are available for the treatment of people by providing them low vision aids. There are some major causes of low vision like glaucoma, cataract, corneal opacity, macular degeneration, diabetic retinopathy, etc. Because of these diseases, a person having low vision cannot perform his daily life activities like reading, writing, driving and recognizing the faces.

A detailed study was conducted to determine the main diseases of the eyes which lead to low vision and blindness in southeast Nigeria.[18] The purpose of this study was to find which visual components mostly affect the functions of glaucoma patients which could cause low vision. Quality of life could be affected due to eye diseases as a patient could not be able to complete their routine life work due to decreased visual acuity and loss of visual field. The relationship between different visual functions was evaluated to check which component usually disturbs the quality of life. It was detected that a patient with damage to the visual field is more affected to implement his daily life activities as compared to a patient having reduced visual acuity but in the case of low vision patients, visual acuity is a furthermost significant factor. So it was concluded that there is a strong association among all low vision aids components to retain the activities of life specifically in low vision patients.[19]

Other studies showed the risk factors associated with low vision in older persons. As visual acuity is reduced in older patients having glaucoma so study showed a relationship among all visual functions and also rules out the causes of low vision patients. It was concluded that in older people not only the low vision aids are important but also some associated factors like falls could affect.[20]

A study concluded different visual functions in advanced glaucoma patients having low vision problem and its relation with quality of vision and quality of life because low vision patients cannot comfortably perform their daily life activities as a normal person can do. A strong relationship was found among visual functions in low vision patients by using low vision aids. Low vision aids increase the effectiveness of daily living tasks in advanced glaucoma patients.

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