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Contact Lenses Mono-vision Correction for Presbyopia: Experience in Gaza Strip

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Abstract: ***Purpose**: This study was carried out to determine the efficacy and characteristics of contact lenses mono-vision as presbyopia optical management in optometry practice in Gaza Strip. **Methods**: 17 subjects were included in this study. Visual functions measured were both eyes distance, intermediate and near vision, stereo-acuity, contrast sensitivity function and reading speed. Comparisons were done between before and after intervention. Contrast sensitivity and reading speed were measured after the intervention only, thus, the results were compared with normal limits. Questionnaire was administered for all participants to evaluate the visual performance and satisfaction level for many daily tasks such as mobility, TV watch, reading newspaper and other tasks. **Results**: contact lenses mono-vision correction significantly improved near vision but intermediate vision was found to be worse with correction. Stereo-acuity showed significant reduction whereas contrast sensitivity remains within normal limits. Reading speed was found to be ideal for fluent reading. All subjects showed adaptation at dispensing visit with significant high level of general satisfaction. **Conclusion**: it has been concluded that contact lens mono-vision correction is an excellent option for presbyopic subjects in Gaza. And it is recommended that this option should be considered widely in presbyopia management by optometrists in Gaza.*

Keywords: mono-vision; presbyopia; contact lenses; addition; Gaza Strip.

1. Introduction

Presbyopia is the refractive condition when the accommodative ability of the eye is insufficient for near vision [1]

It has been reported that the age distribution of the world's population has markedly changed over the past 50 years with the presbyopic section in developing countries showing steady growth. By the year 2050, it has been reported that, as an expectation, 21% of the world's population will be aged 60 years and older [2]

This rising proportion of age of presbyopia represents a problem for optometrists and eye care practitioners in giving their patients the best possible correction for both far and near viewing distances. Traditionally, Presbyopia correction can be achieved with single vision near, bifocal or progressive spectacles .

Recently, the good understanding of presbyopic contact lenses characteristics gave the optometrists many options in presbyopia management [3]. Current techniques for the correction of presbyopia with contact lenses are based on one of three principles: mono-vision (MV), alternating vision or simultaneous vision. MV involves fitting one eye for distance (typically the dominant eye) and one eye for near, alternating vision principle is the same as the bifocal design in spectacle lenses in which the pupil should traverse from distance to near portion whereas simultaneous vision designs provide concurrent clear vision at two or more distances [3].

In Gaza strip, there is many options for presbyopia correction in which the single vision reading spectacles is the most prescribed. Bifocal and progressive spectacle lenses are also considered widely. However, contact lenses and other techniques such as surgeries and MV still not followed for presbyopia correction.

There are number of factors which force optometrists and eye care practitioners in Gaza to depend mainly on prescribing single vision reading spectacles. These factors include skills level of practitioners and their failure in proper patient selection for the most suitable correction option, the lack of patient's motivation for trying new presbyopia correction methods suggested by practitioners and finally the cost which may have a large impact on patient decision. However, in case of ammetropia with presbyopia, having two spectacles one for reading and the other for distance correction burden on patient's regular life, moreover the cost is not an advantage any more. At this point, patients usually are motivated in trying other options.

MV contact lens was considered to be an easy to prescribe and cost-effective option for both practitioner and presbyopia patients. Lazaro et al mentioned that some authors consider MV as the most successful contact lens option, between 70% and 76% with the main disadvantage being decrease in stereopsis and the amount of decrease is usually small but becomes more significant with increased addition (ADD) power in the non-dominant eye [4]

In the present study, the investigation of the characteristics of MV correction by contact lenses was believed to be the first to conduct in Gaza strip. This will shed light on the well-known but still ignored other presbyopia correction options in order to widen the optometry practice protocol in Gaza.

2. Methodology

This is a cross sectional descriptive study. The study was carried out in the optometry refraction clinic at Optometry Department in the Islamic University of Gaza . The duration

of the study was 124 Days. 17 subjects were recruited from the staff of Islamic University and authors relatives

Inclusion criteria were age more than 40 years old; the reason was to make sure all patients are presbyoic. However, presbyopia was diagnosed if near vision is less than 0.8M at 40 cm or 0.8M and better but with symptoms of eye fatigue and strain. In addition, amplitude of accommodation (AA) should be 5 Ds or less (except one case has amplitude of 6.50Ds). Best corrected visual acuity (BCVA) was at least 0.7 with refractive error (RE) not more than ±5Ds and not more than -1.00Dc .

Exclusion Criteria were ocular pathology such as cataract, keratoconus, dry eye, diabetic retinopathy, or age related macular degeneration. Systemic health problems or medication that would contraindicate contact lens wear. Previous ocular surgery. However two cases were diabetic and one case had history of ocular surgery (dacryocystorhinostomy). The inclusion of those participants was because of lack of subjects .

The research followed the tenets of the Declaration of Helsinki. Informed consent was obtained from each subject first, and then informed instructions regarding the nature of the research including subject's rights, the purpose of the study and tests conducted which were all safe methods were given. History taking and standard optometry examinations including, distance, near and intermediate visual acuity (VA), accurate refraction and AA measurement were done. Only subjects who represented more the inclusion criteria were chosen for this study.

After identifying the participants, the dominant eye of each subject was determined using the Dolman method (the hole-in-the-card test). Dominant eye was corrected for distance and the non-dominant eye for reading .

The prescription was determined to be distance correction for dominant eye and distance correction with addition (reading correction) for non-dominant eye. The addition was calculated keeping 1/2 AA in reserve at distance between 30 - 40 cm. However, the addition of 3 uncooperative subjects was determined according to age. Contact lenses were ordered and subjects were asked to wait for the dispensing visit. At dispensing visit each subject was fitted with his contact lenses MV (CLMV) correction. All subjects showed immediate adaptation. The insertion and removal of CL were performed by examiners .

For each eye, distance VA (DVA) was measured using projector chart and recorded in decimal format. Near and intermediate VA (NVA, IVA) were measured using M chart system at 40 cm and 80 cm respectively. Both eyes opened VA was also measured for the 3 distances and the data obtained from both eyes' VA were used to compare the VA pre and post treatment. This was done in a consistent normal illumination with white neon bulb light .

Accurate refraction was done using auto-refractometer and BCVA was determined. The AA was measured either by using push-up plus lens or minus lens method according to whether the subject was able or not to read the 0.8 M line. Stereopsis was measured using Titmus Stereo Test at near only. The stereo-acuity was recorded in seconds of arc. Above tests were performed before and after the intervention . Contrast sensitivity function (CSF) was measured at 1.5,3,6,12,18 cycle per degrees (cpd). The FACT chart was used to plot the binocular CSF for each subject and the CS was recoded as the last plate the subject can detect for each spatial frequency. The test was measured binocularly to determine to what extend the non-dominant eye corrected for reading (which is expected to have defective CSF at distance) could interfere and therefor affect the CS perceived binocularly. Reading speed was also measured, the patient was asked to read for 10 seconds and the number of words successfully read was counted. The paragraph chosen for the reading speed test for all subjects was from newspaper in Arabic language. The reading speed was recorded as the number of words/10 seconds. These two tests were performed after the intervention only.

The satisfaction level and subjective reports of participants were measured and evaluated using questionnaire (not validated). This questionnaire contained items which cover symptoms and daily life tasks including: recognize people faces, mobility, move up and down stairs, TV watch, typing and reading on laptop, reading small prints labeled on medication bottles, reading newspaper, symptom of diplopia or ghosting, adaptation after one week and general satisfaction level. Adaptation after one week question was only asked for those who showed no adaptation at dispensing visit. A number of items were answered by reporting the degree of performance (excellent, good, poor), some by reporting the satisfaction either satisfied or not and improvement level was recorded as no, small or marked improvement. All tasks were examined by simulation at optometry clinic in the dispensing visit .

Data analysis was performed using SPSS software V.20 and Excel 2010 . The descriptive analysis of the data was done. The sample size was 17; therefore Shapiro-Wilk test was used to test normality of each set of data. The missing data were replaced by the mean series method and the significance level chosen was p = 0.05 .

3. Results

Descriptive and demographic data analysis including number of subjects, age, gender, BCVA and spherical equivalents in right and left eye and addition needed (ADD) are summarized in Table 1 .

Table 1: Descriptive and Demographic Data of Subjects

		CLMV (n = 17)			
		Mean ± SD	*Range*	*Max*	*Min*
Age (years)		47.88 ± 5.12	15	54	39
Right eye BCVA		0.96 ± 0.09	0.3	1	0.7
Left eye BCVA		0.97 ± 0.08	0.28	1	0.72
Right eye SE (DS)		-0.19 ± 1.40	7.50	2.5	-5
Left eye SE (DS)		-0.16 ± 1.70	9.50	4	-5.5
ADD needed		1.80 ± 0.58	2	2.5	0.5
Gender	*Males*	9 (52.9%)			
	Females	8 (47.1%)			

Visual functions results:
The means of pre-treatment both eyes DVA, IVA and NVA were 0.88 ± 0.27, 1.02 ± 0.35 and 1.09 ± 0.5 respectively. For the post-treatment the means were 0.95 ± 0.09, 1.5 ± 0.67 and 0.65 ± 0.23 for both eyes DVA, IVA and NVA respectively. The pre-treatment and post treatment stereo-acuity means were 334.11 ± 297.06 and 735.88 ± 896.66 seconds of arc respectively.
Wilcoxon Signed Ranks Test showed a significant improvement in near vision post CLMV intervention ($p < 0.05$) and it has been showed that there was a significant reduction in IVA ($p < 0.05$). Whereas the DVA showed no significant change after the intervention ($p > 0.05$). The same test showed a significant reduction in stereo-acuity post CLMV treatment ($p < 0.05$). (Table 2)

Table 2: Means of Visual Functions pre and post treatment

	Pre-treatment Mean ± SD	*Post-treatment Mean ± SD*	*p-value*
BE DVA	0.88 ± 0.27	0.95 ± 0.09	0.345
BE IVA	1.02 ± 0.35	1.5 ± 0.67	0.004
BE NVA	1.09 ± 0.5	0.65 ± 0.23	0.005
Stereo-acuity	334.11 ± 297.06	735.88 ± 896.66	0.028

The average reading speed was 21 .88 ± 4.04 word/10 seconds which is considered excellent for highly fluent reading. In FACT test, the mean of number of plates seen at 1.5, 3, 6, 12, 18 cpd was within the normal range (grey zone on record sheet of FACT test) (Table 3).

Table 3: Average of number of plates of FACT chart seen by each subject

Spatial Frequency	Number of plates Mean ± SD
1.5 cpd	7.29 ± 1.16
3 cpd	6.41 ± 1.22
6 cpd	5.53 ± 1.73
12 cpd	3.24 ± 2.27
18 cpd	2.00 ± 2.55

Satisfaction level and subjective reports results:
The percentage of subjects who reported excellent performance was ranged between 35.3 % in reading small prints on medication bottles and 94.1% in reading newspaper (Figure 1). The satisfaction level score ranged from 82.4% of subjects were satisfied in TV watch task and 100% of subjects were satisfied in many tasks such as using cell phone and laptop (Figure 2). 11.8% of subjects (2 cases) reported symptoms of diplopia or ghost image. All subjects showed excellent adaptation at far, intermediate and near distances at dispensing visit except one case showed small improvement after one week in all distances.

4. Discussion

This study was performed in order to examine to what extend CLMV correction for presbyopia could be an effective treatment in terms of visual functions and subjective satisfaction level for a sample from Gaza strip.

Success rate of CLMV treatment was found to be 59-67% [5]. Some authors reported even higher success rate 70% and 76% [4]. A study showed that CLMV perform better than a centre near multifocal CL at near and distance [6].

In present study, the satisfaction rate (which could reflect the success rate) was at least 82.4% of subjects were satisfied at some tasks (some tasks 100%). This is considered high, however, other factors which may reduce success rate were not examined here such as contact lens complications and handling problems.

In a previous study, the ADD below +1.5 Ds was found to be better than higher ADDs for the performance in MV [7]. Another study said that a compromise in IVA may occur until the reading ADD reached +2.00Ds [8].

In present study, as the ADD was close to +2.00 Ds (1.80 Ds ± 0.58), it has been found that the improvement was for near vision only with worse IVA after the intervention. This may due to failure in coverage the intermediate zone since the focus gap between distance and near is relatively large.

Compared to results found before [9, 10], stereo-acuity was found to be worse after intervention. However, only the stereo-acuity for near was measured whereas the stereo-acuity done in reviewed study was for distance [9]. But it was noted that subjects showed good performance in tasks need stereo-acuity such as move up and down stairs and mobility.

Reading speed function and CSF were found to be within normal limits. Also, it has been found that, the performance in tasks needs CS such as recognising faces, move up and down stairs and mobility was found to be good.

There was a significant high rate of general satisfaction (which included the advantageous and disadvantageous) with CLMV. This may be because of many reasons including the appearance with CL is more desired than spectacle, other advantage appears with emmetrops (the majority of cases) who need only one CL for one eye to be under CLMV.

Although high satisfaction level in all tasks and in general satisfaction, attention should be given to the occupations which need some special visual functions to be intact such as pilots. One report talked about an aircraft accident related to CLMV wear, this highlights the importance of history taking including details of patient occupation [11].

The major limitation of this study was the small sample size which might cause a high possibility of committing type 1 & 2 errors.

One of the limitations also was the administration of non-validated questionnaire which may fail to reflect the visual task needed by the measured visual functions properly. This may also explain the relative difference between the visual function performance and satisfaction in the same task.

Other limitation was that in choosing the dominant eye, the Dolman method (the hole-in-the-card test) was used to determine the dominant eye to be corrected for distance. However, this could be misleading to the correct dominant eye as one study showed that only low proportion of included

subjects exhibited dominance in the same eye when tested by various dominance test methods [12], and in the same study, it has been concluded that in choosing the dominant eye it must be realized in vision performance. But this is not performed in present study which may make the chosen dominant eye to be the wrong eye. Future studies will focus on overcoming these limitations. It has been concluded that CLMV correction is an excellent option for presbyopic subjects in Gaza. And it is recommended that this option should be considered widely in presbyopia management by optometrists in Gaza.

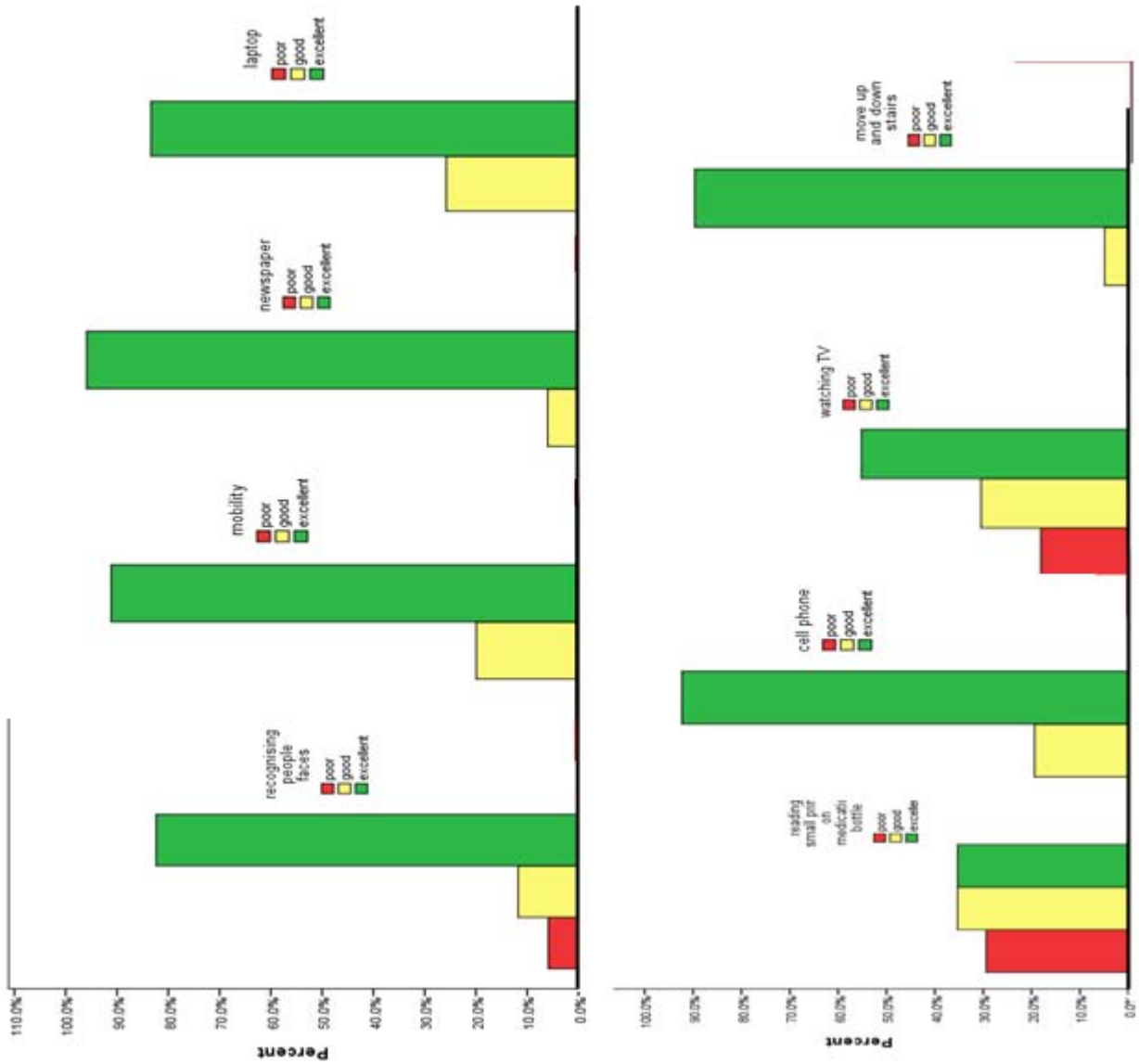

Figure 1: The Performance Level of Many Tasks after CLMV treatment

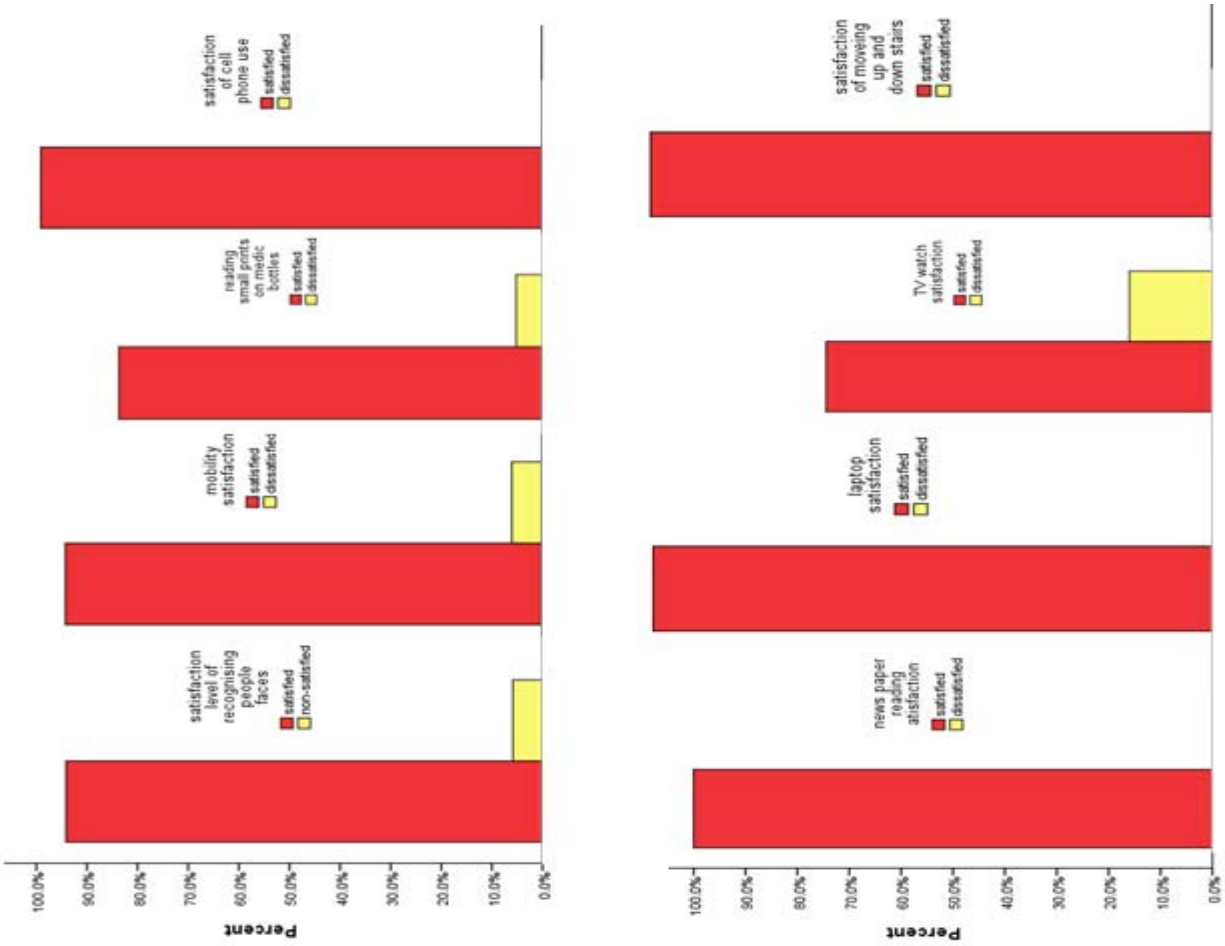

Figure 2: The Satisfaction Report of examined Tasks

References

[1] Millodot M. Dictionary of optometry and visual science (5: e uppl.). s 107. In: Elsevier Butterworth-Heinemann; 2000.

[2] Woods J, Woods C, Fonn D. Visual performance of a multifocal contact lens versus monovision in established presbyopes. Optometry & Vision Science 2015;92:175-82.

[3] Back A, Grant T, Hine N. Comparative visual performance of three presbyopic contact lens corrections. Optometry & Vision Science 1992;69:474-80.

[4] García-Lázaro S, Ferrer-Blasco T, Radhakrishnan H, Albarrán-Diego C, Montés-Micó R. Visual comparison of an artificial pupil contact lens to monovision. Optometry & Vision Science 2012;89:E1022-E9.

[5] Evans BJ. Monovision: a review. Ophthalmic and Physiological Optics 2007;27:417-39.

[6] Gupta N, Naroo SA, Wolffsohn JS. Visual comparison of multifocal contact lens to monovision. Optometry & Vision Science 2009;86:E98-E105. Franklin A. Presbyopia and contact lenses. Part 1: optical challenges of contact lenses in presbyopia. Optician 2005;229:22-7.

[7] Erickson P. Potential range of clear vision in monovision. Journal of the American Optometric Association 1988;59:203-5.

[8] Durrie DS. The effect of different monovision contact lens powers on the visual function of emmetropic presbyopic patients (an American Ophthalmological Society thesis). Transactions of the American Ophthalmological Society 2006;104:366.

[9] Guillon M, McGrogan L, Maissa C. Effect of simultaneous image bifocal and monovision on stereopsis. Optom Vis Sci 1998;75:271.

[10] Nakagawara VB, Veronneau SJ. Monovision contact lens use in the aviation environment: a report of a contact lens-related aircraft accident. American journal of ophthalmology 2000;130:542-3.

[11] Robboy MW, Cox IG, Erickson P. Effects of sighting and sensory dominance on monovision high and low contrast visual acuity. Eye & Contact Lens 1990;16:299-301.

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