The Impact of the Use of Hydrogel Lenses on the Visual functions of Young Adult Sudanese

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ABSTRACT

Purpose: To investigate the effects of wearing hydrogel lenses on daily wear basis for long period (year) on the visual functions in Sudanese young adult subjects. Methods: A descriptive cross sectional, case control study was conducted among 63 neophyte (who never worn contact lens before) volunteer students in Faculty of Optometry. All subjects were fitted with hydrogel soft contact lenses (CLEVIO) (water content 38%) POTEC Co.LTD for one year. Selected with best corrected visual acuity, contrast sensitivity, binocular vision (stereopsis), normal colour vision and central visual acuity. Results: Repeated measure analysis of variable (ANOVA) was used to find is there any significant mean differences in contrast sensitivity, stereocuity, colour vision and central visual field measurements with hydrogel contact lenses wear during the time of the study (i.e. baseline, 2 weeks, 1 month, 3 months, 6 months and 12 months). The test yielded significant reduction in contrast sensitivity values with contact lens wear during the study period, F = 157.44 , P < 0.001. Analysis of variables also showed significant reduction in means of stereoaucity measured with contact lenses during the study period, F = 3.70, p = 0.003. There was no change in colour vision and central visual field during sessions of the period study. Conclusions: The wearing of hydrogel soft contact lenses for long periods (one year) showed significant drop in contrast sensitivity values and in stereoscopic vision. There was no change in colour vision and central visual field during sessions of the period study. The study also showed that there was no or little reduce in contrast sensitivity and stereoaucity in early period of the study (up to 1 month).

Key words: hydrogel lenses, visual acuity, contrast sensitivity, stereocuity, central visual field, colour vision, daily wear.

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Introduction

Contact lenses are medical devices, which are primarily used to correct various refractive errors of the eye. They are the smallest, least visible, the fine of all devices designed to cover the cornea. Contact lens provides a safe and effective way to correct vision when used with care and proper supervision. They can offer a good alternative to eyeglasses, depending on the eyes and the individual life style.

Prescribing and fitting contact lenses have become an integral part of today’s comprehensive ophthalmic practice.

Majority of people are using contact lenses for cosmetic purposes and correction of refractive errors, other reasons of wearing contact lenses including occupational, sports and therapeutic uses.

During the last decade it remained one of the fast developing aspects of a constantly evolving contact lens technology. This has been due to improvements and changes in polymers and materials, techniques of manufacture, cleaning and disinfection procedures and methods of fitting.

Majority of patients using contact lenses in Sudan are fitted with hydrogel lenses either for correction of refractive errors or cosmetic reasons. So that, there is a need to evaluate vision and related vision quality through these lenses.

Materials and Methods

This is a hospital-based cross sectional, descriptive, case control study done in Khartoum at Faculty of Optometry and Visual Science Eye Hospital from October 2011 to June 2014.

A total of 63 (12 males, 51 females) young adults Sudanese neophyte (who never worn contact lens before). All were volunteer students in Faculty of Optometry and Visual Science selected with best corrected visual acuity (VA), contrast sensitivity (CS), stereoacuity (SA), normal colour vision (CV) and central visual field (CVF), were recruited to be involved in the study. Their ages were ranged between 18 to 36 years of ages. Routine eye examination was carried and subjects were fitted with clear (white) hydrogel lenses (CLEVIO) (water content 38%) POTEC CO.LTD for one year.

Subjects selected should be free of ocular diseases, had no complaints of ocular irritation, no history of prior contact lens wear, no systemic allergies and diseases, no use of medications
that may interfere with contact lens wear, no corneal flourescein staining or anterior segment abnormality.

Subjects were instructed that the lenses were to be worn exclusively on a daily wear, open eye basis. Each subject was provided with a care regimen and instructed in its proper use. Measurements of both eyes were considered for analysis. Measurements of vision, contrast sensitivity, stereoacuity, central visual field and colour vision were taken at each follow-up visits. Each subject seen as baseline, after 2 weeks, 1 month, 3 month, 6 month, 12 months.

The data collected were evaluated using statistical analysis software (PASW SPSS 18, SPSS Inc). Descriptive statistics were carried out for all study parameters. Paired sample t- test was used to evaluate the effects of wearing hydrogel lenses on visual functions and visual performance. Statistical significance was taken as the p ≤ 0.05.

**Results**

Out of 80 subjects enrolled in this study, 17 (1.25%) subjects dropped out due to different reasons that prevented them from completing the study sessions.

Sixty three subjects were successfully participated in this study. Mean age of participants was 21.83 ± 2.25 (range; 18 to 28 years). Males / females distribution was 12 (19%) and 51 (81%) respectively.

Table 1 illustrates the baseline mean and standard deviation of all parameters studied.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>21.38 ± 2.25</td>
</tr>
<tr>
<td>Corrected VA</td>
<td>normal</td>
</tr>
<tr>
<td>Spherical equivalent of refraction</td>
<td>-2.08 ± 1.17</td>
</tr>
<tr>
<td>Keratometric reading</td>
<td>43.06 ± 1.32</td>
</tr>
<tr>
<td>Unaided contrast sensitivity</td>
<td>1.35 ± 0.23</td>
</tr>
<tr>
<td>Unaided stereacuity</td>
<td>45.40 ± 11.89</td>
</tr>
<tr>
<td>Visual field</td>
<td>normal</td>
</tr>
<tr>
<td>Colour vision</td>
<td>normal</td>
</tr>
</tbody>
</table>
Figure 1 indicates the means and the standard deviations of contrast sensitivity values according to the period time of the study.

![Contrast Sensitivity Chart](chart1.png)

Figure 2 presents the means and standard deviations of stereoscopic vision values taken at every study session.

![Stereoacuity Chart](chart2.png)
Table 2 central field at start, after 2 weeks, after 1 moth, after 3 months, after 6 months, and after 12 months:

<table>
<thead>
<tr>
<th>State</th>
<th>Base line</th>
<th>At 2 weeks</th>
<th>At 1 month</th>
<th>At 3 months</th>
<th>At 6 months</th>
<th>At 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>Fail</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
</tr>
</tbody>
</table>

Table 3 color vision at start, after 2 weeks, after 1 month, after 3 months, after 6 months, and after 12 months:

<table>
<thead>
<tr>
<th>State</th>
<th>Base line</th>
<th>At 2 weeks</th>
<th>At 1 month</th>
<th>At 3 months</th>
<th>At 6 months</th>
<th>At 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>Fail</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
</tr>
</tbody>
</table>

**Discussion**

Hydrogel contact lenses which allow the patients to wear them on a daily wear schedule up to one year (12 months), are already save and successful. As general wearing of contact lenses is not innocuous.

The effect of refractive error and its correction has traditionally been characterized by clinical measures such as visual acuity or contrast sensitivity. While these measures provide important information, they give little indication on impact of refractive error or its correction on person as a whole. Many studies have reported the effect of hydrogel lenses on the tear film by reducing tear film stability (Guillon et al. 1990). Also Thai et al. (2004) reported that there was little difference in the effect of the contact lens material on the pre-lens tear film but all materials had significant negative effect on normal tear film.

The effect of hydrogel lens wear on the contrast sensitivity function has been assessed in several studies: some studies have found significant losses in visual performance during hydrogel lens wear others have found no such losses on the visual performance or even an improvement in visual performance.
Contrast sensitivity function may be suppressed during adaption, but otherwise should be no different from that obtained with best corrected spectacles prescription.

High and low contrast acuity charts – reduced acuity with a high – contrast charts suggests a refractive problems, whereas reduced acuity with a low – contrast chart indicates a ‘non-refractive’ problem, such as poor fit lens , ocular pathology or excess lens deposition (Efron 2002).

In this study the repeated measure analysis of variable (ANOVA) was used to find is there any significant mean differences in contrast sensitivity and stereoacuity measurements with contact lenses during the time of the study (i.e baseline, 2 weeks, 1 month, 3 months, 6 months and 12 months). The test yielded significant reduction in contrast sensitivity values with contact lens wear during the study period, F = 157.44 , p < 0.001. Figure 1 illustrates the means and standard deviations of contrast sensitivity values according to time.

The study also showed that there was no or little reduce in contrast sensitivity in early period of the study ( up to 1 month). This reveals the Importance of frequent replacement when using hydrogel lenses. Products should be replaced at least monthly for the save and healthy of the eyes.

Stereopsis may be defined as binocular perception of depth based upon retinal disparity. This results from the brain being presented with two slightly dissimilar retinal images. For stereopsis to be manifest, the images must be imaged on non–corresponding retinal points, with the disparity not exceeding Panum’s fusional area. Clinical assessment of stereopsis is valuable because it indicates the level of binocularity. It can be used to aid in the detection of binocular anomalies as well as monitoring the success of therapy to treat these conditions (Rosenfield M 2009) . The contoured test (the Titmus Wirt circles) were used to measure the stereoacuity (SA) in all subjects using hydrogel lenses and the follow–up examinations were carried during the periods of the study i.e. baseline, 2 weeks, 1 month, 3 months, 6 months and 12 months. All subjects completed the follow–up sessions and measurements showed that:

Analysis of variables showed significant reduction in means of stereoacuity measured with contact lenses during the study period, F = 3.70, p = 0.003. Figure 2 shows the means and standard deviations of stereoacuity values taken at every study sessions

Central visual field plotting showed that all subjects passed the test. There was no change obtained during the period time of follow- up examination on central field for all participants. Visual field is fundamental to the measurement of visual function by using technological and techniques for evaluation. The central visual field 10 degree radius tested by Amsler’s grid which can provide useful information in cases of metamorphopsia and small central scotomas. See table 2.

Colour screening showed that all subjects passed the test .Statistic analysis in all subjects showed no influence of wearing hydrogel lenses on colour vision see table 3 .This findings reveals that long use of contact lenses are a suitable tool for correcting refractive errors. Colour is a sensation and not a physical attribute of an object. The wave length composition
of light produces the perception of colour, which is very useful in identifying objects or distinguish objects. At least two photo pigments are required to distinguish some colour, instead of seeing only in shade of gray. While three photo pigments are required to distinguish the full spectrum of colour. Colour vision examination is an essential part of screening before a person is taken up for a job. A person who is colour vision defective may go through life quite unconscious of his colour deficiency and without making any incriminating mistakes, differentiating objects by their size, shape and luminosity, using all the time a complete colour vocabulary based on his experience that teaches him that colour terms are applied with great consistency to certain objects and to certain achromatic shades, until circumstances are arranged to eliminate these accessory aids and then he realizes that his sensations differ in some way from normal.

Many ocular diseases cause deficiency of colour vision e.g. squint ambyopia, glaucoma. Diabetic retinopathy, retinal disorders, optic nerve disorders and colour vision after laser photocoagulation also some drugs and systemic diseases cause differentency in colour vision. This study reveals that wearing hydrogel contact lenses has no influence in colour function (Jatoi SM 2013).

CONCLUSIONS

Hydrogel soft contact lenses wearers for long periods (one year) showed a significant reduction in contrast sensitivity and stereoscopic vision values.

While, color vision and central visual field showed no changes during the sessions of follow up visits.

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Nil.

Conflicts of interest
There are no conflicts of interest.
REFERENCES


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