

**To compare the metamorphopsia, contrast sensitivity and vision acuity
in patients with unresolved CSCR and patient with resolved CSCR**

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Abstract

Purpose:

Aim- To compare the metamorphopsia, contrast sensitivity and vision acuity in patients with unresolved CSCR and patient with resolved CSCR.

Methods: This is the literature review study to compare the patient with resolved CSCR and unresolved CSCR based on the visual assessment as vision, contrast sensitivity and metamorphopsia. As vision is decreased then contrast sensitivity also plays a major role in clarity of vision and as we know the morphological changes in retina especially the serous detachment of the retinal pigment epithelium (RPE) it shows scotoma, micropsia, metamorphopsia, M-charts have been used to quantify the severity of metamorphopsia associated with different macular diseases This are the main objective of the study.

Conclusion: CSCR is a condition in which fluid accumulates under the retina, causing a serous detachment and vision loss. A study was done by Sin Woo Bae et

al, they found that, the correlation between the best corrected visual acuity and M score, in which there was no statistically significant correlation was evident and OCT and metamorphopsia. They also found that, the non-metamorphopsia group has longer symptom duration, there was no much difference in statistical significance from that of the metamorphopsia a group and other was based on OCT. In a study done by George Bennett measured visual acuity in patient with active central serous retinopathy. This study shows that 14 patients (74%) central serous retinopathy attacks lasting less than 3months left visual acuity of 6/9 or better, whilst only 5 patients (38%) of those of longer did so. This was not statistical significance.

Keywords-

CSCR, Vision, Contrast sensitivity, metamorphopsia.

Introduction

Central serous retinopathy (CSR)

Central serous chorioretinopathy (CSC) is an eye disease characterized by serous retinal detachment caused by leaks from the retinal pigment epithelium (RPE). CSC is known to be caused primarily by choroidal circulation abnormalities, resulting in choroidal vascular hyperpermeability.[1–4] The choroidal thickness in eyes with CSC is found to be increased.[5] The major symptom is decreased visual acuity (VA), although VA may be normal in the early stage of the disease. Other symptoms of CSC are relative scotoma, micropsia, metamorphopsia, and disturbance of color sensation.[6] CSC has a relatively good long-term prognosis and is self-limited in the majority of patients.[7] Most retinal detachments in acute CSC resolve spontaneously in 3–6 months or immediately after treatment.[8,9] However, there may be residual symptoms such as decreased retinal sensitivity, metamorphopsia, decreased VA, and central scotoma.[10–12] In chronic cases, visual function declines because unresolved retinal detachment can lead to RPE and photoreceptor damage.[13,14].

There are many theories concerning the pathogenesis of CSC. In fluorescein fundus studies, Glass noticed a serous detachment of the retinal pigment epithelium (RPE) caused by areas of abnormal capillary permeability. Low intraocular pressure and high interstitial pressure in choriocapillaris have been observed to cause serous fluid to seep under the sensory retina. In addition, a diffuse disorder has been suggested in

Section A-Research paper

the metabolic system of RPE [15]. In recent studies with indocyanine green angiography (ICG), Guyer et al. [16] have suggested that choroidal hyperpermeability and serous detachment cause a mechanical defect in RPE and thus serous detachment of the neurosensory retina. Prunte and Flammer showed that there is a delay in choroidal arterial filling followed by choroidal hyperfusion with dilated capillaries and venules which can be caused by ischemia. In severe cases of CSC, intrachoroidal leakage in ICG angiography has been shown to persist sub-clinically for a long period. The etiology of CSC is still unknown although many possible factors have been related to it: psychological stress, high level of adrenocorticotrophic hormone (ACTH), high corticosteroid dosages in various treatments, and pregnancy [17].

This is the literature review study to compare the patient with resolved CSCR and unresolved CSCR based on the visual assessment as vision, contrast sensitivity and metamorphopsia. Generally patient with CSCR have serous detachment due to that vision may not improve, our idea is to see the major difference in vision before and after completely resolved CSCR it may be chronic or acute. We thought if the vision is decreased then contrast sensitivity also plays a major role in clarity of vision. Then we thought it would be the better idea to see the difference in vision and contrast sensitivity in these patients. And as we know the morphological changes in retina especially the serous detachment of the retinal pigment epithelium (RPE) it shows scotoma, micropsia, metamorphopsia know sings then thought about what will the degree of scotoma in such patients as Amsler charts are commonly used to detect the metamorphopsia, but it is difficult to quantify the degree of the metamorphopsia with these charts then so of the articles showed that the M-charts have been used to quantify the severity of metamorphopsia associated with different macular diseases. This study is based on the vision, contrast sensitivity and metamorphopsia what would be the difference in patient with resolved and unresolved CSCR. Do the vision, contrast and metamorphopsia improve after resolving CSCR.

Visual acuity and Contrast sensitivity

These are the two aspects in clinics and for research purpose. Whereas vision is an ability to resolve fine detail, by identifying smallest black letter on white background and contrast sensitivity is an ability to detect low-contrast objects of various sizes. [18]

Metamorphopsia

Metamorphopsia is the major cause of decreases in vision, calculate the amount of metamorphopsia most commonly Amsler chart are used but it is not accurate to quantify the degree of metamorphopsia. To overcome this Matsumoto et al developed a chart in 1999 [19], called M-CHARTS this chart quantifies the severity of metamorphopsia which are associated with retinal/ macular diseases.[20]

What is M- Chart?

This chart quantifies the severity of metamorphopsia which are associated with retinal/ macular diseases.

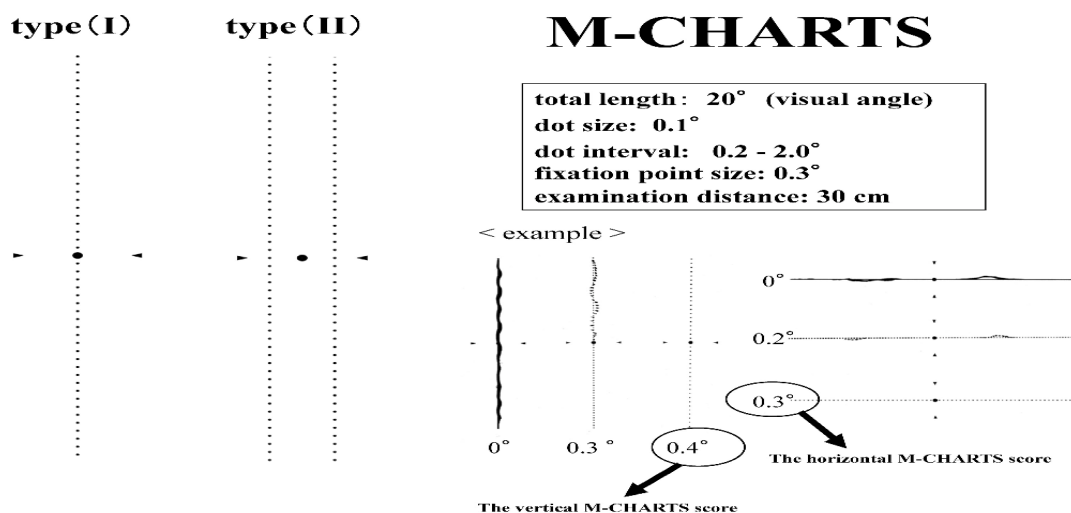
M-CHARTS include two types of charts, type 1 and type 2.

Type 1 M-CHARTS consists of single dotted line. It is designed for patients as epiretinal membrane or age- related macular degeneration [21].

Type 2 M-CHARTS consist double dotted line. It is designed for patients as typical macular hole and avoids the influence of a central scotoma [21].

The M- chart is consists of a single solid line and 19 dotted lines, this dot interval is ranged from 0.2° to 2.0° when it is viewed from 30cm. The patient with metamorphopsia, the straight line appears curved or irregular. Patient will hold the M- chart at 30cms patients will marks the dotted lines as it appears to the patient, when the dotted line appears straight this will be taken as metamorphopsia score in degrees. [22]

The score of metamorphopsia is given in Horizontal and vertical metamorphopsia I.e; MH and VH. They are measured separately. In the normal eye metamorphopsia score is zero, the value of 2.0 for a metamorphopsia score >2.0 for the statistical analyses [22].



[20]

Review of literature

A study done by Pentti Koskela et al. measured contrast sensitivity in resolved central serous retinopathy patient in which 21 patients was measured 6-15 years after the acute stage of central serous retinopathy. According to their study in majority of cases contrast sensitivity was lower in the affected eye, but 5(1c/d), 4(6c/d) and 7(19c/d) of the 21 cases in affected eye showed better contrast sensitivity. The difference between the fellow eye and affected eyes was statistically significant at 1 and 6 c/d ($P < 0.05$) but not at 19c/d. And visual acuity remained impaired in so many cases as the difference between affected and the unaffected eye was statistically significant ($P < 0.05$)^[23].

In another study done by J.A. Mutlak at al. measured visual acuity and contrast sensitivity in patient with resolved central serous retinopathy. In this study 23 patients were examined 23 affected eyes were compared with 20 non-affected eyes. This study shows poorer visual acuities ($P < 0.014$) and comparisons of contrast sensitivity were made between the affected and unaffected eyes at equal levels of visual acuity. No significant difference was found between eyes with CSR and non-affected eye except for a group of 6 affected and 4 unaffected eyes at 6/9 visual acuity for which there was a significant impairment of perception for the high frequency recording (22.8 c/d) for affected eye ($P < 0.0072$), when compared without

Section A-Research paper

matching for visual acuity no significant difference was found for each frequency and the sum of frequencies^[24].

In a study done by George Bennett measured visual acuity in patient with active central serous retinopathy. this study shows that 14 patient (74%) central serous retinopathy attacks lasting less than 3 months left visual acuity of 6/9 or better, whilst only 5 patients (38%) of those of longer did so. This was not statistical significance ($X^2=2.6$, $n=1$, $P>01$)^[25].

Another study has been done by Johan Sjostrand (1979) measured contrast sensitivity in Fifteen normal controls (age 19-63 years) and 22 patients (age 19-78 years) in different maculopathies. Attenuation of the high- and middle frequency ranges was an early finding in macular disease, whereas changes including the low-frequency range were observed in more advanced maculopathies. Comparison of results obtained using the small (1.4") or large-field (6"-24") TV-system demonstrated a field-dependence of the contrast sensitivity attenuation in localized macular disorders. In more wide-spread lesions in the posterior pole, contrast attenuation over the whole frequency range was found also with the largest (24") stimulation field used. Fifteen normal controls (age 19-63 years) and 22 patients (age 19-78 years) with macular disease of different types took part in this study. In this study during the course of the disease and during the acute phase contrast sensitivity was decreased for high and intermediate frequencies. Generally, the CSC improved parallel to the increase of visual acuity. Also noticed that during resolution when the visual acuity had improved to 1.5, the patient still complained about slight blurring of the vision and the CSC was still markedly abnormal in the high- and mid-frequency region^[26].

Metamorphopsia

A study done by Seokhyun Bae, Kiwon Jin, Hakyoun Kim and So Hyun Bae was to determine the clinical parameters related to metamorphopsia outcome in patients with resolved central serous chorioretinopathy (CSCR). They selected 36 eyes of 33 patients with resolved CSCR, men-28 and women-5, acute CSCR- 14 (38.9%) and

Section A-Research paper

chronic- 22 patients (61.1%), all the patients under went complete ophthalmic measurements as best corrected visual acuity, slit lamp, fundus examination, M-chart after 6-12 months of resolving CSCR. Here 13 patients showed SRD (Self resolving diseases) and other 23 patients underwent treatment to resolve CSCR. After resolving 19 eyes were detected metamorphosis and other 17 eyes were normal. The mean of metamorphopsia horizontal and vertical score were 0.4 ± 0.5 and 0.3 ± 0.4 .

In the multivariate analysis (ONL- outer nuclear layer thickness, RPE- retinal pigment epithelium, ELM- external limiting layer, CFT- central foveal thickness, IS/OS- inner and outer segment, COST- cone outer segment tip) the study state that poor metamorphopsia outcome in chronic-recurrent CSCR ($P=0.019$) and the eyes with disrupted ELM ($P=0.021$) or broad disrupted ELM ($P=0.004$) are with high risk for metamorphopsia. And they stated that the metamorphopsia was detected in half of patient (52.8%) where as Amsler Chart detected up to (67.7%) in resolved CSCR patients.[27]

A study done by Sin Woo Bae, Ju Byung Chae on Assessment of metamorphopsia in patients with central serous chorioretinopathy, selected 33 eyes of the 33 patients examined were those of 26 men (80.6%) and 7 women (19.4%). In the early visit they observed the 1. Co-relation between the best corrected visual acuity and M score, in which there was no statistically significant correlation was evident (Pearson correlation analysis, $P = 0.492$) and 2. OCT and metamorphopsia.

Then they divided into two groups 1. Metamorphopsia and non-metamorphopsia group where 15 patients have metamorphopsia with M- score was over 0.3 and other was 18 patients non metamorphopsia with M-score was zero. The non-metamorphopsia group have longer symptom duration, there was no much difference in statistical significance from that of the metamorphopsia group and other was based on OCT which consists of four groups- (1) focal retinal PED the result was of 15 patients' eyes (40%) in the metamorphopsia group and 1 of 18 patients (5.5%) in the non-metamorphopsia group have significantly more common with the metamorphopsia group ($P = 0.03$). (2) Severe subretinal fluid accumulation Six of 15 eyes (40%) in the metamorphopsia group and 5 of 18 (27%) in the non-metamorphopsia group the difference between the two groups was not statistically significant ($P = 0.48$). (3) High-level reflectivity of the photoreceptor layer 5 of 15

eyes (33%) in the metamorphopsia group and 6 of 18 (33%) in the non-metamorphopsia group; the difference between the two groups was not statistically significant ($P = 1.00$). (4) Posterior clumping in the photoreceptor layer showed 2 of 15 eyes (13.3%) in the metamorphopsia group and 3 of 18 (16.6%) in the non-metamorphopsia group; no clinically significant difference was evident between the two groups ($P = 1.00$).[28]

The study states that the degree of metamorphopsia does not correlate with BCVA and posterior clumping in the photoreceptor layer, high reflectivity of the photoreceptor layer, or high-level reflectivity of the photoreceptor layer.

Discussion –

As in busy clinics we missed to check the contrast sensitivity, color vision, metamorphopsia to patient who have before and after resolved CSCR. As an Optometrist we need see the most common sing were the patient have hyperopic shift or not. When the patient is diagnosed as CSCR it is important to know it is chronic or acute. In the next visit need to check the contrast sensitivity, color vision, metamorphopsia and need note the behavior of the patient like he/she is in stress, consume alcohol, do they smoke, use any steroids as the CSCR is an unknow diseases.

In acute phase contrast sensitivity usually decreases for high and intermediate frequencies. As CSC improved visual acuity improves. It is also noticed that during resolution when the visual acuity had improved the patient still complained about slight blurring of the vision and the CSC was still markedly abnormal in the high- and mid-frequency region and during the acute phase the patients complained of fine about impaired discrimination details, metamorphopsia and micropsia (Frisen & Frisen et al 1979) As in the study of (Seokhyun Bae et al.) they observed that after resolution of CSCR they found residual metamorphopsia so patient is needed for follow up to check metamorphopsia as well as can check for severity of disease.

In the majority of cases visual acuity and contrast sensitivity returned to normal. Nevertheless, in so many patient visual acuity remained impaired. Contrast sensitivity behaved grossly similarly, CSR reduces contrast sensitivity at high and intermediate spatial frequencies, whereas contrast thresholds are practically

Section A-Research paper

unaffected below 2 C/D. It is also said that, contrast sensitivity was decreased especially at the intermediate spatial frequencies despite normal visual acuity. According to the study of (J. A. Mutlak et al.) Contrast sensitivity is usually affected during the acute stage of the disease and this has been found to be unrelated to visual acuity. The contrast sensitivity may be affected when visual acuity is normal and recovers to various degrees even when visual acuity remains unchanged after resolution of the disease (Kayazawa et al. 1982). Moreover, it has been reported that the intermediate and high frequencies of contrast sensitivity may be reduced in unresolved CSR (Sjostrand & Frisen 1977).

Conclusion-

CSCR is a condition in which fluid accumulates under the retina, causing a serous detachment and vision loss. A study was done by Sin Woo Bae et al, they found that, the correlation between the best corrected visual acuity and M score, in which there was no statistically significant correlation was evident and OCT and metamorphopsia. They also found that, the non-metamorphopsia group has longer symptom duration, there was no much difference in statistical significance from that of the metamorphopsia a group and other was based on OCT. In a study done by George Bennett measured visual acuity in patient with active central serous retinopathy. This study shows that 14 patients (74%) central serous retinopathy attacks lasting less than 3months left visual acuity of 6/9 or better, whilst only 5 patients (38%) of those of longer did so. This was not statistical significance.

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Section A-Research paper

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Section A-Research paper

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