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Research Article

Treatment Modalities and Outcomes of Acute and Chronic Cases of Central Serous Chorioretinopathy

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Abstract

Purpose: To assess the visual outcome of different types of central serous chorioretinopathy and to evaluate the effect of treatment modalities for acute, chronic and recurrent central serous chorioretinopathy. Also, to quantify macular thickness (MT) changes after observation and follow up for acute central serous chorioretinopathy without any intervention, after treatment with intravitreal bevacizumab or laser for chronic and recurrent cases.

Methods: This Cross sectional, interventional study examined the eyes of patients with central serous chorioretinopathy including the fundus evaluation, Spectral Domain optical coherence tomography, fundus fluorescein Angiography, prior to and 1, 3 and 6 months after treatment. Best corrected visual acuity, intraocular pressure, detail fundus examinations were done. Clinical and tomographic features of the macula were also assessed during the follow-ups.

Results: 55 eyes of 55 patients were enrolled in the study. 100% of acute cases, that is, 61.81% of the total (n = 34) were treated with topical NSAIDS and observation. For chronic cases 16.36% (n = 9) of the cases were treated with focal laser and 20% (n = 11) of the cases were given injection Avastin. At 6 month, 98.18% (n = 54) had visual acuity between 6/6 to 6/18. 1.82% (n = 1) had visual acuity between 6/18-6/60 whereas none of the patients had visual acuity worse than 6/60. The average macular thickness was 435.47 ± 153.55 **µm** at presentation which improved to 218.36 ± 67.57 **µm** at the end of 6th month. The difference in CMT at the baseline and at the end of 6 months was statistically significant (p = 0.005). The subretinal fluid was resolved at 1 month in 12.72% (n = 7) whereas SRF resolved in 56.36% (n = 31) of the cases in the 3rd month. In 21.81% (n = 12) of the cases the SRF resolved in the 6th month and in 9.09% (n = 5) of the cases the subretinal fluid remained unresolved at the end of 6th month. The resorption of SRF was in maximum number of cases at the end of 3 months.

Conclusion: In treatment of CSCR, additional benefits from the use of NSAIDS along with observation accentuates the resolution of Subretinal fluid and improvement of visual acuity for the acute cases. The chronic cases accounted for 27.7% and 14.55% cases were recurrent. Intravitreal bevacizumab (avastin) is more effective in the treatment of chronic and recurrent CSCR as compared to the laser therapy. No serious complications were encountered by treatment with any of the modalities. The efficacy of the intravitreal Avastin and its comparison needs to be further studied and evaluated to establish the proper treatment guidelines in cases of chronic and recurrent CSCR.

Keywords: Chorioretinopathy; Chronic Cases; Central Serous Chorioretinopathy (CSCR)

Introduction

Central serous chorioretinopathy (CSCR) is characterized by an idiopathic serous neurosensory detachment primarily affecting the macula. The neurosensory retina is separated from the retinal pigment epithelium. Central serous chorioretinopathy (CSCR) was first described by Von Graefe in 1866 and terms "Recurrent central retinitis" [1]. In most of the cases, the disorder is self-limited and resolves spontaneously in 4 to 6months, and the patients usually

retain good vision. However, chronic CSCR is often associated with persistent subretinal exudation, cystoid macular degeneration, choroidal neovascularization and consequent gross reduction of vision [2,3]. The acute form of the disease is associated with focal leakage at the level of the retinal pigment epithelium (RPE) demonstrated with fluorescein angiography and hyperpermeability of the choroid demonstrated with indocyanine green angiography. Severe visual loss is reported in 5% of patients with chronic CSCR [4]. Clinicians usually elect to observe patients with acute CSCR, because these patients generally show self-remission. However, intervention in terms of the chronicity of the disease must be done as severe visual impairment may occur following chronicity and recurrence of the disease.

Symptoms of the disease include blurred central vision, metamorphopsia or distorted vision, micropsia, dyschromatopsia, and the sensation of transparent grey spot in the central visual field. It is a common disease, and it typically affects young to middle aged adults.

Central serous chorioretinopathy appears uncommon among African Americans but may be particularly severe among Hispanics and Asians Classically, CSCR is most common in male patients aged 20 - 55 years with focal, isolated RPE leaks in one eye. So, this condition affects men 6 - 10 times more often than it affects women. Spaide., *et al.* reviewed 130 consecutive patients with CSCR and found the age range at first diagnosis to be 22.2 - 82.9 years, with a mean age of 49.8 years [5]. In many patients, no specific causes for CSCR can be found. However, certain factors have been linked to CSCR including the use of steroid medications (whether oral, topical, or inhaled), high stress levels, type A personality, hypertension, pregnancy, Cushing syndrome, H. pylori infection, sleep apnea, systemic lupus erythematosus, gastroesophageal reflux disease, and use of psychopharmacologic medications [5,6]. The diagnosis of CSCR can be attained by careful retinal examination, a noninvasive retinal scan called optical coherence tomography (OCT), and fluorescein angiography (FA).

CSCR can be classified into two categories with prognostic implications: (1) acute and (2) chronic/recurrent. Acute CSCR usually resolves spontaneously within 3 months in 80 - 90% of patients with complete or near complete recovery of vision. Therefore, initial management of acute CSCR typically involves monitoring the patient for gradual improvement and discontinuing the use of any steroid medications. Incidentally, CSCR may be multifocal (multiple fluid blisters in one eye) or bilateral (affecting both eyes) in nature.

Follow-up visits are essential to rule out chronic or recurrent CSCR, in which the sub-retinal fluid fails to reabsorb within 3 - 6 months and/or episodes of leakage repeatedly occur. As a result, the RPE and retinal photoreceptors often end up with some damage in this form of CSCR. Therefore, treatment may be recommended in effort to reduce the degree of permanent visual impairment. The main treatment options include either photodynamic therapy (PDT) or thermal laser, which essentially act to seal the leakage source.

Intravitreal injection of a medicine such as Avastin, which acts to decrease vascular permeability (leakage), can also be done. Patients with CSCR, especially those who have the chronic/recurrent type, need to be continually monitored for the resolution of subretinal fluid and potential development of RPE damage.

Regarding the management options available only close follow up of the acute cases maybe sufficient. However for the chronic cases severe medical attempts like tranquilizers, beta-blockers like Propranolol, Finasteride, Rifampicin Methotrexate have been tried but without much successful records [7-10]. Other treatments include argon laser photocoagulation and photodynamic therapy. Photodynamic therapy is expensive and not currently available in our country. Treatment with Focal photocoagulation of the leak site has shown significant decrease in the duration of detachment in various studies [11,12]. Hence this study can help in aiding the management of the disease and measure the outcome in terms of the subretinal fluid resorption and improvement of visual acuity.

Intravitreal Bevacizumab (Avastin) is the newest treatment available and none of the studies have been done so far in Nepal regarding this drug. So, this study is the first of its kind that will address the efficacy of this drug and can help in formulating the treatment guideline especially for chronic and recurrent CSCR because the studies done in various part of the world have proved the efficacy of Avastin in reducing the macular thickness and improving visual acuity [13]. About 5% of patients experience severe permanent visual loss due to this disease. Patients with classic central serous chorioretinopathy (CSCR) (characterized by focal leaks) have a 52% risk of recurrence in the same eye ranging from 1 - 5 episodes. Risk of choroidal neovascularization from previous CSCR

is 5% but has an increasing frequency in older patients diagnosed with CSCR [14]. So, this disease is capable of causing potential eye complication that can lead to visual impairment.

Methodology

The study was done over a period of 18 months at Tilganga Eye Institute, Nepal. All clinically diagnosed cases of central serous chorioretinopathy were included in the study. The ethical consideration was approved by the institutional review board of Tilganga Eye Institute. Patients with choroidal neovascularization, history of prior treatment for CSCR with laser, photodynamic therapy, anti VEGF like Bevacizumab, patients with other ocular conditions like glaucoma, Uveitis, history of allergy to fluorescence and those not willing to give informed consent for participation in this study were excluded from the study. Sample size was calculated with the following formula, $n = Z^2 \times p \times q/d^2$ Where, P = prevalence of Central Serous Retinopathy in Tilganga Institute of Ophthalmology (previous year) q = 100 - P, d = maximum tolerable error. After clinical diagnosis of the Central serous chorioretinopathy investigations were sent for Optical Coherence Tomography (OCT). A certified operator obtained OCT images of macula in dilated pupil using Optical coherence tomography, Stratus Zeiss Humphrey 2004 model. OCT examinations comprises of a macular scan option of six radial 6-mm-long scans. Quantitative OCT measurement namely retinal thickness was be measured automatically using OCT retinal mapping software. The Fundus fluorescein Angiography (FFA) was performed using a contrast medium (20% sodium fluorescein 3 ml undiluted) was administered through a vein by venipuncture. A series of photographs were taken using the Zeiss FF4 series camera.

After the OCT/FFA diagnosis of the patient, they were divided into two groups: -

- **Acute:** Patients with symptoms less than 4 months duration were categorized as acute and were subjected to regular follow ups and Observation.
- **Chronic/Recurrent:** Those with symptoms lasting for more than 4 months were categorized as chronic and those patients with repeated episodes (more than 1) after 4 months of observation were categorized as recurrent cases. Chronic and recurrent patients were kept in the same group as the treatment modality is same for both the group and for convenience of allocation.

The Acute group were treated with observation, topical Non-Steroidal Anti-inflammatory Agents (NSAIDS)

Laser or Intravitreal injection of Bevacizumab were given to the chronic and recurrent category. The treatment was based on macular involvement, if the macula was involved patient was subjected to treatment with Bevacizumab whereas rest of the cases received laser treatment.

For the laser argon green laser (514 nm) was given with Volk area centralis contact lens with the parameters used - spot size of 100 microns, duration of 100 to 200 milliseconds and power just enough to produce minimal graying.

For treatment with Anti VEGF (Bevacizumab) in all patients, the intravitreal injection of off label Bevacizumab was performed in a standard protocol in the operation theater under complete aseptic conditions.

Patient were followed up after 1 month, 3 month, 6 months after initiation of treatment. In each follow up Best Corrected Visual Acuity (BCVA), detailed fundus examination, OCT and FFA was repeated. To compare the visual outcomes of eyes, "improved," was defined as when there were increments of BCVA by one line in the Snellen's chart, decrement of letters even by one letter as "worsened" and other cases as "unchanged." The OCT measured the Central Macular Thickness, presence of subretinal fluid and resorption of the fluid.

Data collection and statistical analysis

Written informed consent was taken from the patients meeting the inclusion criteria. All the data was collected by using standard protocol as per the proforma. The collected data were analyzed using appropriate statistical tools. Bar diagram, pie chart and histogram were used wherever necessary. Variables were described in terms of mean, median, mode and SD. P value of equal or < 0.05 was considered as statistically significant for the study outcome measures.

Results

In this study 55 eyes of 55 patients were enrolled. 48 cases (87.27%) were male and 7 (12.73%) were female. Right eye was involved in 24 cases (43.64%) and left eyed was involved in 31 cases i.e. (56.36%). Regarding the age of presentation of the symptoms,

the patients presented between 21 - 64 years. The most common age group was 30-39 years (49.09%) as shown in table 1 and summarized in the bar diagram in figure 1 with the mean age being 38.47 ± 8.33 years. The distribution of cases in each group was not statistically significant (p = 0.08).

Age (Yrs)	Total number	%
20-29	6	10.91
30-39	27	49.09
40-49	17	30.90
50-59	5	9.09
TOTAL	55	100

Table 1: Age Distribution.

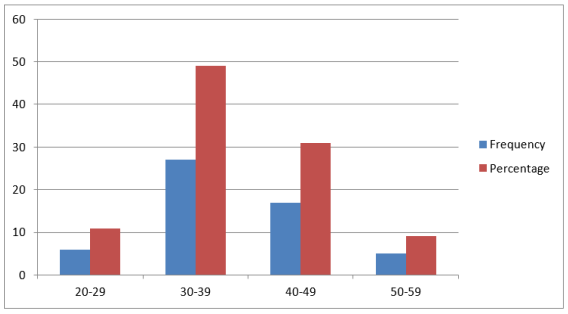

Figure 1: Age distribution. The most common age group affected was between 30-39yrs.

The most common clinical presentation was blurred vision accounting for 54.55% (n = 30) followed by metamorphopsia in 29.09% (n = 16). Micropsia was seen in 9.09% (n = 5) whereas 3.64% (n = 2) presented with floaters and 3.64% (n = 2) presented with distorted vision.

Stress was the most common risk factor present in 36.36% (n = 20) of the cases and 9.09% (n = 5) were type A personalities, followed by smoking in 25.45% (n = 14) of cases.18.18% (n = 10) had history of using corticosteroids, Alcohol consumption was seen in 7.27% (n = 4) cases. 1.82% (n = 1) were hypertensive and 1.82% (n = 1) were tobacco consumers.

Acute cases accounted for 58.18% (n = 32) whereas there were 27.17% (n = 15) of chronic cases and recurrent cases accounted for14.55% (n = 8).

Among the FFA patterns in the Chronic and Recurrent cases, 47.82% (n = 11) exhibited Inkblot pattern, Smokestack pattern was seen in 34.78% (n = 8) of cases whereas Diffuse leakage was seen in 17.39% (n = 4) of the cases. For the acute cases the FFA was not performed i.e., for 58.18% (n = 32).

In the OCT findings for the central macular thickness at presentation, 10.91% (n = 6) presented with central macular thickness of < 300 µm, 36.36% (n = 20) had macular thickness between 300-400 µm whereas 52.73% (n = 29) had macular thickness of > 400 µm. The average macular thickness was 435.47 ± 153.55 µm.

Regarding the visual acuity, the age group was categorized into three groups, i.e., visual acuity between 6/6 to 6/18, visual acuity between 6/6 to 6/18, and visual acuity worse than 6/60. On the day of presentation, 65.45% (n = 36) had visual acuity between 6/6 to 6/18. 29.09% (n = 16) had visual acuity between 6/8 to 6/60 whereas 5.45% (n = 3) had visual acuity worse than 6/60.

Among the total 55 cases, and 100% of acute cases, that is, 61.81% of the total (n = 34) were treated with topical NSAIDS and observation. For chronic and recurrent cases, 16.36% (n = 9) of the cases were treated with focal laser and 20% (n = 11) of the cases were given injection Avastin. From among the laser treated group, due to non-resorption of SRF, 3.64% (n = 2) of the cases that did not respond to focal laser treatment received injection avastin in addition to the laser treatment. Amongst the avastin treated patients 2 (18.1%) cases underwent repeat injection at the interval of 1 month.

At 1 month, 83.64% (n = 46) had visual acuity between 6/6 to 6/18. 16.36% (n = 9) had visual acuity between 6/18 - 6/60 whereas none of the patients had visual acuity worse than 6/60. The distribution of the visual acuity at 1 month amongst the groups was statistically significant. (p = 0.01). At 3 month, 96.36% (n = 53) had visual acuity between 6/6 to 6/18. 3.64% (n = 2) had visual acuity between 6/18-6/60 whereas none of the patients had visual acuity worse than 6/60. The difference in the visual acuity amongst the groups was statistically significant. (p = 0.002) at the end of third month. At 6 month, 98.18% (n = 54) had visual acuity between 6/6 to 6/18. 1.82% (n = 1) had visual acuity between 6/18 - 6/60 whereas none of the patients had visual acuity worse than 6/60. The difference in the visual acuity amongst the groups was statistically significant (p = 0.001) at the end of sixth month.

On comparison of difference between the visual acuity at different months, i.e., on the day of presentation, 65.45% (n = 36) had visual acuity between 6/6 to 6/18, which improved in 83.64% (n = 46) at the end of 1 month, and it improved in 96.36% (n = 53) at the end of 3 months and 98.18% (n = 54) at the end of 6 months. Similarly, at presentation, 29.09% (n = 16) had visual acuity between 6/18 to 6/60 at presentation whereas only 16.36% (n = 9) had visual acuity between 6/18 to 6/60at 1 month, 3.64% (n = 2) at the end of 3 months and only 1.82% (n = 1) at the end of 6 months respectively had visual acuity between 6/18 to 6/60. 5.45% (n = 3) had visual acuity less than 6/60 at presentation, whereas none of the patients had visual acuity worse than 6/60 at the end of 3 and 6 months respectively as shown in table 2 and summarized in the bar diagram in figure 2. The difference in visual acuity at the end of 3 months from the baseline is statistically significant (p = 0.007). The difference of visual acuity at the end of 6 months from the baseline is also statistically significant (p = 0.004). However, on comparison of visual acuity at the end of 6 months with that of the of 3 months is not statistically significant (p = 0.3), So the maximum improvement of visual acuity was observed in all cases at the end of 3 months. Overall, at the end of 6 months, 32 out of 32 (100%) in acute cases there was improvement of BCVA. Similarly, in Chronic cases all 15 cases and all the 8 cases of recurrent cases, visual acuity improved at the end of 6th month.

Grade	Pretreatment	1 month visit	3 months	6 months
6/6-6/18	36	47	53	55
<6/18-6/60	16	8	2	0
<6/60	3	0	0	0

Table 2: Distribution of best corrected visual acuity.

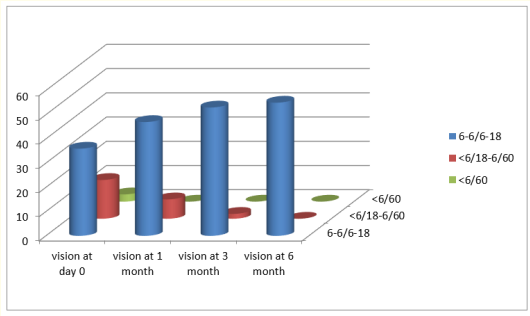

Figure 2: Distribution of Best Corrected Visual Acuity in various months.

10.91% (n = 6) presented with central macular thickness of < 300 µm on the day of presentation, which improved to 27.27% (n = 15) by the end of 1 month and 65.45% (n = 36) had CMT < 300 µm at the end of 3 months and 87.27% (n = 48) had CMT < 300 µm 36.36% at the end of 6 months. Similarly, 36.36% (n = 20) had macular thickness between 300 - 400 µm at presentation, by the end of 1 month, 38.18% (n = 21) had the macular thickness in that range. By the end of 3 months and 6 months, 30.91% (n = 17) and 10.01% (n = 6) patients had CMT between 300 - 400 µm respectively. CMT at presentation and at different months are shown in table 3 and summarized in the bar diagram in figure 3 respectively. On the day of presentation, 52.73% (n = 21) had macular thickness of > 400 µm. and only 1.82% (n = 1) had macular thickness of >400 µm at the end of 6 months. The average macular thickness was 435.47 ± 153.55 µm at presentation which improved to 218.36 ± 67.57 **µ**m at the end of 6th month. The difference in CMT at the baseline and at the end of 6 months was statistically significant (p = 0.005).

Follow up	(< 300 µm)	(300 to 400 µm)	(>400 µm)
o month visit	6	20	29
1 month visit	15	21	19
3 month visit	36	17	2
6 months visit	48	6	1

Table 3: Outcome in terms of central macular thickness (cmt) in various months.

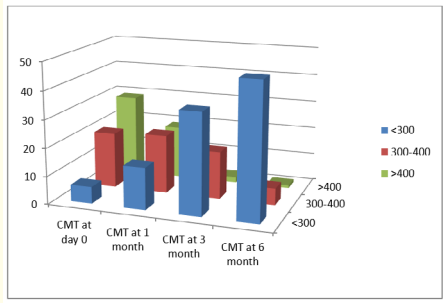

Figure 3: Distribution of Central Macular Thickness in various months.

The subretinal fluid was resolved at 1 month in 12.72% (n = 7) whereas SRF resolved in 56.36% (n = 31) of the cases in the 3rd month. In 21.81% (n = 12) of the cases the SRF resolved in the 6th month and in 9.09% (n = 5) of the cases the subretinal fluid re-

mained unresolved at the end of 6th month. The resorption of SRF was in maximum number of cases at the end of 3 months.

Regarding the complications in the treatment groups, none of the patients treated with NSAIDS experienced any adverse effects whereas in the avastin group, 3.64% (n = 2) of patients encountered subconjunctival hemorrhage. Only 1.81% (n = 1) had progression of cataract, while none of the patients had any serious complications like Endophthalmitis or retinal detachment amongst the patient treated with injection avastin. and in the cases treated with focal laser, 3.64% (n = 2) of the patients had raised increased intraocular pressure.

Discussion

Central serous chorioretinopathy (CSCR) has been referred to by many names, including central serous retinopathy, central serous pigment epitheliopathy, and central serous retinitis. Visual disturbances typically take several months to resolve. The acute form of the CSCR is associated with focal leakage at the level of retinal pigment epithelium (RPE) as seen with fluorescin angiography and hyperpermeability of the choroid demonstrated with indocyanine green angiography. Severe visual loss is reported in 5% of patients with chronic CSCR.[15] Treatment is usually to observe patients with acute CSCR, because these patients generally show self-remission. However, intervention in terms of the chronicity of the disease must be done as severe visual impairment may occur following chronicity and recurrence of the disease.

5% of patients experience severe permanent visual loss due to this disease and patients with classic central serous chorioretinopathy (CSCR) (characterized by focal leaks) have a 52% risk of recurrence in the same eye ranging from 1-5 episodes. Risk of choroidal neovascularization from previous CSCR is 5% but has an increasing frequency in older patients diagnosed with CSCR.[16] So this disease is capable of causing potential eye complication that can lead to visual impairment.

In this study 55 eyes of 55 patients were studied. 48 cases (87.27%) were male and 7 (12.73%) were female. Right eye was involved in 24 cases (43.64%) and left eyed was involved in 31 cases i.e. (56.36%). Male outnumbered females in the ratio 7:1. Cassel GH., *et al.* had concluded in their study that CSCR affects men 6-10 times more often than it affects women where in their study [15,16].

Regarding the age of presentation of the symptoms, the patients presented were between 21 - 64 years. The most common age group was 30 - 39 years (49.09%) with the mean age being 38.47± 8.33 years. Similar finding was observed in a study by Jamil AZ., *et al.* in Lahore. The mean age of patients who presented during the study duration was 39.52 ± 8.85 years [16]. Despite the geographical variations, the most commonly affected age group still remains the young age group with male predominance worldwide.

The most common clinical presentation was blurred vision accounting for 54.55% followed by metamorphopsia in 29.09%. Micropsia was seen in 9.09% whereas 3.64% presented with floaters and 3.64% presented with distorted vision. These results were comparable to the study done by Jamil., *et al.* where 31cases (48.43%) presented with blurred vision, metamorphopsia and micropsia was relatively lower i.e., 12.5% whereas 14.06% had complaints of scotoma. This could be accredited to the fact that most of the cases in this study were young patients who could appreciate metamorphopsia earlier than dimunition of vision.

Stress was the most common risk factor present in 20 cases (36.36%) and 5 cases (9.09%) were type A personalities, followed by smoking in 14 cases (25.45%) 18.18% i.e., 10 cases had history of using corticosteroids, out of which 4 cases were using oral steriods, 3 were using topical steroids and 2 cases were using the inhalational form. Alcohol consumption was seen in 4(7.27%) cases. 1 case (1.82%) was hypertensive and 1 case (1.82%) was tobacco consumer. A study done by Robert Haimovici., *et al.* had identified steroid as the major risk factor for developing CSCR with the odds ratio being 37.1 (95% CI, 1.0 - 50.7) where systemic corticosteroid use was seen in 14% of the cases. Also, alcohol consumption was seen in 26(8.33%) of cases with odds ratio of 8.2 Uncontrolled hypertension was present in 6.08% of the cases. 20.51% of the cases were smokers in the study which is again comparable to this study.[17] Stress as seen as the commonest risk factor has been previously identified a a risk factor. LA Yanozzi had identified type A personality and stress as a risk factor for CSCR [17]. In a study done by young sub Eom., *et al.* hypertension was present in 25.7% which is again closely related to stress.[18] The relation to stress in this study can be attributed to the low socioeconomic status and the psychosocial impact on the young generation in developing country like ours. other identified risk factors like pregnancy, Cushing syndrome, H. pylori infection, sleep apnea, systemic lupus erythematosus, gastroesophageal reflux disease, and use of psychopharmacologic medications. we're not seen in this study.

In this study patients with symptoms less than 4 months duration were categorized as acute, those with symptoms lasting for more than 4 months were categorized as chronic and those patients with repeated episodes (more than 1) after 4 months of observation were categorized as recurrent cases. Acute cases accounted for 58.18% (n = 32) whereas there were 27.17% (n = 15) of chronic cases and recurrent cases accounted for 14.55% (n = 8). This is similar to the study done by Elias., *et al.* where the recurrence rate was found to be 13.37% in patients with 6 months or more follow up. Acute cases due to the self-limiting nature of the disease tends to be more. In this study 58. 18% were acute cases which is less compared to 80. 50%. in their study owing to the large sample size in that study i.e they had studied 752 eyes [18]. In the study done by Castro Corriea., *et al.* for CSCR amongst 150 patients, chronic CSCR was found to be present in 16% which is slightly higher in this study i.e., 27.17% it can be because of the short term follow up in this study for 6 months as compared to 14 years where most of the cases might have resolved spontaneously in the long run.

FFA revealed that 47.82% (n = 11) exhibited Inkblot pattern, Smokestack pattern was seen in 34.78% (n = 8) of cases whereas Diffuse leakage was seen in 17.39% (n = 4) of the cases. For the acute cases the FFA was not performed i.e., for 58.18% % (n = 32). In a study by Shahid Jamal Siddiqui., *et al.* where hyper-fluorescence with ink-blot appearance was seen in 67.64% and smoke-stack appearance in 30.35% [19]. Since in this study FFA was performed only in chronic and recurrent cases in this study so the difference in the results can be attributed to it. On the day of presentation, 65.45% (n = 36) had visual acuity between 6/6 to 6/18. 29.09% (n = 16) had visual acuity between 6/8 to 6/60 whereas 5.45% (n = 3) had visual acuity worse than 6/60. In a study done by Yun Young Kim., *et al.* the initial average logMAR VA was 0.4, and 23 out of the 36 (80%) eyes showed a Snellen VA of 20/40 i.e. 6/12 or more; 19.44% were 20/200 i.e. 6/60 or less at presentation [20]. The reason for difference in the results could be the enrolment of all the cases of CSCR i.e., acute, chronic and recurrent cases in this study.

Also, the disparity of number of cases in acute, chronic and recurrent groups could have disparity in distribution of visual acuity i.e., the presenting vision in the acute group might have been good compared to those with chronic or recurrent cases where the presenting vision could have been worse.

Among the total 55 cases, and 100% of acute cases, that is, 61.81% of the total (n = 34) were treated with topical NSAIDS and observation. For chronic and recurrent cases, 16.36% (n = 9) of the cases were treated with focal laser and 20% (n = 11) of the cases were given injection Avastin. Promising results in previous studies with observation and topical NSAIDS have already been proven in acute cases. In one of the study by Sang-Uk Park., *et al.* in terms of BCVA, anti-VEGF and observation only had similar therapeutic effects in acute CSC patients [21]. Similarly for chronic and recurrent cases, Koss MJ., *et al.* evaluated the treatment of central serous chorioretinopathy with either subthreshold diode laser MicroPulse or intravitreal bevacizumab [22].

On comparison of difference between the visual acuity at different months, i.e., on the day of presentation, 65.45% (n = 36) had visual acuity between 6/6 to 6/18, which improved in 83.64% (n = 46) at the end of 1 month, and it improved in 96.36% (n = 53) at the end of 3 months and 98.18% (n = 54) at the end of 6 months. Similarly, at presentation, 29.09% (n = 16) had visual acuity between 6/18 to 6/60 at presentation whereas only 16.36% (n = 9) had visual acuity between 6/18 to 6/60 at 1 month, 3.64% (n = 2) at the end of 3 months and only 1.82% (n = 1) at the end of 6 months respectively had visual acuity between 6/18 to 6/60. 5.45% (n = 3) had visual acuity less than 6/60 at presentation, whereas none of the patients had visual acuity worse than 6/60 at the end of 3 and 6 months respectively. The difference in visual acuity at the end of 3 months from the baseline is statistically significant (p = 0.007). The difference of visual acuity at the end of 6 months from the baseline is also statistically significant (p = 0.004). However on comparison of visual acuity at the end of 6 months with that of the of 3 months is not statistically significant (p = 0.3), So the maximum improvement of visual acuity was observed in all cases at the end of 3 months which was static till the end of 6 months Sang-Uk Park., *et al.* in terms of BCVA, anti-VEGF i.e. with avastin and observation only had similar therapeutic effects in acute CSCR patients, where the visual acuity improvement was seen throughout the study period except the first month, the improvement by more than two lines was seen in the third month which remained static till the 6 months and then improved by the end of 1 year [21].

In this study average macular thickness was 435.47 ± 153.55 µm. In the study done by Sang-Uk Park, et the average macular thickness on presentation was 449.9 **µ**m. which is almost consistent with this study. Also, at the end of 6th month the improvement of the CMT was 218.36 ± 67.57**µ**m. The difference in CMT at the baseline and at the end of 6 months was statistically significant (p = 0.005). this finding is also consistent with the study by Sang-Uk Park where the CMT at the end of 6 months was 235.8 µm [21].

The subretinal fluid was resolved at 1 month in 12.72% (n = 7) and in 56.36% (n = 31) of the cases in the 3rd month. In 21.81% (n = 12) of the cases the SRF resolved in the 6th month and in 9.09% (n = 5) of the cases the subretinal fluid remained unresolved at the end of 6th month. So, in the maximum number of cases, the resolution of SRF was observed at 3 months. Similar result was observed in the study done by Michael L. Klein., *et al.* where in the observation of cases all the cases had resorption of the SRF by the end of 3 months and there was improvement in Visual acuity [22]. Similarly, even with the treatment with avastin, in a study done by Lim JW., *et al.* 82.5% had resolution of SRF by the end of 3 months in the avastin treated groups.[13] From among the laser treated group, due to non-resorption of SRF, 3.64% (n = 2) of the cases that did not respond to focal laser treatment received injection avastin in addition to the laser treatment. Amongst the avastin treated patients 2 (18.1%) cases underwent repeat injection at the interval of 1 month. 3 patients from the avastin group were excluded from the study due to loss to follow up. This result is different from the previous comparative studies done to compare the efficacy of laser versus intravitreal Avastin, in one of the comparative studies by MJ Koss., *et al.* 12.5% persistent leakage in the laser group compared with 60% in the Avastin and 92% in the control group with no treatment [23]. In this study persistent leakage was present in laser group in 3.64% who had to undergo injection Avastin for the same.

Amongst the 5 patients, only 1 patient had significant amount of SRF with the CMT being > 400 µm and the patient was advised with treatment with PDT, while 4 patients had minimal fluid in the OCT and visual acuity being incremented by two lines in the Snellen's chart therefore were subjected to observation.

One of the interesting observations in this study was improvement in the visual acuity in all the 5 patients despite non- resorption of SRF. This might be due to the fact that the SRF was minimal in the OCT at the end of 6 month, and the central macular thickness was < 400 **µ**m in 4 cases. All 5 patient had presenting vision of < 1/60, hence the increment of vision by two lines despite the non-resorption of fluid might have been a confounding factor in this study.

Regarding the complications in the treatment groups, none of the patients treated with NSAIDS experienced any adverse effects whereas in the avastin group, 3.64% (n = 2) of patients encountered subconjunctival hemorrhage. Only 1.81% (n = 1) had progression of cataract, while none of the patients had any serious complications like Endophthalmitis or retinal detachment amongst the patient treated with injection Avastin. or focal laser, 3.64% (n = 2) of the patients had raised increased intraocular pressure. These results are comparable to the studies done previously where none of the studies either for laser or Avastin encountered any serious complications [13,22,24].

Conclusion and Recommendation

Although CSCR is a self-limiting disease and self-resorption of the subretinal fluid may be observed in most of the cases, additional benefits from the use of NSAIDS along with observation accentuates the resolution of Subretinal fluid and improvement of visual acuity for acute cases. The chronic cases were 27.7% and recurrent CSR was seen in 14.55%. Intravitreal bevacizumab (Avastin) is more effective in the treatment of chronic and recurrent CSCR as compared to the laser therapy. No serious complications were encountered by treatment with any of the modalities.

The efficacy of the intravitreal Avastin and its comparison needs to be further studied and evaluated to establish the proper treatment guidelines in cases of chronic and recurrent CSCR.

Limitation

The major limitation of this study was the fewer number of cases in the chronic and recurrent groups compared to the acute groups which might have affected the outcomes of the study. Also, a long term follows up to one year would be ideal to establish the efficacy and long-term outcome of treatment in chronic and recurrent groups.

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