E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/15.01.78

Comparative analysis of logarithm of the minimum angle of resolution best-corrected visual acuity in Central serous chorioretinopathy patients treated with 1% brinzolamide and control group

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Abstract

Background: The retinal condition known as central serous chorioretinopathy (CSR) impairs vision acuity. In this study, the impact of placebo (carboxymethyl cellulose) (Group B) and 1% brinzolamide (Group A) in enhancing logMAR Best-Corrected Visual Acuity (BCVA) throughout a 3-month follow-up was evaluated. **Methods:** 50 CSR patients seeking care at Maharani Laxmi Bai Medical College in Jhansi were split into two groups at random: Group A consisted of 25 patients with 28 eyes, and Group B consisted of 25 patients with 27 eyes. Age, laterality, intraocular pressure, vault height, and central macular thickness were among the baseline variables that were noted. At Day 1, Day 15, One Month, and Three Months, BCVA was assessed. **Results:** The average age of Group A was 41.28 ± 8.91 years, while Group B's was 43.84 ± 11.61 years. The majority of involvement in both groups was unilateral. Initially, most eyes had BCVA between June 60 and June 24. The BCVA improved steadily in both groups during the course of the study. Three months later, the mean BCVA in Group A was 0point 1206 ± 0point 1333, while in Group B it was 0point 1367 ± 0point 1406. At any follow-up point, no statistically significant difference in BCVA improvement was found between the groups ($p > 0.05$). **Conclusion:** The BCVA of CSR patients was significantly improved over a 3-month period by both 1 percent brinzolamide and carboxymethyl cellulose, with comparable efficacy. It is advised that these results be confirmed by additional studies with bigger cohorts and longer follow-up

Keywords: Central serous chorioretinopathy, best-corrected visual acuity, 1% brinzolamide, Carboxy methyl cellulose

Introduction: A common retinal condition known as central serous chorioretinopathy (CSCR) is characterized by serous detachment of the neurosensory retina. This condition is usually brought on by fluid leaking from the choroidal circulation through a defect in the retinal pigment epithelium (RPE)[1]. Young to middle-aged adults, particularly men, are primarily affected, and risk factors like stress, corticosteroid use, and type A personality traits are linked to it [2]. Clinically, blurred vision, micropsia, metamorphopsia, and a relative central scotoma are among the symptoms of CSCR. Significant visual impairment and chronic retinal damage can result from recurrent or persistent episodes, even though many cases resolve on their own [3]. CSCR has a complex pathophysiology that includes impaired fluid transport, RPE dysfunction, and choroidal hyperpermeability. Given the risk of long-term visual impairment, particularly in cases that occur frequently, prompt and efficient intervention is essential [4]. Numerous treatment approaches, from lifestyle changes and observation to medication and laser treatments, have been put forth. The ability of carbonic anhydrase inhibitors, such as brinzolamide, to increase RPE pump activity and thus promote subretinal fluid absorption has drawn attention among pharmacological options. Brinzolamide 1 percent is a topical medication that has historically been used to treat glaucoma, but because of its potential, its use in retinal conditions, such as CSCR, is being investigated more [5].

On the other hand, eye drops containing placebo (carboxymethyl cellulose) are mainly used as lubricants and are not anticipated to have an impact on the underlying disease process. In ophthalmic research, they are frequently employed as a supportive or control treatment to evaluate the placebo effect and the disease's natural progression. A comparison between an inert agent, such as CMC, and an active agent, such as brinzolamide, can reveal important information about the drug's actual therapeutic advantages in the treatment of CSCR [6]. When assessing the effectiveness of treatment for retinal disorders, best-corrected visual acuity (BCVA) is still a crucial metric. However, statistical analysis of raw BCVA measurements expressed in Snellen fractions can be difficult. Thus, a more accurate and consistent way to measure visual acuity is to convert to the logarithm of the minimum angle of resolution (logMAR). The logMAR scale is especially helpful in clinical research because it makes it possible to assess changes in visual function more accurately [7, 8].

This study aims to perform a comparative analysis of logMAR best-corrected visual acuity in patients with CSCR treated with topical brinzolamide 1% versus those treated with placebo (carboxymethyl cellulose). By evaluating the visual outcomes between the two groups, this research seeks to determine the efficacy of brinzolamide in enhancing visual recovery in CSCR patients. The findings of this study may contribute to the evolving management strategies of CSCR, offering potential for improved visual prognosis in affected individuals.

Material and Methods

Study Design: This research undertaking was structured as a Randomized, prospective, comparative, and interventional study, executed within the Department of Ophthalmology, Maharani Laxmi Bai Medical College, Jhansi. The study was sanctioned by the Institutional Ethics Committee, and all participants were furnished with informed consent prior to their enrollment.

Study Population: We included 50 patients who had been clinically diagnosed with acute central serous chorioretinopathy (CSCR) and whose diagnosis was confirmed by optical coherence

tomography (OCT). Neurosensory retinal detachment with a symptom duration of less than six months was considered acute CSCR.

Inclusion Criteria: Participants in the study had to be between the ages of 20 and 55. Participants were only allowed to enroll if they had been diagnosed with Central Serous Retinopathy (CSR) within the last 20 days. Prior to starting the study, the participants had never received any kind of CSR treatment. To verify eligibility, optical coherence tomography (OCT) had to show evidence of foveal subretinal fluid collection, and clinical investigations had to be suggestive of serous retinal detachment.

Exclusion Criteria: Patients who were younger than 18 years old or older than 70 years were not allowed to participate. The study also did not include pregnant women. Patients with poor fixation or hazy ocular media, which could impede precise imaging, were excluded. Participants were excluded if they had a history of diabetes mellitus or any other eye disorders that might independently result in the buildup of subretinal fluid, such as choroidal neovascularization or age-related macular degeneration. Additionally excluded were patients who were currently receiving acetazolamide therapy, had a history of CSR treatment within the previous six months, or had a known sulfa drug allergy. Furthermore, the final analysis did not include patients who were lost to follow-up during the study period.

Grouping and Intervention: Participants were randomly assigned into two groups (25 patients in each group):

- **Group A (Brinzolamide Group):** Patients received topical brinzolamide 1% ophthalmic suspension, instilled three times daily in the affected eye for a period of 3 months.
- **Group B (Control Group):** Patients received placebo (carboxymethyl cellulose - CMC) eye drops, instilled three times daily in the affected eye for 3 months.

Patients were instructed on proper administration techniques and adherence to therapy was monitored at each follow-up.

Outcome Measures: The primary outcome measure was the change in best-corrected visual acuity (BCVA) expressed in logarithm of the minimum angle of resolution (logMAR) units from baseline to 3 months.

Data Collection: Visual Acuity Assessment: BCVA was recorded using a standard Snellen chart and subsequently converted to logMAR units for statistical analysis.
Optical Coherence Tomography (**OCT) Imaging:** Spectral-domain OCT was used at baseline and at each monthly follow-up to document subretinal fluid status and retinal morphology.
Follow-Up Schedule: Patients were evaluated at baseline, 15 days, 1 month, and 3 months. Each visit included BCVA assessment, slit-lamp biomicroscopy, intraocular pressure (IOP) measurement, and OCT imaging.
Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS version26.0 Continuous variables were expressed as mean ± standard deviation. Comparisons were assessed using independent sample t-tests. A p-value <0.05 was considered statistically significant.
Observation and results

50 CSR cases treated at Maharani Laxmi Bai Medical College in Jhansi with a three-month follow-up were included in the current study. Twenty-five patients and twenty-eight eyes made up Group A, and twenty-five patients and twenty-seven eyes made up Group B. Table 1 indicates that the majority of patients in Group A (44 percent) were between the ages of 41 and 50, whereas 32 percent of patients in Group B were in both the 31–40 and 41–50 age groups. In Group A, the average age was 41.28 ± 8.91 years, while in Group B, it was 43.84 ± 11.61 years. Unilateral involvement was more common in both groups (88 percent in Group A and 92 percent in Group B), as Table 2 demonstrates. Table 3 shows that most eyes had BCVA between 6/60 and 6/24 at presentation (57.1 percent in Group A and 40.7 percent in Group B). Table 4 shows that the majority of eyes had intraocular pressures between 10 and 21 mmHg, with Group A having 92–86 percent and Group B having 96–30 percent. Table 5 displays the vault height distribution. In both groups, the most common range was between 301 and 400 microns (25 percent in Group A and 25 point 92 percent in Group B), with no instances exceeding 1000 microns. The majority of the eyes in both groups (60 percent in Group A and 62 percent in Group B) had central macular thicknesses between 401 and 600 microns, with no eyes measuring more than 1000 microns (Table 7). Group A and Group B's logMAR BCVA at Day 1, Day 15, 1 Month, and 3 Months are contrasted in Table 8. Over time, both groups demonstrated consistent progress. Group A's mean BCVA on Day 1 was 0.6475 ± 0.3694, while Group B's was 0.6140 ± 0.3572 (p = 0.7339). It improved to 0point 1206 ± 0point 1333 in after three months.

Table 1 showing age distribution of patients Group A and Group B

	Group A		**Group B**	
Age	**No. of patients**	**Percentage**	**No of patients**	**Percentage**
18-20 years	0	0	1	4%
21-30 years	2	8%	1	4%
31-40 years	9	36%	8	32%
41-50 years	11	44%	8	32%
51-60 years	3	12%	4	16%
61- 70 years	0	0	3	12%
TOTAL	25	100%	25	100%
Mean ± S.D.	41.28±8.91years		43.84±11.61years	

Table 2 showing laterality of eye in Group A and Group B

	Group A		**Group B**	
Eyes	**No. of patients**	**Percentage**	**No. of patients**	**Percentage**
Unilateral	22	88%	23	92%
Bilateral	3	12%	2	8%
Total	25	100%	25	100%

Table 3 showing BCVA in Group A (28 eyes) and Group B (27 eyes) at the time of presentation.

	Group A	**Group B**

BCVA (Snellen chart)	No. of patients	Percentage	No. of patients	Percentage
1/60-3/60	2	7.1%	3	11.1%
6/60-6/24	16	57.1%	11	40.7%
6/18-6/12	7	25%	10	37.04%
6/9-6/6	3	10.7%	3	11.1%
Total	28	100%	27	100%

Table 4 showing IOP in Group A (28eyes) and Group B (27 eyes)

	Group A		Group B	
IOP (mmHg)	**No. of patients**	**Percentage**	**No. of patients**	**Percentage**
<10	2	7.14%	1	3.70%
10-21	26	92.86%	26	96.30%
>21	0	0%	0	0%
Total	28	100%	27	100%

Table 5 showing Vault height on OCT in microns in Group A and Group B

	Group A		Group B	
Vault height in OCT(in microns)	**No of patients**	**Percentage**	**No. of patients**	**Percentage**
<1	0	0%	0	0%
1-50	0	0%	0	0%
51-100	1	3.57%	0	0%
101-200	1	3.57%	5	18.52%
201-300	3	10.71%	4	14.81%
301-400	7	25%	7	25.92%
401-500	3	10.71%	5	18.52%
501-600	4	14.28%	2	7.40%
601-700	4	14.28%	3	11.10%
701-800	4	14.28%	0	0%
801-900	0	0%	1	3.70%
901-1000	1	3.57%	0	0%
>1000	0	0%	0	0%
Total	28	100%	27	100%

Table 6 showing comparison of vault height of Group A with Group B .

	Group A	Group B	

	Mean	Standard deviation	Mean	Standard deviation	p-value
Day 1	479.29	±200.72	375.58	±184.97	0.0516
1 Month	199.14	±142.06	302.96	±171.03	**0.0175**
3 Month	15.68	±41.17	32.04	±86.65	0.3727

As we can see from the above table that in Group A at 1 Month vault height decreased

significantly in comparison to Group B.

Table 7 showing Central Macular Thickness on OCT in Group A and Group B

Central Macular Thickness on OCT (in microns)	No. of patients	Percentage	No. of patient	Percentage
≤260	0	0%	0	0%
261-400	6	21.4%	7	25.93%
401-600	17	60.7%	17	62.96%
601-800	4	14.3%	3	11.11%
801-1000	1	3.6%	0	0%
>1000	0	0%	0	0%
Total	28	100%	27	100%

Table 8 showing comparison of log MAR BCVA of Group A and Group B Day 1, Day 15, 1 Month and 3 Month follow up.

BCVA (logMAR)	Group A		Group B		p-value
	Mean	Standard deviation	Mean	Standard deviation	
Day 1	0.6475	±0.3694	0.6140	±0.3572	0.7339
Day 15	0.5035	±0.2358	0.4721	±0.2453	0.6304
1 month	0.2823	±0.1811	0.3003	±0.1205	0.6673
3 month	0.1206	±0.1333	0.1367	±0.1406	0.6647

Discussion

50 CSR cases that were treated at Maharani Laxmi Bai Medical College in Jhansi and followed up on for three months were included in this study. Randomization was used to assign patients to two groups: Group A (5 patients, 28 eyes) and Group B (25 patients, 27 eyes). In Group A, the majority of patients (44 percent) were between the ages of 41 and 50, whereas in Group B, 32 percent were in both the 31–40 and 41–50 age groups, as indicated in Table 1. Group A had an average age of 41.28 ± 8.91 years, while Group B had an average age of 43.84 ± 11.61 years. Our analysis of the age distribution was found to be in line with previous research [9–11]. Unilateral involvement

predominated in both groups, as indicated by Table 2 (88 percent in Group A and 92 percent in Group B). As is evident from all studies, ours was in line with other research on the disease's laterality, since U/L CSR was the most prevalent presentation [12–14]. At presentation, most eyes had BCVA between 6/60 and 6/24 (57.1 percent in Group A and 40.7 percent in Group B), as shown in Table 3. According to the data above, BCVA at presentation differed by region and was also influenced by the degree of subretinal fluid accumulation. However, no study [14, 15, 16] found that the average BCVA at presentation was less than 6/60. The majority of eyes had normal intraocular pressure (10–21 mmHg), with 92–86 percent in Group A and 96–30 percent in Group B, according to Table 4. One percent Brinzolamide was found to lower intraocular pressure in a number of studies [17–18].

In both groups, the vault height distribution (Table 5) was most frequently between 301 and 400 microns (25 percent in Group A and 25 point 92 percent in Group B), with no instances exceeding 1000 microns. Vault height in our investigation was found to be in line with earlier research [11,15]. The majority of the eyes in both groups (60 percent in Group A and 62 percent in Group B) had central macular thicknesses between 401 and 600 microns, with no eyes measuring more than 1000 microns (Table 6). Our results were found to be in line with previous research [19, 15, 20]. Group A and Group B's logMAR BCVA at Day 1, Day 15, 1 Month, and 3 Months are contrasted in Table 7. Over time, both groups demonstrated consistent progress. Group A's mean BCVA on Day 1 was 0.6475 ± 0.3694, while Group B's was 0.6140 ± 0.3572 ($p = 0.7339$). It improved to 0.1206 ± 0.1333 in Group A and 0.1367 ± 0.1406 in Group B by the end of three months ($p = 0.6647$). There was never a statistically significant difference between the groups at any of the time points. Scott Burk MD et al. (2003) found that the majority of patients with central serous chorioretinopathy will spontaneously restore their visual acuity in 6 months (average recovery time of 3–4 months), which supports the idea that the disease resolves on its own [21]. According to Liew G et al. (2013), the majority of acute CSCR cases go away on their own in two to three months [22]. According to ShanthiLatha Y J et al. (2015), 70% of patients experienced a spontaneous improvement in visual acuity within 4-6 months of observation.

Conclusion:

In this study which was conducted over a period of 13 month we concluded that topical Brinzolamide 1% tend to fasten the resorption of subretinal fluid during the follow up as measured on OCT but has no effect on the final visual outcome and that the disease runs its self limiting course and resolves spontaneously in 3 Months time interval in most cases. Though topical Brinzolamide 1% may hasten the recovery but observation and reassurance remains the key to success in patients with idiopathic acute CSR. Side effect of topical 1% brinzolamide are also very less which makes this drug a potential treatment of choice for acute CSR to fasten the sub retinal fluid absorption.

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