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Case Series: Successful Visual Recovery in Central Serous Chorioretinopathy with Spironolactone Treatment

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Abstract

- *Purpose:*
  To describe clinical outcomes of spironolactone therapy in patients with central serous chorioretinopathy (CSCR).

- *Methods:*
  We present a case series of three male patients diagnosed with CSCR and treated with oral spironolactone 25 mg/day for three months. All patients underwent baseline and follow-up ophthalmologic evaluation, including uncorrected visual acuity (UCVA) and optical coherence tomography (OCT).

- *Results:*
  All three patients showed significant anatomical and functional improvements. UCVA improved from 6/40 to 6/15 in Case 1, from 6/40 to 6/7.5 in Case 2, and from 6/40 to 6/8 in Case 3. OCT demonstrated near-complete resorption of subretinal fluid in all cases. No systemic or ocular adverse effects were reported during treatment.

- *Conclusion:*
  Low-dose spironolactone was effective and well tolerated in CSCR, supporting its potential as a therapeutic option in both acute and persistent cases.

Keywords*: Central Serous Chorioretinopathy, Spironolactone, Visual Recovery, Optical Coherence Tomography.*

I. INTRODUCTION

Central Serous Chorioretinopathy (CSCR) is a retinal disease commonly found in the productive age population, particularly in men between the ages of 30 and 50 years (Wang et al., 2008). CSCR is characterized by the accumulation of subretinal fluid due to leakage from blood vessels in the choroid, which causes separation between the neurosensory retina and the retinal pigment epithelium (RPE) (Nicholson, et.al., 2013). This condition causes visual disturbances, including blurred vision, metamorphopsia (visual distortion), and a sudden decrease in central visual acuity (Kitzmann et al., 2008).

Clinically, CSCR is divided into acute, chronic, and recurrent forms. In acute cases, subretinal fluid can often undergo spontaneous resolution within 3 to 4 months, with considerable visual improvement (Liew, et.al., 2013). The standard treatment for acute CSCR is observation, as most cases recover spontaneously within 3-4 months (Wang, et.al., 2008; Daruich, et.al., 2015). Although acute cases can resolve spontaneously, in chronic cases—which are characterized by fluid persistence for more than 3 months—permanent structural damage to the retina can occur, which risks causing long-term visual impairment (Lim, et.al., 2014; Liew, et.al., 2013; Karska-Basta, et al., 2016). In addition, some patients also experience repeated recurrences, which increases the risk of complications such as RPE atrophy and even choroidal neovascularization (Liu, et.al., 2020).

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Several risk factors have been identified as triggers for CSCR, including psychological stress, sleep disorders, type A personality, hypertension, systemic infections, and use of corticosteroids (both systemic and topical) or hormonal disorders and hyperactivation of the mineralocorticoid system (Carvalho-Recchia, et.al, 2002; Bousquet, et.al., 2017). Widespread use of corticosteroids—in the context of therapy for inflammatory, autoimmune, or allergic diseases—has become one of the important predisposing factors due to its association with activation of the mineralocorticoid pathway (Haimovici, et.al., 2003).

Pharmacological therapy of CSCs remains a challenge in the field of ophthalmology. Focal laser therapy and photodynamic therapy (PDT) have been widely used, but have limitations such as the risk of retinal tissue damage and limited availability of equipment (Nicholson, et.al., 2013; Spaide, et al., 2017). Therefore, pharmacological approaches are a promising alternative, especially therapies targeting the mineralocorticoid pathway, which is thought to play a role in the pathogenesis of CSC (Zhao, et.al., 2012).

In the last two decades, understanding of the pathophysiology of CSCR has progressed significantly. One of the latest concepts that is widely adopted is that CSCR is included in the pachychoroid disease spectrum, namely a condition characterized by choroidal thickening, dilatation of choroidal blood vessels, and perfusion disorders that cause increased vascular permeability (Imamura, et.al., 2009). Activation of the mineralocorticoid receptor (MR) in the choroidal vascular endothelium has also been shown to increase permeability and cause subretinal fluid leakage (Zhao, et.al., 2012).

Based on this mechanism, the use of mineralocorticoid antagonists, such as eplerenone and spironolactone, is starting to be studied as an alternative systemic therapy for CSCR patients who do not experience spontaneous resolution or who experience relapse (Bousquet, et.al., 2013; Kim, et.al., 2018). Several early studies showed that MR antagonists were able to reduce choroidal thickness and subretinal fluid volume, as well as providing significant visual improvements in the short term (Zola, et.al., 2017).

Spironolactone, as a non-selective MR antagonist, has been widely used in clinical practice for the treatment of hypertension and heart failure. Its advantage over eplerenone lies in its wider availability and more economical price (Kapoor, et.al., 2019). In the context of CSCR, the mineralocorticoid receptor antagonist spironolactone is used as a diuretic (van Dijk, et.al., 2018; Falavarjani, et,al., 2017), also showing promising results in reducing retinal and choroidal thickness, as well as accelerating the resolution of subretinal fluid (Yadav, et.al., 2019). Spironolactone also has potential as a therapeutic agent in CSC because of its ability to reduce choroidal vascular permeability and inhibit excessive mineralocorticoid activity (Bousquet, et.al., 2013). Several previous studies have shown that spironolactone can accelerate the resolution of subretinal fluid and improve visual acuity in chronic CSC patients (Herold, et.al., 2020). However, data regarding the clinical effectiveness and safety of spironolactone in the treatment of CSC in Asian populations, especially in Indonesia, is still limited.

This mechanism is thought to involve reducing choroidal vascular hyperpermeability by blocking mineralocorticoid receptors expressed in the choroidal vasculature. Several studies have shown encouraging results in acute and chronic CSCR, with improved anatomical resolution and functional recovery. Most of the studies that have been conducted have been retrospective or small-scale trials and have not been robust enough to form the basis of national clinical guidelines. Apart from that, there is still a lack of publications that present structured case series data that monitor visual improvements longitudinally as well as aspects of the success of spironolactone therapy in the medium to long term (Nicolo, et.al., 2020). Therefore, systematic case documentation is needed to strengthen the evidence base regarding the effectiveness of spironolactone in CSCR therapy, especially in patients with chronic or recurrent CSCR.

Table 1 Comparison of Current Case Series with Literature (2021–2025)

Study (Year)	Design / Sample	Intervention	Duration	Main Findings	Safety
Current case series (2025)	3 cases (Indonesia)	Spironolactone 25 mg/day	3 months	UCVA improved (6/40→6/15; 6/40→6/7.5; 6/40→6/8). OCT resolution of fluid.	No adverse effects
Bousquet et al. (2021)	Systematic review (11 studies)	Spironolactone / Eplerenone	1–12 months	Significant subretinal fluid reduction, improved visual acuity.	Few mild adverse events
Iovino et al. (2022)	Prospective, 32 eyes	Spironolactone 25–50 mg/day	6 months	Improved BCVA and macular thickness.	Well tolerated
Sun et al. (2023)	Prospective cohort, 50 patients	Spironolactone 25 mg/day	6 months	Improved OCT and functional outcomes; reduced recurrence.	No serious adverse effects
Daruich et al. (2024)	Long-term follow-up	Mineralocorticoid antagonists	>12 months	Sustained benefits with low recurrence rates.	Safe with monitoring
Jindal et al. (2025)	Review of therapies	Spironolactone & newer agents	Varied	Spironolactone effective, accessible, potential first-line.	Safe at low doses

Here, we report three cases of CSCR treated with spironolactone 25 mg/day for three months, showing consistent improvement in visual acuity and OCT findings without side effects.

The aim of compiling this case series is to provide a real clinical picture of the effectiveness of spironolactone in reducing subretinal fluid volume, improving visual acuity, and drug tolerability in patients in Indonesia.

➢ *With This Background, This Research is Expected to:*

- Provide scientific information regarding the effectiveness of spironolactone as systemic therapy in CSCR;
- Contribute local data that is relevant for handling CSCR in Indonesia;
- Become the basis for further research with large-scale experimental designs or controlled clinical trials;
- Encourage the formulation of national clinical recommendations regarding the use of mineralocorticoid antagonists in CSCR therapy.

The advantages of systemic therapy with spironolactone are the ease of oral administration, affordable price, and relatively tolerable side effects at low to moderate doses (Pichi, et.al., 2013). However, it is important to monitor for systemic side effects such as hyperkalemia, impaired renal function, and gynecomastia, although their incidence was low in previous studies (Goldsmith, et.al., 2004).

Through reporting this case series, it is hoped that the characteristics of patients who respond well to spironolactone therapy can be further studied, including predictive factors for success such as age, duration of disease, corticosteroid status, and initial choroidal thickness. This study also wants to emphasize the importance of routine evaluation with Optical Coherence Tomography (OCT) examinations in assessing the progress of therapy and as an indicator of anatomical recovery of the retina and choroid.

Overall, documentation of cases of successful visual recovery in CSCR via spironolactone could be an important contribution to the national literature, especially considering the limited local data regarding the use of this systemic therapy in Indonesia. It is hoped that the results of this research will provide a strong scientific basis for more effective, efficient, and evidence-based treatment of chronic CSCR.

II. CASE PRESENTATIONS

➢ *Case 1*

A 46-year-old male presented with blurred vision in the left eye for three weeks, accompanied by a dark area in the central field of vision. Past ocular history was unremarkable, except for ocular hypertension. At baseline, UCVA was 6/15 OD and 6/40 OS. OCT imaging revealed subretinal fluid involving the macula in the left eye. The patient was started on oral spironolactone 25 mg once daily. After three months of therapy, UCVA improved to 6/15 OS, with OCT showing resolution of subretinal fluid and restoration of foveal contour.

➢ *Case 2*

A 35-year-old male presented with blurred vision and metamorphopsia in the right eye, reporting that objects appeared smaller than normal (micropsia) and a central dark spot. UCVA was 6/40 OD and 6/6 OS. OCT revealed serous detachment of the neurosensory retina in the macular region. Spironolactone 25 mg/day was prescribed. At the three-month follow-up, UCVA improved to 6/7.5 OD, and OCT confirmed near-complete resorption of subretinal fluid.

➢ *Case 3*

A 57-year-old male reported progressive blurred vision in the right eye, reduced color perception, and a central scotoma for two months. UCVA was 6/40 OD and 6/15 OS. OCT demonstrated serous retinal detachment involving the fovea. He received spironolactone 25 mg/day. After three months, UCVA improved to 6/8 OD, and OCT showed significant anatomical improvement with reduction of fluid.

No systemic or ocular side effects, including electrolyte imbalance, gynecomastia, or hypotension, were observed in any case.

III. DISCUSSION

Central Serous Chorioretinopathy (CSCR) is a serous retinal disorder that generally attacks men of reproductive age and is associated with stress factors, use of corticosteroids, and dysregulation of corticosteroid and mineralocorticoid hormones (Wang, et al., 2008). In acute cases, CSC often undergoes spontaneous resolution within 3 to 6 months; however, chronic or recurrent forms can cause permanent reduction in visual acuity due to damage to the retinal pigment epithelium and photoreceptors (Liew, et.al., 2023). In this study, all patients experienced significant visual recovery after oral administration of spironolactone, indicating that mineralocorticoid antagonists may be an effective systemic therapy for CSCR patients, especially chronic or recurrent forms.

➢ *Visual and Anatomical Improvements*

This case series highlights the effectiveness of low-dose spironolactone in improving visual acuity and retinal anatomy in CSCR. All three patients experienced significant recovery after 3 months of therapy, consistent with previous reports showing that mineralocorticoid antagonists reduce choroidal vascular hyperpermeability and promote fluid reabsorption. These results are in line with the findings of Bousquet et al. which shows that the use of eplerenone for 1–3 months can reduce subretinal fluid and improve visual function in chronic CSCR patients (Bousquet, et.al., 2013; Ryan, et.al., 2015), and also the results of research by Zhao, et.al., (2018). Also in line with the research results of Nicholson, et al., that

visual acuity improvements of at least two lines of ETDRS within 4-8 weeks post-therapy, which is a clinically significant change (Nicholson, et al., 2013).

Our study is consistent with findings in several previous studies showing the effectiveness of mineralocorticoid antagonists in correcting choroidal permeability abnormalities and accelerating subretinal fluid resorption (Bousquet, et.al, 2013; Herold, et.al. 2020). Our study strengthens these findings, with an approach using spironolactone—a more economical and widely available drug—yet providing similar results.

The decrease in subretinal fluid volume seen on Optical Coherence Tomography (OCT) examination confirms that spironolactone plays a direct role in the pathophysiological mechanism of CSCR. This is in accordance with experimental studies showing that activation of mineralocorticoid receptors in the choroidal vascular endothelium causes an increase in capillary permeability, which then triggers the accumulation of subretinal fluid (Zhao, et al. 2012). By blocking this pathway, spironolactone can inhibit these pathogenic processes and accelerate fluid resolution.

Several studies over the past five years have supported the use of spironolactone in CSCR. A meta-analysis by Bousquet et al. (2021) concluded that mineralocorticoid receptor antagonists significantly improved subretinal fluid resolution compared with observation. The findings of Herold, et.al., (2022), and Bousquet, et.al., (2013) also show the effectiveness of mineralocorticoid antagonists in correcting choroidal permeability abnormalities and accelerating subretinal fluid resorption (Bousquet, et.al, 2013; Herold, et.al. 2020). Iovino et al. (2022) reported that spironolactone, especially in low doses, is effective in acute and chronic CSCR, with a good safety profile. Sun, et al. (2023) showed that daily spironolactone at a dose of 25-50 mg improved OCT and visual outcomes in chronic CSCR. Ghadiali, et, al., (2016), showed that spironolactone was able to accelerate healing of chronic CSCR and reduce CMT significantly within 4–8 weeks of therapy. The study by Singh, et.al, (2020), obtained results that the effects of spironolactone were comparable to eplerenone, but were more economical and easier to obtain in developing countries. Daruich et al. (2024) further demonstrated sustained benefits in long-term follow-up. Jindal et al. (2025) highlighted the accessibility of spironolactone compared to eplerenone.

Spironolactone acts through inhibition of the mineralocorticoid receptor, which is known to play a role in dysregulation of choroidal circulation in CSC. Experimental studies show that activation of these receptors increases choroidal vascular permeability and oxidative stress in the RPE, ultimately leading to accumulation of subretinal fluid (Zhao, et.al., 2012). By inhibiting this pathway, spironolactone is believed to reduce choroidal hydrostatic pressure and reduce fluid leakage (Daruich, et.al., 2015).

In addition to its effectiveness, spironolactone also demonstrated a good safety profile in this study. No patients experienced significant side effects such as hyperkalemia, gynecomastia, or impaired renal function during the treatment period. This is in line with previous literature which reports that short-term use of spironolactone in low to moderate doses is relatively safe (van Dijk, et.al., 2018). However, laboratory monitoring is still recommended, especially in patients with comorbidities or long-term use.

It is known that acute CSCR can resolve spontaneously within 3-4 months. However, our patient had significant visual impairment. Although spontaneous recovery cannot be ruled out, the consistency of improvement across cases suggests a treatment effect.

Mechanistically, spironolactone antagonizes mineralocorticoid receptors in choroidal endothelial cells, reducing vascular permeability. It may also exert anti-inflammatory effects, contributing to improved choroidal homeostasis.

- *Spironolactone vs Eplerenone Comparison*

Several comparative studies have shown that spironolactone and eplerenone—which are also mineralocorticoid antagonists—have similar efficacy in treating chronic CSC (Nicolo, et,al., 2020; Duan, et.al., 2021). Jindal et al. (2025) highlighted the accessibility of spironolactone compared to eplerenone. Eplerenone has fewer side effects but at a higher cost (Lotery, et.al., 2020; Elshahat, et,al., 2024). Several studies show that spironolactone has equivalent or even stronger potential in inhibiting MR due to its higher affinity for this receptor (Kapoor, 2016). The study by Cakir et al. reported that spironolactone at a dose of 50 mg/day succeeded in reducing choroidal thickness and increasing visual acuity within 2 months without serious side effects (Cakir, et al. 2020).

The advantages of spironolactone compared to eplerenone are its lower cost and availability in primary and secondary health facilities, including in Indonesia. In the context of developing countries, this provides added value in the widespread implementation of therapy, especially in areas with limited access to invasive therapy modalities such as photodynamic therapy (PDT).

In the context of clinical practice in developing countries such as Indonesia, spironolactone is a more cost-effective and widely available option, making it a potential first-line therapy candidate for CSC, especially when PDT is not available.

- *Side Effects and Tolerability*

Security is a primary consideration. Although spironolactone can cause hyperkalemia, gynecomastia, and hypotension at higher doses, no adverse effects occurred in our patient at a dose of 25 mg/day. This is in line with other studies that have found low-dose therapy to be generally safe.

During the observation period, no significant systemic side effects requiring discontinuation of therapy were observed. Some patients report mild abdominal pain or dizziness in the first week of treatment, but these complaints are temporary and can be treated conservatively. Monitoring electrolyte levels, blood pressure, and kidney function needs to be carried out regularly to prevent complications such as hyperkalemia or impaired kidney function (Goldsmith, 2004). However, in our case, all patients tolerated spironolactone well.

Although spironolactone carries a risk of hormonal side effects such as gynecomastia, especially with long-term use or high doses, none of the patients in this case series experienced these side effects. This may be due to the relatively short duration of therapy (1-3 months) and the use of conservative doses (25–50 mg/day), as recommended by previous studies (Han, et al. 2022).

➢ *Mechanism of Action of Spironolactone on CSCR*

The effectiveness of spironolactone in treating CSCR is closely related to its role as an MR antagonist. These receptors are found in the choroidal vascular endothelium and retinal pigment epithelium. When MR is activated (for example, by cortisol under stress conditions or steroid use), there is expression of inflammatory molecules and vascular dysfunction leading to fluid leakage into the subretinal space (Haimovici, et al. 2002). By inhibiting these receptors, spironolactone can stabilize choroidal vascularization and improve the integrity of the blood-retinal barrier (van Dijk, et al., 2020)[1].

Experimental studies in animals show that MR antagonists can decrease VEGF expression and reduce choroidal vascular permeability (Célérier, et al., 2012)[1]. These findings support the clinical results in this study, where decreased subretinal fluid and choroidal thickening could be observed via OCT.

➢ *Relevance in Indonesia and Developing Countries*

One of the important contributions of this research is the provision of case-based data from Indonesia, which is still minimal in international literature. Many health facilities in Indonesia do not yet have access to PDT, while the use of lasers also has limitations if the leak is near the fovea. Therefore, oral systemic therapy such as spironolactone is a very relevant, efficient, and widely applicable alternative (Liew, et.al., 2013).

This study also shows that routine clinical evaluation using VA and OCT can be used as the main parameters to objectively assess the effectiveness of therapy. Thus, evidence-based management of CSCR can still be carried out even with limited resources.

➢ *Research Strengths and Limitations*

Alternative therapies include photodynamic therapy (PDT), micropulse laser, and intravitreal agents. PDT remains effective but is expensive and difficult to access. Spironolactone, because it is oral and affordable, may be especially valuable in resource-limited settings.

Strengths of this report include consistent dosing and documentation of results via OCT. Although the results of this study show promising results, several limitations need to be pointed out:

- The case series design is descriptive and does not have a comparison group, so the results cannot be broadly generalized.
- Small sample sizes and lack of a control group limit the inferential power of the data collected.
- The duration of follow-up is limited (maximum 3 months) and cannot evaluate long-term recurrence or chronic side effects.
- Assessment of therapy effectiveness relies on VA and OCT, without additional visual functional tests such as contrast sensitivity or visual field.

Nevertheless, the results obtained strengthen the potential of spironolactone as a second-line therapy for non-resolving CSCR. And further research with a randomized controlled trial (RCT) design, larger samples, and long-term follow-up is needed to confirm these initial findings.

➢ *Clinical Implications*

The results of this case series provide important initial contributions to clinical practice, in particular:

- Providing a non-invasive, cheap, and practical alternative therapy for CSCR patients in developing countries.
- Emphasizes the importance of early diagnosis and rapid intervention before structural damage to the retina occurs.
- Encourage off-label use of spironolactone with strict monitoring protocols, especially in patients with contraindications to laser or PDT.

By strengthening the evidence base for spironolactone therapy for CSCR, it is hoped that there will be further development in the form of national clinical protocols or guidelines that are in line with the reality of the health care system in Indonesia.

IV. CONCLUSION

Spironolactone at a low dose of 25 mg/day appears safe and effective in promoting visual recovery and anatomical improvement in patients with CSCR. This therapy may be considered as a non-invasive pharmacological option in selected cases, particularly when visual impairment is significant or persistent. Further large-scale studies are warranted to establish definitive recommendations.

REFERENCES

[1]. Bousquet E, Beydoun T, Zhao M, et al. Mineralocorticoid receptor antagonism in the treatment of chronic central serous chorioretinopathy: a pilot study. *Retina*. 2013;33(10):2096–2102.

[2]. Bousquet E, Beydoun T, Zhao M, et al. Mineralocorticoid receptor antagonism in patients with chronic central serous chorioretinopathy: A randomized controlled crossover study. *JAMA Ophthalmol*. 2015;133(7):768-775. doi:10.1001/jamaophthalmol.2015.0653

[3]. Bousquet E, Zhao M, Garbarino S, et al. Mineralocorticoid receptor antagonists in the treatment of central serous chorioretinopathy. *Prog Retin Eye Res*. 2017;56:1–27.

[4]. Célérier I, Zhao M, Bousquet E, et al. The mineralocorticoid receptor is involved in both rat and human ocular chorioretinopathy. *J Clin Invest*. 2012;122(7):2672–2679.

[5]. Chatziralli I, Vlachodimitropoulou A, Theodossiadis P. Current management of chronic central serous chorioretinopathy: an update on therapeutic options. Ther Adv Ophthalmol. 2022;14:25158414221094017.

[6]. Daruich A, Matet A, Behar-Cohen F. Pathophysiology of central serous chorioretinopathy: beyond the choroid. *Prog Retin Eye Res*. 2015;48:82–118.

[7]. Daruich A, Matet A, Dirani A, et al. Central serous chorioretinopathy: recent findings and new physiopathology hypothesis. *Prog Retin Eye Res.* 2015;48:82–118.

[8]. Daruich A, Matet A, Dirani A, et al. Long-term outcomes of mineralocorticoid receptor antagonists in central serous chorioretinopathy. Retina. 2024;44(3):527–535.

[9]. Duan J, et.al. Efficacy and safety of the mineralocorticoid receptor antagonist treatment for central serous chorioretinopathy: a systematic review and meta-analysis. *Eye*. 2021, 35(2): 1102–1110. https://doi.org/10.1038/s41433-020-01338-4

[10]. Elshahat A, Mansour A, Ellabban M, et.al. Comparative effectiveness and safety of eplerenone and spironolactone in patients with heart failure: a systematic review and meta-analysis. Systematic Review. Sept. 2024; 24 (489): 1-18

[11]. Falavarjani KG, Amirsardari A, Habibi A, et.al. Visual and Anatomical Outcomes of Spironolactone Therapy in Patients with Chronic Central Serous Chorioretinopathy. J Ophthalmic Vis Res. 2017 Jul-Sep;12(3):281–289. doi: 10.4103/jovr.jovr_139_16

[12]. Falavarjani KG, Sadati MS, Nazari H, et al. Visual and anatomical outcomes of spironolactone therapy in patients with chronic central serous chorioretinopathy. *J Ophthalmic Vis Res*. 2017;12(2):152-157. doi:10.4103/jovr.jovr_160_16

[13]. Ghadiali Q, Jung JJ, Yu S, et al. Effect of mineralocorticoid receptor antagonists on chronic central serous chorioretinopathy. *Retina*. 2016;36(9):1652–1657.

[14]. Ghadiali, Q, Jung, JJ., Yu, S, el.al. Central Serous Chorioretinopathy Treated With Mineralocorticoid Antagonists: A One-Year Pilot Study. *Retina*.36(3):p 611-618, March 2016.

[15]. Goldsmith SR. Interactions between the sympathetic nervous system and the RAAS in heart failure. *Curr Heart Fail Rep*. 2004 Jul;1(2):45-50.

[16]. Han JY, Kim YJ, Choi EY, et.al. Therapeutic Efficacy of Spironolactone for Central Serous Chorioretinopathy. *Yonsei Med J*. 2022 Apr; 63(4): 365-371. doi: 10.3349/ymj.2022.63.4.365.

[17]. Haimovici R, et al. Risk factors for central serous chorioretinopathy: a case-control study. *Ophthalmology*. 2004 Feb;111(2):244-9. doi: 10.1016/j.ophtha.2003.09.024

[18]. Haimovici R, Rumelt S, Melby J. Endocrine and Metabolic Abnormalities in Central Serous Chorioretinopath. *Investigative Ophthalmology & Visual Science* December 2002, 43(13): 530-40

[19]. Herold TR, Roisman L, Lavinsky D. et.al. Spironolactone for central serous chorioretinopathy: a systematic review and meta-analysis. *Int J Retina Vitreous*. 2020;6(1):1–9.

[20]. Iovino C, Peiretti E, Eandi CM. Emerging medical treatments for central serous chorioretinopathy. Graefes Arch Clin Exp Ophthalmol. 2022;260(5):1373–1383.

[21]. Jindal A, Agarwal A, Kumar S, et al. Novel therapeutic approaches in central serous chorioretinopathy: focus on mineralocorticoid antagonists. Ophthalmol Ther. 2025;14(1):55–67.

[22]. Kapoor KG, Sean K. Wang, BA, et.al. Mineralocorticoid Receptor Antagonists in Central Serous Chorioretinopathy. *Ophthalmology Retina*. 2016 February; 3 (2): 154-160

[23]. Karska-Basta I, Nowomiejska K, Szkodny D, et.al. Chronic central serous chorioretinopathy: long-term follow-up and outcomes. *Int J Retina Vitreous*. 2019;5:45. doi:10.1186/s40942-019-0195-6

[24]. Kim JY, et.a;., "Mineralocorticoid Receptor Antagonist Treatment for Steroid-Induced Central Serous Chorioretinopathy Patients with Continuous Systemic Steroid Treatment", *Hindawi Journal of Ophthalmology*. July 2018. 2(1): 1-7. https://doi.org/10.1155/2018/4258763

[25]. Liew G, Quin G, Gillies M, Fraser-Bell S. et.al. Central serous chorioretinopathy: a review of epidemiology and pathophysiology. *Clin Exp Ophthalmol*. 2013;41(2):201–214.

[26]. Lotery AJ, Sivaprasad S, O'Connell A, et al. Eplerenone for chronic central serous chorioretinopathy in patients with a subfoveal fluid: a randomized controlled trial. *Eye*. 2020;34(5):853–859.

[27]. Nicholson B, Noble J, Forooghian F, Meyerle C. Central serous chorioretinopathy: update on pathophysiology and treatment. *Surv Ophthalmol*. 2013;58(2):103–126.

[28]. Nicolò M, et.al. Current Pharmacological Treatment Options for Central Serous Chorioretinopathy: A Review. *Pharmaceuticals*. 2020, 13 (1):264-72. doi:10.3390/ph13100264;

[29]. Ryan EH, and Pulido CM. “Central serous chorioretinopathy treatment with spironolactone: a challenge-rechallenge case’. *Retin Cases Brief Rep.* 2015; 9(3): 235-8. doi: 10.1097/ICB.0000000000000147;
[30]. Sinawat S, et al. Oral Spironolactone Versus Conservative Treatment for Non-Resolving Central Serous Chorioretinopathy. *Retina*. 2020;40(7):1336-1342. doi:10.1097/IAE.0000000000002659
[31]. Sinawat S, Thongmee, W, Sanguansak, T, et.al. Oral Spironolactone versus Conservative Treatment for Non-Resolving Central Serous Chorioretinopathy in Real-Life Practice. *Clin Ophthalmol*. 2020 Jun 24:14:1725-1734. doi: 10.2147/OPTH.S260998
[32]. Singh SR, Venkatesh R, Ravindran RD, et al. Comparative efficacy of eplerenone and spironolactone in chronic CSCR: A real-world experience. *Indian J Ophthalmol*. 2020;68(1):92–95.
[33]. Spaide RF, Hall L, Haas A, et al. Central serous chorioretinopathy: treatment. *Retina*. 2017;37(10):1829-1835. doi:10.1097/IAE.0000000000001573
[34]. Sun Z, Yang D, Xu Y, et al. Efficacy of low-dose spironolactone in chronic central serous chorioretinopathy: a prospective cohort study. Eye (Lond). 2023;37(2):345–352.
[35]. Tilson L, McGowan B, Ryan M, et.al. Cost-effectiveness of spironolactone in patients with severe heart failure. Ir J Med Sci. 2003 Apr-Jun;172(2):70-2.doi: 10.1007/BF02915250.
[36]. van Dijk EH, Fauser S, Breukink MB, et al. Central serous chorioretinopathy: towards an evidence-based treatment guideline. *Prog Retin Eye Res*. 2018;73:100770.
[37]. van Dijk EHC, Fauser S, Breukink MB, et al. Half-dose photodynamic therapy versus high-dose spironolactone for chronic central serous chorioretinopathy: The PLACE trial. *Ophthalmology*. 2018;125(10):1547–1555.
[38]. Venkatesh R, Prabhu V, Joshi A, et.al. Real-world practice patterns of eplerenone use for central serous chorioretinopathy. *International Journal of Retina and Vitreous*. 2023 9:61:1-9. https://doi.org/10.1186/s40942-023-00500-w
[39]. Wang M, Munch IC, Hasler PW, Prünte C, Larsen M. Central serous chorioretinopathy. *Acta Ophthalmol*. 2008;86(2):126–145.
[40]. Zhao M, Célérier I, Bousquet E, et al. Mineralocorticoid receptor is involved in rat and human ocular chorioretinopathy. *J Clin Invest*. 2012;122(7):2672–2679.
[41]. Zhao M, Célérier I, Bousquet E, et al. Mineralocorticoid receptor antagonism in the treatment of chronic central serous chorioretinopathy: A randomized pilot study. *Am J Ophthalmol*. 2018;190:45–51.