Clinical course of von Szily reaction: Case report and comprehensive review of the literature

Caleb C. Ng\textsuperscript{a,b,*}, Judy J. Chen\textsuperscript{a,b}, Anita Agarwal\textsuperscript{a,b}, Emmett T. Cunningham Jr.\textsuperscript{a,b,c,d}

\textsuperscript{a} West Coast Retina Medical Group, San Francisco, CA, USA
\textsuperscript{b} The Department of Ophthalmology, California Pacific Medical Center, San Francisco, CA, USA
\textsuperscript{c} The Francis I. Proctor Foundation, UCSF School of Medicine, San Francisco, CA, USA
\textsuperscript{d} The Department of Ophthalmology, Stanford University School of Medicine, Stanford, CA, USA

ARTICLE INFO

Keywords:
Herpes simplex virus
Herpes zoster ophthalmicus
Immunocompromised
Necrotizing retinitis
Sclerouveitis
Varicella zoster virus

ABSTRACT

Purpose: To describe a rare case of von Szily reaction (VSR) accompanied by a comprehensive review of the literature.

Observations: A 57-year-old woman with herpes zoster ophthalmicus (HZO) associated with ipsilateral sectoral sclerouveitis and anterior uveitis (sclerouveitis) subsequently developed contralateral necrotizing retinitis, leading to a diagnosis of VSR. A literature review revealed 10 additional cases of VSR. The full VSR cohort of 11 subjects included six women and five men, had a median age of 39 years (range 21–78 years), and most presented with HZO (n = 7, 63.6%), often associated with either ipsilateral anterior uveitis (n = 5; 45.5%) or keratitis (n = 4; 36.4%). All 11 cases developed necrotizing retinitis in the fellow eye, at a median of six weeks following onset in the sentinel eye. The most frequently implicated agent was varicella zoster virus (VZV; n = 8, 72.7%). A high proportion of the eight patients with VZV-associated VSR were identified as having increased risk of VZV reactivation, including age of 50 years or greater (n = 5, 62.5%), an underlying malignancy (n = 3, 37.5%), and/or use of immunosuppressive medication (n = 2, 25.0%).

Conclusion: This was the first reported case of VSR presenting as HZO-associated with sclerouveitis. A comprehensive literature review revealed that most previously reported cases presented with HZO associated with isolated anterior uveitis and/or keratitis, and that all reported cases of VSR developed necrotizing retinitis in the fellow eye, typically within two months of initial presentation. Patients with VZV-associated VSR often had known risk factors for VZV reactivation.

1. Introduction

Von Szily first reported that rodents given an intracameral inoculation of herpes simplex virus type-1 (HSV-1) in one eye developed ipsilateral anterior uveitis followed by contralateral necrotizing retinitis.\footnote{1} This unique pattern of bilateral, sequential herpetic uveitis has since been shown to occur via viral spread along parasympathetic fibers of the oculomotor nerve to the ipsilateral ciliary ganglion, then to the Edinger-Westphal nucleus, thereafter to the suprachiasmatic area of the hypothalamus, and finally crossing over to the contralateral optic tract, optic nerve and retina.\footnote{2} Sparing of the ipsilateral retina is believed to be mediated by CD4\textsuperscript{+} and CD8\textsuperscript{+} T-cell dependent mechanisms.\footnote{3,4} While von Szily’s observations have been reproduced and studied further in several animal models,\footnote{5,6} reports of the phenomenon in humans have been rare. When observed, this unique series of events has been referred to clinically as the von Szily reaction (VSR).\footnote{7}

To the best of our knowledge, a total of 10 previous clinical reports of VSR have appeared in the literature.\footnote{7–14} We added here an eleventh case, the first wherein herpes zoster ophthalmicus (HZO) was accompanied by sclerouveitis at presentation. A comprehensive review of the 11 total reported cases was performed.

2. Case report

A 57-year-old Caucasian woman presented with left-sided HZO associated with sectoral sclerouveitis (Fig. 1A) and anterior uveitis (sclerouveitis). She previously received a four-day course of oral corticosteroid for left-sided periorbital pain and edema. A week later, an outside
ophthalmologist diagnosed her with left-sided HZO and anterior uveitis, and initiated treatment with oral acyclovir and topical corticosteroid drops. Best-corrected vision and intraocular pressures were normal bilaterally. The patient admitted poor compliance with recommended treatment, but noted symptomatic improvement in the left eye. Three weeks later she experienced decreased vision and floaters in her right eye. Repeat examination revealed a best-corrected vision of 20/60 on the right and 20/20 on the left, improved sclerouveitis on the left, and symptoms of scleritis, uveitis, or retinitis in either eye and her best-corrected visual acuity had improved to 20/32 on the right and 20/20 on the left.

3. Methods

A comprehensive literature review identified eight reports with a total of 10 previously described patients with VSR. The addition of our case brought the total to number of subjects to 11 (Table 1). Age at presentation ranged from 21 to 78 years, with mean of 45.3 years and median of 39 years. Five of the subjects were male and six were female (M:F ratio 0.83:1). Causative agents were uncovered through PCR (45.4%), serology (36.4%), or vitreous biopsy with viral culture (9.1%). Two eyes (18.2%) lacked any viral testing; one was given a clinical diagnosis of presumed VZV. Varicella zoster virus (VZV) was the most commonly implicated agent (72.7%), with herpes simplex (HSV) type 1 and type 2 detected in one case each (9.1%). A high proportion of the eight patients with VZV-associated VSR were identified to possess increased risk of VZV reactivation due to age (50 years or greater; n = 5, 62.5%), an underlying malignancy (37.5%), and/or use of immunosuppressive agents (25.0%). The most common findings in the presenting eye included HZO (n = 7; 63.6%), anterior uveitis (n = 5; 45.5%) and keratitis (n = 4; 36.4%). Ipsilateral cranial nerve palsy (n = 2; 18.2%), sectoral scleritis (n = 1; 9.1%), and ipsilateral acute retinal necrosis (ARN; n = 1, 9.1%) were also reported. Management approaches to the presenting eye included observation (n = 4, 36.4%), treatment with topical corticosteroids (n = 6, 54.5%), oral antiviral medication (n = 4, 36.4%), topical antiviral agents (n = 3, 27.3%), and/or oral corticosteroids (n = 2, 18.2%). All 11 patients (100%) developed contralateral necrotizing retinitis, and nine of those eyes (81.8%) were diagnosed clinically as having acute retinal necrosis (ARN). Time to fellow eye involvement ranged from 2 weeks to 21 years, with a median of 6 weeks. Fellow eyes received treatment with systemic antiviral medications (n = 10, 90.9%), topical corticosteroids (n = 7, 63.6%), systemic corticosteroids (n = 5, 45.4%), intravitreal antiviral medications (n = 1, 9.1%), and/or topical antiviral medications (n = 1, 9.1%). Time to last visit ranged from 3 weeks to 3.5 years, with a median of 8.5 weeks. Anatomic disposition of the presenting eyes at last visit was most commonly uncommon (63.6%), but corneal scarring, sectoral iris atrophy, pigmented retinal scars, and total retinal detachment were each observed in one case (9.1%). Visual acuity in the presenting eyes at last visit ranged from 20/16 to no light perception (NLP), with a median of 20/30. Nine (81.8%) fellow eyes were described to have resolution of the retinitis with an attached retina at last examination. Four of these eyes (36.4%) were treated with prophylactic laser barricade, with one still progressing to retinal detachment. Two (18.2%) eyes underwent successful surgical repair of retinal detachments. One contralateral eye each (9.1%) had optic neuropathy and had total rhegmatogenous retinal detachment at last visit. The outcome of one eye (9.1%) was not described. Visual acuity in contralateral eyes at last visit ranged from 20/16 to NLP, with median of 20/40.

5. Discussion

A 58-year-old woman developed unilateral HZO with sclerouveitis and was found to have necrotizing retinitis in her contralateral eye three weeks later, a clinical picture consistent with VSR. Of the 11 total reported subjects with VSR (Table), the majority presented with HZO, frequently with anterior uveitis, keratitis, or both. A contralateral necrotizing developed in all cases, typically within two months. Among those with VZV-associated VSR, the presence of one or more risk factors.

![Fig. 1. (A) External photograph of the right eye showed temporal, sectoral scleritis in the setting of herpes zoster ophthalmicus. (B) Widefield (Optos®) fundus photograph of the left eye revealed mild vitritis and patchy necrotizing retinitis in the nasal inferotemporal periphery (arrows). Both images were taken three weeks after initial presentation, concurrent with onset of symptoms in the secondarily involved eye. External photograph was taken after the installation of phenylephrine and tropicamide, confirming the presence of scleritis as opposed to either episcleritis or conjunctival injection.](image-url)
Table 1
Clinical Characteristics of Report Cases of von Szily Reaction.

| Author                | Age | Sex | Immune Status | Virus Testing | Initial Eye Findings in Presenting Eye | Treatment for Presenting Eye | Time to Contra lateral Eye Involvement | Findings in Contralateral Eye | Treatment for Contralateral Eye | Final anatomic disposition Contralateral Eye | Time to Last Visit | Final Vision Initial Eye | Final Vision Contralateral Eye |
|-----------------------|-----|-----|---------------|---------------|----------------------------------------|-----------------------------|----------------------------------------|-------------------------------|----------------------------------|----------------------------------------|-------------------|--------------------------|--------------------------|
| Ng et al., 2020       | 58y | F   | Compromised   | VZV PCR       | OS HZO Anterior uveitis, Sectoral Scleritis, Congenital HSV-2 keratitis | PO Acyclovir and Prednisolone eyedrops | 3w Patchy necrotizing retinitis | PO Valacyclovir and Prednisolone and Cyclopentolate eyedrops | Unremarkable Attached | Resolved retinits | 1.6y 20/20 20/32 |
| Smith et al., 2007    | 21y | F   | Competent     | PCR of Vitreous biopsy | OS | None | Prednisolone eyedrops | 5y Patchy retinitis | Prednisolone and Trifluridine eyedrops | PO Acyclovir | Peripheral retinal scars | Attached 20/50 |
| Matthews et al., 2002 | 32y | F   | Compromised   | VZV PCR       | OD HZO Keratouveitis, PO Famiciclovir, 4w Acyclovir and Prednisolone eyedrops | ARN | Early ARN | IV Acyclovir, Prophylactic laser barricade SB/PPV for RRD, | Attached s/p Epiretinal membrane | Attached retinits | 3.5y 20/30 HM |
| Matthews et al., 2002 | 39y | M   | Compromised   | VZV PCR       | OS HZO Keratouveitis, PO Famiciclovir and Dexamethasone eyedrops | 4w | Early ARN | IV Acyclovir Prophylactic laser barricade | Unremarkable | Attached retinits | 1.25y 20/30 20/20 |
| Nakanishi et al., 2000| 64y | M   | Compromised   | VZV Serology  | OS HZO | Acyclovir ointment | 4w | Early ARN | IV Acyclovir PO prednisone and ASA Corticosteroid eyedrops | Unremarkable | Attached | 3.5w 20/16-1 20/16-1 |
| Farrell et al., 1991  | 64y | M   | Compromised   | VZV Serology  | OD HZO Anterior uveitis, CN 3 palsy | 7w | Early ARN | IV Acyclovir PO Prednisone, Corticosteroid eyedrops | Unremarkable | Attached retinits | 6w 20/100 LP |
| Lewis et al., 1989    | 27y | M   | Competent     | HSV-1 Viral Culture From Diagnostic Vitrectomy Serology | OS | Unknown | None | Unknown | ARN | Unremarkable | Total RRD 4w 20/20 NLP |
| Browning et al., 1987 | 78y | M   | Compromised   | VZV Serology  | OS HZO CN 4 palsy, anterior uveitis | None | 7w | Early ARN | IV Acyclovir PO Prednisone and Methyprednisolone | Unremarkable | Attached retinits | 3w 20/30 20/25 |
| Yeo et al., 1986      | 59y | F   | Compromised   | VZV Serology  | OS HZO None | 6w | Early ARN | IV Acyclovir PO Acyclovir, Prednisolone eyedrops | Unremarkable | Attached s/p SB/PPV | 9w 20/30 LP |

(continued on next page)
| Author          | Age | Sex | Immune Status                | Virus Testing | Initial Eye | Findings in Presenting Eye | Treatment for Presenting Eye | Time to Contralateral Eye Involvement | Findings in Contralateral Eye | Treatment for Contralateral Eye | Final anatomic disposition Contralateral Eye | Time to Last Visit | Final Vision Initial eye | Final Vision Contralateral eye |
|-----------------|-----|-----|-------------------------------|---------------|-------------|-----------------------------|-----------------------------|--------------------------------------|----------------------------------|----------------------------------|---------------------------------|------------------|---------------------------|-------------------|
| Fisher et al., 1981 | 26y | F   | Compromised (Steroid exposure) | unknown       | OS          | ARN                         | Corticosteroid and Mydriatic eyedrops | 2w                                  | ARN                               | 2w                              | Total RRD with multiple breaks | Attached Resolved retinitis | 2y               | NLP                        | 20/20             |
| n = 11          |     |     |                               |               |             |                             |                             |                                     |                                  |                                  |                                 |                  |                           |                   |
| Mean 45.3y      | F   | 63.4% | Compromised                  | VZV 72.7%     | OD:         | HZO 63.6%                   | Corticosteroid               | Median 6w                           | Retinitis 100%                     | Systemic Antiviral 90.9%        | Unremarkable                  | Attached with Resolved retinitis | Median 8.5w       | Range 20/30            | Range 20/16-NLP      |
| Median 39y      |     | 36.6% | Competent                    | PCR 45.4%     | OS:         | HSV-1 9.3%                  | Topical Corticosteroids 54.5% | Range 2w                           | 81.8%                            | Topical Corticosteroids 63.6%   | Total RRD 91.1%                | Range 3w-3.5y       | Range 20/16-NLP      | Range 20/16-NLP      |
| Range 21-78y    |     |       |                               | Culture 9.1%  | CN palsy: | HSV-2: 9.1%                 | Systemic Corticosteroids 54.5%|                                    |                                   | Systemic Scarring 9.1%           | Total RRD 91.8%               |                               |                           |                   |
|                 |     |       |                               | Keratouveitis 9.1% | None:     | Sectoral Scleritis 9.1%     | Laser Barricade 36.4%         |                                    |                                   | Sectoral Iris Atrophy 9.1%      | 91.1%                          |                               |                           |                   |
|                 |     |       |                               | Keratitis 9.1% | Oral:      | Antiviral 27.3%             | RRD repair 18.2%             |                                    |                                   | Optic neuropathy 9.1%           | 91.1%                          |                               |                           |                   |
|                 |     |       |                               | ARN 9.1%      | Corticosteroids 18.2%       | Intravireal Antiviral 9.1%   |                                    |                                   | Pigmented Retinal Scleritis 91.1%| 91.1%                          |                               |                           |                   |
|                 |     |       |                               | Unknown 9.1%  |                                      | Topical Antiviral 9.1%      |                                    |                                   |                                  |                                 |                               |                           |                   |

Legend: w - weeks, y - years, M – male, F - female, OD - right eye, OS - left eye, SLE - systemic lupus erythematosus, VZV - varicella zoster virus, HSV - herpes simplex virus, PCR - polymerase chain reaction, N/A - not applicable, HZO - herpes zoster ophthalmicus, CN - cranial nerve, ARN - acute retinal necrosis, SB - scleral buckle, PPV - pars plana vitrectomy, RRD - rhegmatogenous retinal detachment, HM - hand motion, LP - light perception, NLP - no light perception, PO - by mouth, IV - intravenous, ASA - acetylsalicylic acid.

a Smith et al. made diagnosis of von Szily reaction based on concurrent ipsilateral keratouveitis and acute retinal necrosis with magnetic resonance imaging changes involving both optic tracts, lateral geniculate ganglia, temporal lobes, and the midbrain.

b Patient treated with “five tablets” of oral prednisone daily for four days after she presented with early symptoms of HZO OS to local urgent care.

c Clinical diagnosis of VZV.

d Treated with pulsed cyclophosphamide and methylprednisolone.

e Sectoral scleritis was present on examination of the initial eye when necrotizing retinitis was diagnosed in the contralateral eye.

f Authors described a left hypertropia worse on right gaze and left head tilt.
for VZV reactivation was common.

Similar to animal models wherein intracamer al herpes virus inoculation led to ipsilateral anterior uveitis followed by contralateral retinal necrosis within one or two weeks, for patients with VSR typically have unilateral, anterior herpes virus infection followed by necrotizing retinitis in the fellow eye within two months. Several cases have, however, differed in noteworthy ways. For example, a 27-year-old man (Lewis et al., Table 1) with unilateral necrotizing retinitis was retrospectively diagnosed with VSR based on magnetic resonance imaging of the brain, which revealed bilateral enhancement of the anterior and posterior visual pathways. In addition, two patients with a remote history of keratitis and onset of contralateral retinitis five and 21 years following their last episode of keratitis were also classified as having a VSR. Lastly, a 26-year-old woman (Fisher et al., Table 1) with necrotizing retinitis in the presenting eye followed two weeks later by necrotizing retinitis in the fellow eye was retrospectively diagnosed with a VSR, despite the fact that 10-12.9% of patients with necrotizing retinitis who receive antiviral treatment and 27.3–69.6% of patients who do not receive such treatment will eventually develop necrotizing retinitis in the fellow eye — a series of events not typically classified as VSR, but traditionally as bilateral ARN (BARN).

Since the diagnosis of a VSR requires the presence of necrotizing retinitis and because necrotizing herpetic retinitis is most often due to VZV, it is perhaps not surprising that VZV was implicated in most clinical reports of VSR. As the diagnosis of VSR also requires the presence of anterior infection in the presenting eye, and the most common cause of VZV-related anterior uveitis is HZO, it follows therefore that most cases of the VSR began as HZO.

Of eight cases of VZV-associated VSR, all but one had one or more risk factors for VZV reactivation. Nearly two-thirds were ≥50 years of age, just over one-third had an underlying malignancy, one quarter received treatment with immunotherapeutics, and just over one-third possessed a combination of the above mentioned risk factors. Each of these risk factors have been associated separately with VZV reactivation.

While all seven cases of conventional VSR possessed risk factors for impaired immunity and VZV reactivation, an absence of early systemic antiviral therapy in some patients may have also played a role in the subsequent development of contralateral retinitis. Specifically, just four of these patients (57.1%) received early systemic antiviral treatment, two (28.7%) received no treatment, and one (14.3%) only topical acyclovir in the presenting eye.

Our case is the first report of VSR presenting initially as HZO associated with sclerouveitis. Herpetic scleritis is an acute, unilateral condition, often associated with moderate to intense pain. Patients with herpetic scleritis are three times more likely to have vision loss compared to non-infectious scleritis.

Most patients with VSR retained vision better than or equal to 20/20 in both eyes following treatment with systemic antiviral medications and topical or systemic corticosteroids. However, eyes that developed optic nerve involvement (n = 1) or retinal detachment (n = 4) had a final visual acuity that ranged from hand motion to no light perception. Contralateral eyes with necrotizing retinitis accounted for four of the five eyes left with poor vision at final visit. Three of the five eyes that were left with poor vision at final visit failed to receive early systemic antiviral therapy, perhaps further supporting the use of early systemic antiviral treatment in patients with HZO.

6. Conclusion

The VSR is a rare clinical syndrome characterized by bilateral, consecutive, ocular herpes virus infection. The vast majority of cases were associated with VZV, most commonly presenting as HZO with anterior uveitis, keratitis, or both. Patients with VSR were often relatively immunosuppressed and prone to VZV reactivation by dint of age or underlying medical conditions. All reported VSR patients developed necrotizing retinitis in the fellow eye, usually within two months, which resulted in poor long-term vision in one-third of these eyes. Patients who develop HZO and possess one or more underlying factors for impaired immunity should be counseled regarding signs and symptoms of contralateral eye involvement and undergo bilateral, dilated eye examination both at presentation and during follow up visits. Consideration should be given to early, systemic anti-viral therapy in patients who develop HZO.

Patient consent

The patient consented to the publication of the case in writing.

Funding

San Francisco Retina Foundation.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Declaration of competing interest

None of the authors have any financial disclosures.

Acknowledgments

None.

References

1. Von Szily A. Experimental endogenous transmission of infection from bulbus to bulbus. Klin Monatsh Augenh Heilkd. 1924;72:593–602.
2. Vann VR, Atherton SS. Neural spread of herpes simplex virus after anterior chamber inoculation. Invest Ophthalmol Vis Sci. 1991 Aug;32(9):2462–2472.
3. Aunan X, Atherton SS. Sparing of the ipsilateral retina after anterior chamber inoculation of HSV-1: requirement for either CD4+ or CD8+ T cells. Invest Ophthalmol Vis Sci. 1994 Jul;35(8):3251–3259.
4. Matsubara S, Atherton SS. Spread of HSV-1 to the suprachiasmatic nuclei and retina in T cell depleted BALB/c mice. J Neuroimmunol. 1997 Dec 1;80(1-2):165–171.
5. Whitting JA, McCulley JP, Niederkern JY, Streilein JW. Ocular disease induced in mice by anterior chamber inoculation of herpes simplex virus. Invest Ophthalmol Vis Sci. 1984;25:1065–1073.
6. Zalts MM, Opromocik EM, Hemady R, Foster CS. Immunohistopathologic findings in herpes simplex virus chorioretinitis in the von Szily model. Invest Ophthalmol Vis Sci. 1992 Jan;33(1):68–77.
7. Smith LR, Kuz F, Wilson DJ, Flaxel CJ, Rosenbaum JT. Two patients with the von Szily reaction: herpetic keratitis and contralateral acute retinal necrosis. Am J Ophthalmol. 2007 Mar 1;143(3):536–538.
8. Fisher JP, Lewis ML, Blumenkranz M, et al. The acute retinal necrosis syndrome: Part I: clinical manifestations. Ophthalmology. 1982 Dec 1;89(12):1309–1316.
9. Yeo JH, Pepose JS, Stewart JA, Sternberg Jr P, List RA. Acute retinal necrosis syndrome following herpes zoster dermatitis. Ophthalmol. 1986 Nov 1;93(11):1418–1422.
10. Browning DJ, Blumenkranz MS, Culbertson WW, et al. Association of varicella zoster dermatitis with acute retinal necrosis syndrome. Ophthalmology. 1987 Jun 1;94(6):602–606.
11. Lewis ML, Culbertson WW, Post MJ, Miller D, Kukame GT, Diz RD. Herpes simplex virus type 1: a cause of the acute retinal necrosis syndrome. Ophthalmol. 1989 Jun 1;96(6):875–878.
12. Farrell TA, Wolf MD, Folk JC, Pulido JS, Yuh WT. Magnetic resonance imaging in a patient with herpes zoster keratouveitis and contralateral acute retinal necrosis. Am J Ophthalmol. 1991;112(6):735–738.
13. Nakanishi F, Takahashi H, Ohara K. Acute retinal necrosis following contralateral herpes zoster ophthalmicus. Jpn J Ophthalmol. 2000 Sep;44(5):561–564.
14. Matthews BN, Erb N, Gordon C, Callens AR, Murray PJ, Salmon M. Unilateral varicella zoster virus ophthalmicus and contralateral acute retinal necrosis. Eye. 2002 Nov;16(11):778–780.
15. Finchaint S, Cebrian-Cuenca AM, Briscoe H, et al. Similar herpes zoster incidence across Europe: results from a systematic literature review. BMC Infect Dis. 2013;13(1):170.
16. Yawn BP, Saddler P, Wollan PC, Sauver JL, Kurland M, Sy LS. A population-based study of the incidence and complication rates of herpes zoster before zoster vaccine introduction. Mayo Clin Proc. 2007 Nov 1;82(No. 11):1341–1349. Elsevier.
17. Pawelec G, Barnett Y, Forsey R, et al. T cells and aging. January 2002 update. Front Biosci. 2002 May 1;7(May):d1156–d1183.
18. Lippitz BE. Cytokine patterns in patients with cancer: a systematic review. Lancet Oncol. 2013 May 1;14(6):e218–e228.
19. Browning DJ. Acute retinal necrosis following epidural steroid injections. Am J Ophthalmol. 2003;136:192–194.
20. Ramaiya KJ, Rao PK. Herpetic necrotizing retinitis following flucinolone acetonide intravitreal implant. Ocul Immunol Inflamm. 2011;19:72–74.
21. Saatci AO, Ayhan Z, Arikan G, et al. Unilateral acute retinal necrosis in a multiple sclerosis patient treated with high-dose systemic steroids. Int Ophthalmol. 2010;30:629–632.

22. Meghpara B, Sulkowski G, Kesem MR, Tesler IH, Goldstein DA. Long-term follow-up of acute retinal necrosis. Retina. 2010 May 1;30(5):795–800.
23. Polay DA, Sternberg Jr P, Davis J, et al. Decrease in the risk of bilateral acute retinal necrosis by acyclovir therapy. Am J Ophthalmol. 1991 Sep;112(3):250–255.
24. Wong RW, Jumper JM, McDonald HR, et al. Emerging concepts in the management of acute retinal necrosis. Br J Ophthalmol. 2013 May 1;97(5):545.
25. Marsh RJ, Easty DL, Jones BR. Iritis and iris atrophy in herpes zoster ophthalmicus. Am J Ophthalmol. 1974 Aug 1;78(2):255–261.
26. Gonzalez-Gonzalez LA, Molina-Prat N, Doctor P, Tauber J, de la Maza MT, Foster CS. Clinical features and presentation of infectious scleritis from herpes viruses: a report of 35 cases. Ophthalmology. 2012 Jul 1;119(7):1460–1464.