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Case Report

Treating x-linked retinoschisis with topical dorzolamide: A case report from Jamnagar

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Abstract

Eleven years old boy presented with complaint of dimnison of vision in school. On visual examination right eye best corrected visual acuity (BCVA) was 6/18 and left eye BCVA was 6/24.On fundoscopic examination patient had foveal schisis, noted as a spoke wheel pattern radiating from the fovea and a domelike elevation of a thin layer of retina. On Spectral-domain optical coherence tomography (SD-OCT) showed right eye central macular thickness (CMT) was 554µm and left eye CMT was 617µm.The patient was prescribed 2% dorzolamide hydrochloride eye drops in thrice-daily dosing. At 6 months follow-up, BCVA improved to 6/12 in right eye and 6/18 in left eye. SD- OCT showed reduction in foveal schisis and CMT decreased to 161µm and 189µm in right and left eye, respectively.

Keywords: XLRS, Dorzolamide, OCT, RS1 gene, Spoke wheel pattern.

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1. Introduction

X-linked juvenile retinoschisis (XLRS) is the most common inherited retinal disease in young males, affecting approximately 1 in 15,000 to 30,000.[1] Mutations in the RS1 gene on the X chromosome cause it. The RS1 gene codes for retinoschisin, a protein secreted by photoreceptors believed to play a role in retinal cell adhesion and architecture.[2]

XLRS is inherited in an X-linked recessive pattern, so it primarily affects males while female carriers are usually asymptomatic.[3] Symptoms typically begin between ages 5-10, with progressive visual impairment often occurring after age 40.[1,3] Characteristic features include reduced visual acuity, strabismus, anisometropia, and retinal splitting (schisis).[1,4] The macula is bilaterally affected, often showing a spoke-wheel pattern of schisis cavities.[4] Peripheral retinal schisis may also occur.[1] Electroretinography shows a distinctive reduction in b-wave amplitude.[5] Optical coherence tomography (OCT) can visualize the retinal splitting and cyst-like spaces.[6]

Treatment options for XLRS include topical carbonic anhydrase inhibitors like dorzolamide, laser photocoagulation, and RS1 gene therapy.[7,8] Dorzolamide has been shown to improve visual acuity and reduce macular schisis, likely by acidifying the extracellular space and enhancing fluid transport out of the retina.[9,10]

Aim of study to evaluate effectiveness of topical Dorzolamide in treating x linked retinoschisis (genetic disorder) by assessing it's impact on retinal structure (retinoschisis) and visual function.

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2. Objective

To explore whether Dorzolamide (carbonic anhydrase inhibitor) which traditionally used for intraocular pressure management, could offer therapeutic benefits in reducing retinal cystic changes and vision deterioration associated with XLRS.

The majority of existing studies on XLRS have focused on genetic and surgical interventions, with limited exploration into pharmacologic approaches targeting retinal cyst formation and degeneration. Specifically, the use of carbonic anhydrase inhibitors such as Dorzolamide in modulating retinal fluid dynamics and preserving macular integrity has not been rigorously evaluated in XLRS. Therefore, there is a critical need for controlled clinical trials to assess the safety, efficacy, and mechanistic effects of topical Dorzolamide in mitigating the retinal pathology associated with XLRS, with an emphasis on its potential to reduce cystic changes and prevent further visual impairment.

3. Case Report

This case report describes an 11-year-old boy who presented with a 6-month history of reduced vision. He had no previous history of trauma, inflammatory or infectious ocular disease. Ocular mobility and anterior segment bio microscopy examination was normal. Applanation (Goldmann) tonometry recorded 15 mmHg in both eyes. Best corrected visual acuity (BCVA) of 6/18 OD and 6/24 OS, respectively. After taking informed consent pt's pupil was dilated using 10%phenylephrine and 1% tropicamide eyedrops and dilated fundus examination carried out using 20D lens and indirect ophthalmoscope which shows the classic spoke-wheel pattern of foveal schisis.[4] The OCT results revealed a pattern with a cleavage of the retina into two distinct planes, one deep (outer retina) and one superficial. The two layers were superficially connected with thin-walled, vertical palisades, separated by low reflective, cystoid spaces, which were confluent and most prominent in the foveal region.[6] The diagnosis of XLRS was confirmed by electroretinography.[5] After taking informed consent patient was treated with topical dorzolamide 2% three times daily.[9,10] After 6 months, his visual acuity improved to 6/12 OD and 6/18 OS. OCT showed marked resolution of the macular schisis, with central macular thickness decreasing from 554µm to 161µm OD (**Figure 1** a and c) and 617µm to 189µm OS (**Figure 1** b and d).[6,9]

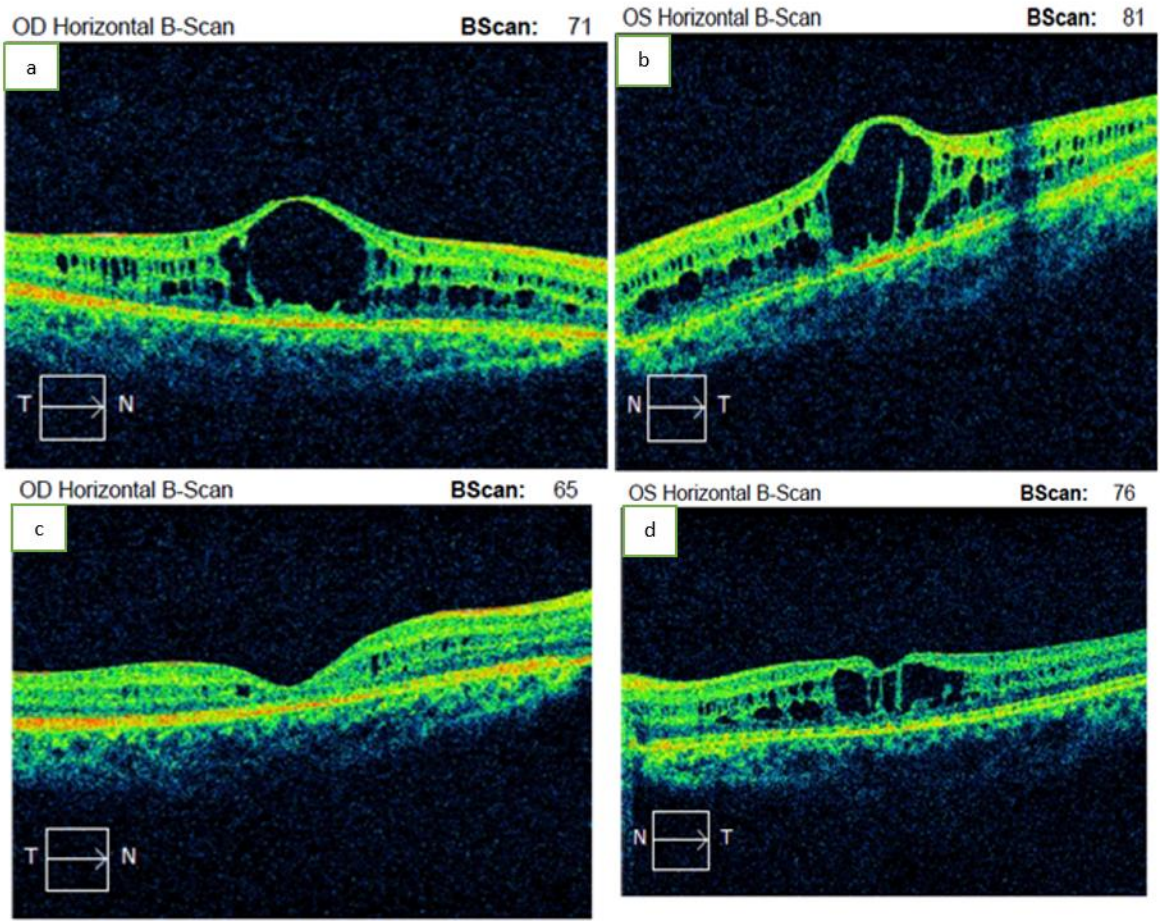

Figure 1:

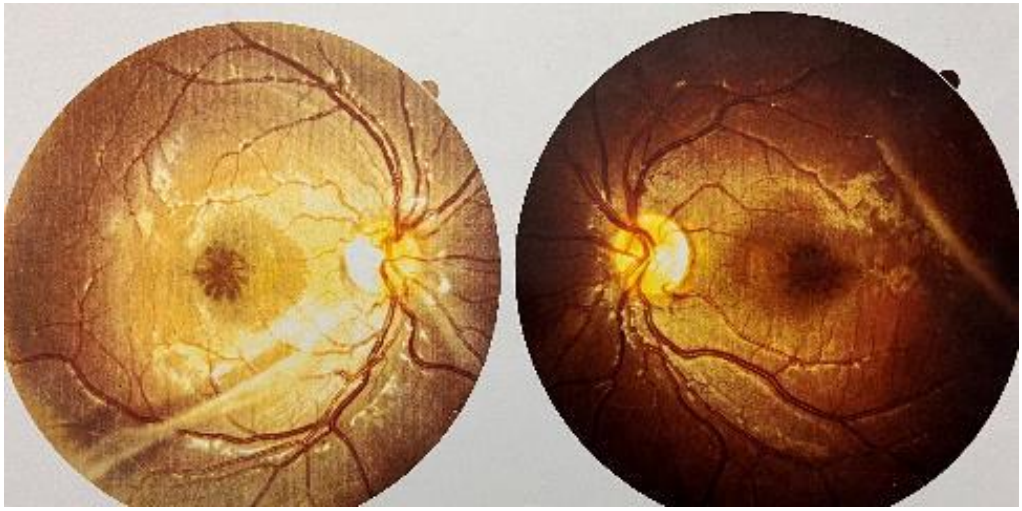

Figure 2: Fundus photograph showing spoke wheel pattern radiating from the fovea at time of presentation

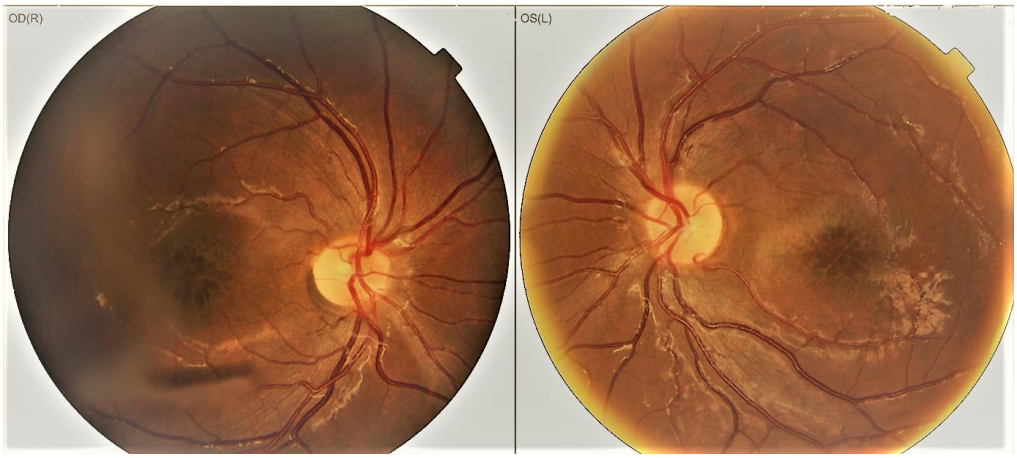

Figure 3: Fundus photograph showing spoke wheel pattern radiating from the fovea after 6 months of topical dorzolamide treatment.

4. Discussion

XLRS is characterized by decreased visual acuity in the first decade of life and splitting of the retinal layers, resulting in cyst formation, predominantly affecting males.[1,3] The disease is slowly progressive, with most patients retaining relatively good vision until their 50s or 60s when macular atrophy develops.[1] Histologically, XLRS shows coalescent cysts primarily in the outer plexiform layer and adjacent nuclear layers of the retina. Non-union of the retinal layers creates schisis cavities that can extend into the vitreous as a translucent, veil-like membrane.[4,11] The schisis is often located inferotemporal to the macula.

In this case, the patient showed a dramatic response to topical dorzolamide three times daily for 6 months.[9,10] Visual acuity improved and OCT demonstrated significant reduction in macular schisis and central macular thickness.[6,9] This is consistent with prior studies showing the efficacy of dorzolamide in XLRS.[9,10] The mechanism is thought to involve acidification of the extracellular space by inhibition of carbonic anhydrase in the retinal pigment epithelium, leading to enhanced fluid transport and improved retinal adhesion.[9,12]

There has been gene replacement experimental study tried with some success with both knock-out mouse XLRS types. In each case, the RS1 gene was given to the afflicted male mice by an adeno-associated viral vector and intraocular injection. A further examination of the retina in these animals revealed that retinoschisin was successfully expressed in all retinal layers. ERG recordings were used to assess retinal function, and in each of these models, replacing the RS1 gene restored the b-wave amplitude.[13,14]

5. Conclusion

This case report emphasizes the importance of early treatment with topical dorzolamide in XLRS patients to reduce macular schisis and prevent complications like lamellar or full-thickness macular holes that can further impair vision at a young age. By reducing cyst formation and promoting retinal layer adhesion, dorzolamide may help preserve visual function in this progressive genetic retinal disorder. Prompt diagnosis and initiation of treatment are

crucial for optimizing long-term visual outcomes in patients with XLRS.

6. Study Limitations

One limitation of study is absence of genetic analysis as our center does not have the necessary facilities for gene testing. Genetic counselling could have provided more definitive diagnosis and insight into underlying genetic mutations and enhancing the robustness of study. While XLRS was diagnosed based on retinal imaging and the patient's clinical history, the absence of genetic confirmation means that the diagnosis was based solely on indirect evidence.

7. Source of Funding

None.

8. Conflict of Interest

None.

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