CASE REPORT

Multi-modal Treatment Approach Incorporating Vision Therapy and Syntonics for Combined Organic and Functional Amblyopia

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ABSTRACT

Background

Amblyopia is characterized by reduced visual acuity along with compromised binocular visual function. Form deprivation amblyopia is obstruction of light which prevents visual development. It is has traditionally been managed at an early stage of life through occlusion therapy.

Case Summary

A 32-year-old male was diagnosed with acquired form deprivation strabismic amblyopia. Ocular trauma resulted in post pupilloplasty with membranectomy surgery of the right eye, and pseudophakia of the right eye, while the posterior segment was within normal limits. Stereopsis was absent. In-office and home vision therapy was implemented, which included syntonic phototherapy, space fixator, and monocular fixation in binocular field and Ambi-iNet.

Conclusion

A multi-modality approach in treatment improved vision and stereopsis for an adult with acquired form deprivation strabismic amblyopia secondary to traumatic cataract, occlusio pupillae, and traumatic angle closure glaucoma.

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BACKGROUND

Amblyopia is a unilateral or bilateral condition in which the best corrected visual acuity is worse than 20/20 or 6/6 in the absence of any pathological abnormality in the eye. Along with reduction in visual acuity, patients have compromised binocular visual function.[1,2] Amblyopia is considered to be a developmental disorder which results in physiological alteration in the visual cortex early in life affecting infants and young children.[3] The most common causes of amblyopia are uncorrected refractive error, anisometropia, and strabismus.[4]

Form deprivation amblyopia is caused by obstruction of light causing formation of distorted images on the retina. Some sources suggest that the obstruction often leads to significant amount of visual impairment if not treated within the critical period of visual system development.[5] Form deprivation amblyopia and strabismic amblyopia are more severe forms of amblyopia as compared to other types such as anisometropic amblyopia or ametropic amblyopia. Causes of form deprivation amblyopia include congenital or traumatic cataract, corneal opacities and eyelid ptosis.[6,7]

Ocular traumas are most the common cause of blindness, and can range from corneal abrasion to devastating globe ruptures.[8] Hypotony, traumatic cataract, iris laceration, vitreous prolapse, hyphema, secondary glaucoma and retinal edema are significantly associated with ocular trauma. In particular, corneal scar corneal opacity, hypotony, aphakia, and retinal detachment contribute to poor final visual outcomes which lead to form deprivation amblyopia.[9,10]

Until relatively recently, the standard treatment of form deprivation amblyopia has been occlusion therapy, which involves patching of the dominant eye. This treatment can be effective for young children, with 75% improvement in visual acuity. However, its effectiveness decreases in older children and adults due to decreased plasticity in brain.[11,12] For that reason, visual intervention was often withheld due to the presumed lack of neuroplasticity. However, methods like dichoptic therapy, perceptual learning and video games have been developed to improve visual outcomes in amblyopia for patients of all ages.[13,14] The case study that we present here involving an adult reflects a more contemporary approach to managing amblyopia. This includes the combination of syntonic phototherapy with optometric vision therapy, based on a synergistic approach to neuroplasticity of the brain.[15]

Although the concept of syntonic phototherapy has existed for many years, its practice remains limited to a minority of the optometric profession. It is not widely held to be evidencebased practice, though the case reports of its efficacy have been steadily mounting. Most of the cases reported involve managing form deprivation amblyopia in infants or children with the help of occlusion therapy. In contrast, our case report involves an acquired form deprivation strabismic amblyopia in an adult with occlusio pupillae and traumatic angle closure glaucoma secondary to traumatic cataract. It presents a stepwise approach in vision therapy and syntonic phototherapy that shows improvement in visual acuity and stereopsis.

CASE REPORT

A 32-year-old male presented with complaints of squint (eye turn) and of poor vision in the right eye. History indicated that the patient had blunt trauma to the right eye caused by impact with a door knob at the age of 6 years. As a result of that episode, the patient developed glaucoma and cataract in the right eye. This was treated with YAG laser peripheral iridotomy and cataract surgery respectively performed elsewhere. YAG pupilloplasty of the right eye for occlusion papillae was conducted in February 2020 (see Figure 1). At that time a B scan report showed that the retina of the right eye was attached and intact (see Figure 2).

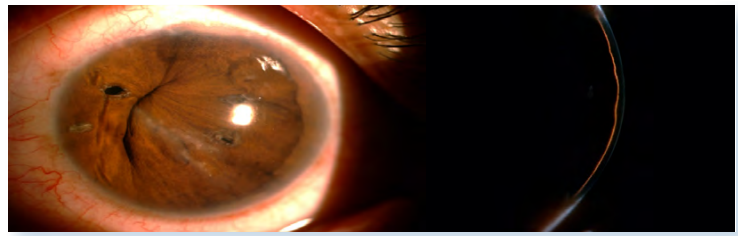

Figure 1. Clinical representation of patient's right eye showing occlusio pupillae

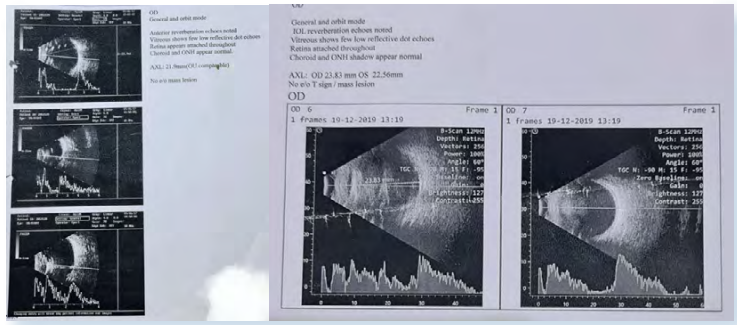

Figure 2. B- Scan ultrasonography reports

INITIAL EXAMINATION

On examination, the best corrected visual acuity was recoded as hand movement in the right eye and 6/6 at distance with N6 at near in the left eye. A constant 20 prism diopter right esotropia was present. Slit lamp examination revealed Occlusio Pupillae (status post traumatic cataract, YAG laser peripheral iridotomy/ pupilloplasty with membranectomy) in the right eye and no obvious abnormality in the left eye. Intra ocular pressure with applanation tonometer was recorded as 20 mm Hg in the

right eye and 10 mmHg in the left eye. After initial optometric examination, he was referred to an eye hospital to consider pupilloplasty surgery, as his past B-scan report showed an attached retina. The patient was instructed to consider the option of vision therapy following surgical intervention, if indicated.

The patient returned to our clinic four months after surgery. Post-operative surgical report from the eye hospital revealed that he underwent pupilloplasty with membranectomy of the right eye under local anesthesia (see Figure 3).

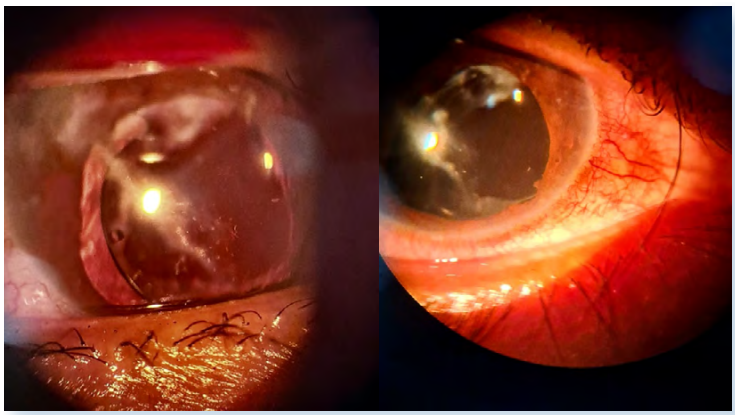

Figure 3. Post-pupilloplasty with membranectomy surgery in the right eye

An Optical Coherence Tomography (OCT) report of the right eye showed that the retina was normal (see Figure 4).

The patient was advised to continue his topical medications for glaucoma, consisting of Brinzolamide Ophthalmic Suspension IP 1.0% eye drops 3 times per day, Carboxymethylcellulose Sodium IP 0.5% eye drops 4 times per day and Nepafenac Ophthalmic Suspension eye drops 2 times per day in the right eye.

The clinical examination data are shown in Table1. On examination best corrected visual acuity was recorded as 6/60 at distance and N10 at near with a correction of – 4.00 / -3.25 X 165, and an add of +2.50 in the right eye. The left eye was 6/6 at distance and N6 at near. Squint (strabismus) evaluation revealed 18 prism diopters of esotropia with 10 prism diopters of hypertropia of the right eye. Sensory testing using the Worth Four Dot revealed suppression of the right eye at distance and near. Visuoscopy

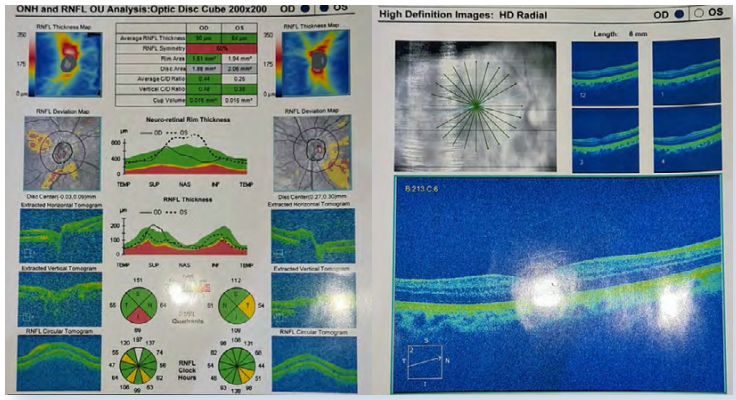

Figure 4. Optical Coherence Tomography report was within normal limits in the right eye

revealed 2 prism diopters of unsteady nasal eccentric fixation in right eye. Stereopsis was absent the on the Randot stereo test. Extraocular motility was unrestricted. The SCCO test revealed reduced saccades and pursuits of the right eye. Functional color field test showed constricted field for right eye by 40 %. Slit lamp examination of the anterior segment showed posterior chamber intraocular lens in the right eye, with the left eye within normal limits. Posterior segment evaluation was within normal limits in both eyes. Based on the findings above, the patient was diagnosed with acquired form deprivation strabismic amblyopia secondary to post traumatic ocular complications. He was advised to undergo vision therapy, although the prognosis for improvement was guarded.

PROGNOSIS AND TREATMENT

The main goal for vision therapy in this case was to improve visual acuity in his right eye. A secondary goal was to correct the squint (strabismus) and improve cosmetic appearance along with depth perception. Aside from functional improvement in spatial judgement, the patient also desired to be able to enjoy 3D games and 3D movies.

A spectacle lens prescription was given in accordance with the refractive findings above. Vision therapy was advised to a) improve his vision in the right eye, b) improve oculomotor skills, and c) reduce the magnitude of strabismus. The guarded visual prognosis was thoroughly

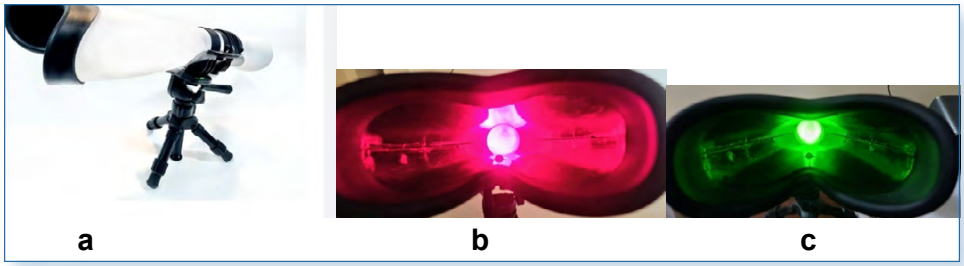

Figure 5. a: Syntonizer b: Alpha-Delta filter c: Mu-Delta filter

explained to patient. We proceeded once the patient accepted the treatment plan.

TREATMENT

The overall treatment plan was subdivided into 3 phases:

1st Phase:

Primary clinical goal was to improve monocular visual skills which included saccades, pursuits, central fixation training along with improvement of vision and functional visual field through the amblyopic eye. In-office vision therapy sessions were started along with home vision therapy sessions for 20 minutes with Ambi-Net.

In office vision therapy sessions were administered for 1hour on a daily basis and started with syntonic phototherapy with Alpha-Delta for 10 minutes followed by Mu-delta for 10 minutes with overall duration of 20 minutes (see Figure 5).

Alpha-delta and mu-delta filters were chosen based on the principles of syntonic syndrome (Chronic Syndrome + lazy eye Syndrome). According to Lazy Eye Syndrome, Alpha-Delta which is in the range of red to-orange colour frequencies acts as a strong sympathetic stimulant to treat esotropia or amblyopia. The filter combinations applied in the procedures are thought to construct a higher electrical charge in the cell membranes in order to reduce the synaptic resistance and thereby overcome amblyopia and binocular suppressions.

Diagnosis also may include functional visual field constriction, abnormal retinal correspondence and poor fusion. With respect to the chronic syndrome, individuals with chronic or degenerative health problems might possess organic, metabolic, toxic, or from past trauma. The filter combination consisting of yellow-green are commonly employed as a physiological stabilizer and detoxifier. Symptoms might include fatigue, loss of visual stamina, asthenopia, headaches, photophobia, and transient blur. Diagnostic findings includes constriction of the visual fields, esophoria, low recoveries in vergence ranges, accommodative insufficiency, reduced red or green fields, and blue field constriction in case of liver involvement. Yellow-green is often combined with indigo-red or ruby when emotional instability is present. Alpha-delta (red to orange) followed by mu-delta (lemon) is also is physiologic stabilizer and detoxifier that is used for individuals with chronic or degenerative health problems that are organic, metabolic, toxic, or from past trauma.

Eccentric fixation of the amblyopic eye was treated through the Fast Pointing Method on the Sanet Vision Integrator with theeye hand and Rotator module by gradually reducing the target size over the course of 30 sessions. The patient had to quickly touch as many of the rotating targets as possible within an initial set time of 10 minutes. This was then gradually reduced to a set time of 2 minutes along with gradual reduction of the target size over 30 sessions. After 30 sessions of the Sanet Vision Integrator with the fast pointing method, we alsoperformed activities with the Macular Integrity Trainer & Tester (MIT-2) to further improve foveal fixation of the right eye.

Concurrent with this, therapies for stabilizing and addressing oculomotor deficits such as saccades, pursuits were carried out. These included the SVI saccades module, Hart chart, Marsden ball, Peg board rotator and Space fixator.

After the completion of 50 sessions of office-based vision therapy, a progress evaluation was conducted to obtain detailed measurements.

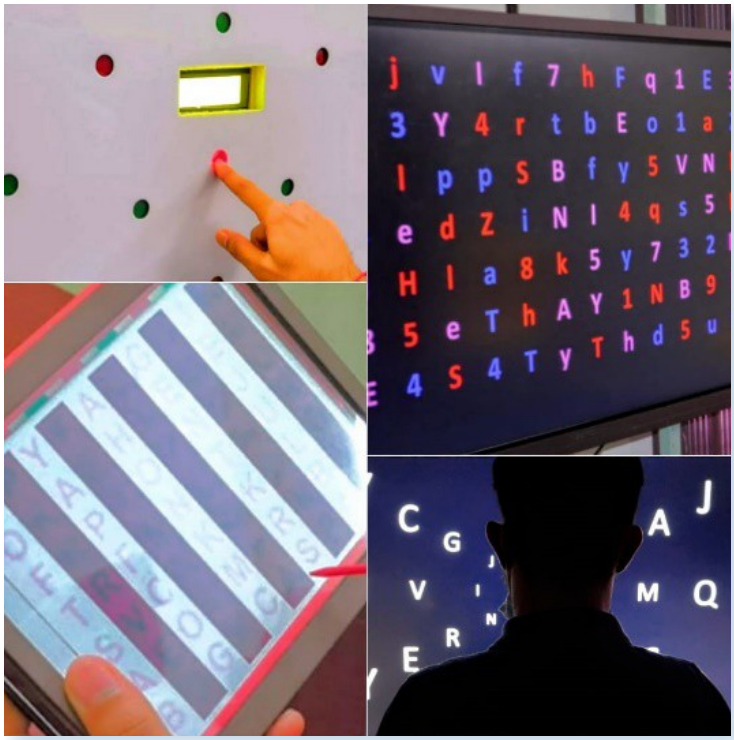

Figure 6. GTVT Charts/ Saccadic Fixator/ Sanet Vision Integrator

Patient's best corrected visual acuity in amblyopic eye was 6/18 for distance and N9 for near. His fixation behavior through the amblyopic eye was well centered and steady. Pursuits and saccades were normalized in the right eye, and the functional visual field was expanded by almost 85% to 90% on the functional visual field tester. On cover testing, his esotropia reduced to 10 prism diopters at distance and near, with 5 prism diopters of hypertropia of the right eye. The patient was advised to continue 20 minutes of daily home vision therapy utilizing Amb-iNet.

2nd Phase:

In the second phase of in-office vision therapy treatment, our primary clinical goal was to reduce the suppression in left eye to promote binocularity. Anti-suppression training was undertaken with the penlight dissociation method. This was done by placing vertical prism over the right eye and fixating the penlight at a distance of 40 cm, gradually increasing fixation to 3 meters. We initiated this technique first in a dark room and then gradually progressed to normal lighting conditions.

MFBF therapies were implemented with GTVT charts, and on the SVI with red lens placed over right eye to reduce suppression (see Figure 6). Cheiroscopic tracing was also performed on the VTS4. Red Green anti suppression activities were performed on the saccadic fixator. Brock String was also incorporated by establishing the centration and fixation point to promote vergence and binocularity.

After 40 additional sessions of in office therapy, the patient's best corrected visual acuity through the amblyopic right eye was significantly improved to 6/9 (20/30). The patient reported diplopia on Worth 4 Dot testing at distance and near, but reported suppression at distance (3 meters) and with smaller targets on the VTS-4. Cover test revealed 5 prism diopters of esotropia at distance and near with 5 prism diopters of hypertropia in the right eye.

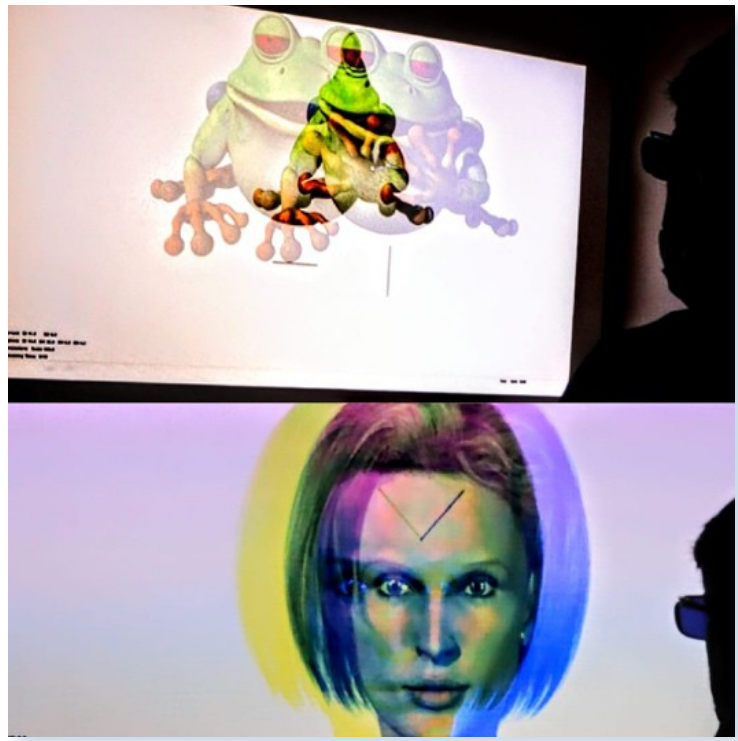

Figure 7. Binocular Therapies – VTS-4

3rdPhase:

In the 3rd phase of in office vision therapy, our primary goal was to improve binocularity along with increasing vergence ranges. Binocular vision therapy activities were started with the Bernell Tranaglyph BC 500 series,

followed by BC600 series of cards at the patient's subjective angle to promote sensory fusion. Motor fusion was gradually incorporated to increase the vergence ranges (see Figure 7).

VTS-4 was also performed to increase the vergence ranges with emphasis on base in ranges while establishing all the binocular cues. Initially, all the vergence activities started at near and then gradually increased to a distance of 3 meters. In later sessions, free space eccentric circles fusion cards were also performed to enhance fusion in free space.

Toward the end of 40 sessions of phase 3, and a total of 130 in-office sessions, a final evaluation was conducted revealing the patient's visual acuity in the amblyopic eye (OD) as 6/9 for distance and N6 for near. WFDT shows fusion for distance and near. Cover test revealed orthophoria for distance and 2-4 Δ of esophoria at near. Titmus Fly test for stereopsis was 80 sec of arc, and fusional ranges for distance and near were normalized. The patient was advised to continue his home vision therapy program as a part of maintenance.

Final Outcome:

During the final evaluation post surgical visual acuity had improved from 6/60 to 6/9 in the right eye (amblyopic eye), which was earlier only Hand Movement +be (HM+ve) prior to surgery. His constant right esotropia reduced to orthophoria for distance and 2-4 Δ of esophoria at near (Figure 8).

The SCCO test revealed improvement in pursuits and saccades to normative level. The WFDT test improved from constant suppression of right eye to grade A fusion from 16 inches to 20 feet. Functional visual field testing showed improvement of peripheral field in the right eye by almost 90%. Stereopsis testing improved from absent to 80 second sec of arc on Titmus Fly Test for stereopsis. Phorometry testing initially showed suppression and improved to Base in blur, break and recovery of X/16/11. Table 1 provides an overview of findings pre and post therapy.

Table 1: Diagnostic data Pre-Vision Therapy and Post-Vision Therapy

Clinical Test	Pre-Therapy	Post-Therapy
Spectacle Rx	NIL	
	NIL	
Visual Acuities		
OD(Dist, Near):	6/60, N10	6/9, N6
OS(Dist, Near)	6/6, N6	6/6, N6
Cover Test		
Distance	18Δ ESO,10 HYPER	ORTHO
Near	18Δ ESO,10 HYPER	2-4 Esophoria
Final Acceptance (Distance vision glass)		
OD(Dist)	-4.00/-3.25X165, ADD: +2.50 DSPH	
OS(Dist)	PLANO	
Binocular Testing		
Base Out(D) – VTS4 Base In(D)-VTS 4 Base Out(N)- VTS 4 Base In (N) – VTS 4 SCCO(fixation) SCCO(Pursuits) SCCO(Saccades) Score 3+ - 4+= Pass 1+-2+= Fail	SUPRESSION SUPRESSION SUPRESSION SUPRESSION 4+,1+,3+(OD,OS,OU) 3+,2+,2+ 3+,2+,2+	29/25(Break/Recovery) 16/11(Break/Recovery) 36/30(Break/Recovery) 12/7(Break/Recovery) 4+,4+,4+ 4+,4+,4+ 4+,4+,4+
Titmus fly test for Stereopsis	NONE	80 arc of sec
Visuoscopy		
OD	2^Nasaleccentric fixation, unsteady	Central fixation,steady
OS	Central fixation, steady	Central fixation,steady
Functional Colour Field Tester		
OD	Reduced	Normal (app. 90 %)
OS	Normal	Normal

Figure 8. **a) Esotropia Pre-Vision Therapy. b) Alignment Post-Vision Therapy**

Table 2: In-Office Optometric Vision Therapy Activities

Binocular/Anti-Suppression	Oculomotor	Monocular Fixation	Syntonics Phototherapy
Vectogram	Space fixator	Fast Pointing Method for eccentric fixation	Alpha-Delta for 10 minutes followed by Mu-Delta for 10 mins (Total Time 20 mins)
RIG luster With white board	MFBF with GTVT Chart 8.5"X11" and SVl (red patch OS)	MIT-2 (Macular integrity trainer and tester	
RIG Pen light association method for diplopia awareness	R/G Bernell sticks (Press Lites)		
RIG Tranglyph	Sanet Vision Integrator Marsden Ball activities		
RIG Maze with flashlight and red acetate (red glasses OS)	Saccadic Fixator		
RIG Maze with red marker	Standing Peg Board Rotator		
R/G with SVI			
MFBF with GTVT chart 8.5''X11" and SVI (red patch OD)			
VTS-4 Free Space Eccentric Circles			
R/G with Saccadic Fixator			
Brock string			

The patient reported improved depth perception while playing 3D games on the computer and while watching 3D movies. Table 2 and 3 provides the in-office and home based vision therapy activities used for treating the patient. He reported better comfort while working on computers. Both the patient and his family were extremely happy with his progress during vision therapy, and the patient was advised to return to our clinic for follow up visits.

DISCUSSION

The case report demonstrates the multimodal approach in vision therapy to improve visual acuity and binocular vision for a patient diagnosed with acquired form deprivation amblyopia with strabismusin an adult with occlusio pupillae, traumatic angle closure glaucoma secondary to traumatic cataract. The multimodal treatment approach included syntonic phototherapy and MFBF therapy to reduce suppression and binocular vision therapies to improve vergence demand.

Syntonic phototherapy is used in patients with deficits in vision, oculomotor skill, binocularity, accommodative facility and constricted visual field. Patient with strabismus have constricted visual field in the deviated eye which can be expanded by syntonic phototherapy. As the visual filed is expanded normal binocular vision is easier to achieve.[16-18]

Syntonic phototherapy stimulates photosensitive elements in the blood and photoreceptive areas in the brain through the retinal vascular beds and optic nerve via the rods and cones pigments or directly through the pathway this is done by light which is used to trigger photoreceptors in the cell.[17] Robert Michael Kaplan concluded that syntonics therapy increases the visual field and performances in children with learning disability.[19]

In our patient syntonic phototherapy worked by improving the monocular skills the range of red to-orange colour frequencies acts as a strong sympathetic stimulant to treat esotropia or amblyopia. The filter combinations applied inthe procedures are thought to construct a higher electrical charge in the cell membranes in order to reduce the synaptic resistance and thereby overcome amblyopia and binocular suppressions. Alpha-delta (red to orange) followed by mu-delta (lemon) is also is physiologic stabilizer and

detoxifier that is used for individuals with chronic or degenerative health problems that are organic, metabolic, toxic, or from past trauma.

Monocular fixation in binocular field (MFBF) is used to reduce suppression. These activities allow both eyes to receive peripheral stimuli using anaglyphic filters while the amblyopic eye is used to see the central stimulus in detail.[20] Patients with amblyopia have deficient binocular visual function which causes suppression. Reports indicated that this can be reversed by ionophoretic application of the bicuculline blocker GABAA (gamma-aminobutyric acid) receptors.21,22 GABAA is responsible in inputs of suppression from the amblyopic eye within the primary visual cortex and plays a key role in brain plasticity. Recently emerging research on the binocular approach with dichoptic therapy has shown promising results in amblyopes by unlocking binocular visual functions that have been suppressed.[14,23,24]

CONCLUSION

This case illustrates the importance of syntonic phototherapy in expanding constricted fields, and MFBF activities to remove suppression and improve binocularity. A multimodal approach in treatment is required for optimal results as seen in this case. Approximately 130 in office sessions were required which included syntonic phototherapy, oculomotor activities, monocular fixation activities and anti-suppression activities. We recommend this multimodal approach for effective management of acquired form deprivation amblyopia with strabismus.

Our case report involved an adult with occlusio pupillae, and traumatic angle closure glaucoma secondary to traumatic cataract. Further research is recommended to enhance our understanding of the nature of cases that can be treated with this approach.

REFERENCES

1. Ciuffreda KJ, Levi DM, Selenow A. Amblyopia: Basic and clinical aspects. Boston: Butterworth-Heinemann, 1991.
2. Birch EE. Amblyopia and binocular vision. Progress in Retinal and Eye Research 2013;33:67-84.
3. McKee SP, Levi DM, Movshon TA. The pattern of visual deficits in amblyopia. Journal of Vision 2003;3(5):380-405.
4. Campos E. Amblyopia. Surv Ophthalmol 1995;40(1):23-39.
5. Sjöstrand J. Form deprivation amblyopia - a treatable cause of blindness. Acta Ophthalmol 2008;86.
6. Uemura Y, Katsumi O. Form-vision deprivation amblyopia and strabismic amblyopia. Graefe's Arch Clin Exper Ophthalomol 1988;226(2):193-6.
7. Wolfe C. Amblyopia Update for the Primary Care OD. GWCO Congress 2019. **https://bit.ly/3ybWABC**
8. Romaniuk VM. Ocular trauma and other catastrophes. Emergency Medicine Clinics 2013;31(2):399-411.
9. Gardiner MF. Overview of eye injuries in the emergency department.**https://bit.ly/3zWc9yx**
10. Puodžiuvienė E, Joubauskien. e G, Vieversyt. e M, Asselineau K. A five-year retrospective study of the epidemiological characteristics and visual outcomes of pediatric ocular trauma. BMC Ophthalmol 2018;18(1):1-9.
11. Antonio-Santos A, Vedula SS, Hatt SR, Powell C. Occlusion for stimulus deprivation amblyopia. The Cochrane Database of Systematic Reviews 2014;2(2):Cd005136.
12. Holmes JM, Lazar EL, Melia BM, Astle WF, Dagi LR, Donahue SP, et al. Effect of age on response to amblyopia treatment in children. Arch Ophthalmol 2011;129(11):1451-7.
13. Vedamurthy I, Nahum M, Huang SJ, Zheng F, Bayliss J, Bavelier D, et al. A dichoptic custom-made action video game as a treatment for adult amblyopia. Vision Research 2015;114:173-87.
14. Sasaki Y, Nanez JE, Watanabe T. Advances in visual perceptual learning and plasticity. Nature Rev Neurosci 2010;11(1):53-60.
15. Gottlieb RL, Wallace LB. Syntonic phototherapy. Mary Ann Liebert, Inc. 140 Huguenot Street, 3rd Floor New Rochelle, NY 10801 USA; 2010.
16. Wallace LB. The Theory and Practice of Syntonic Phototherapy: A Review. Optom Vis Devel 2009;40(2):73-81.
17. Spitler HR. The Syntonic Principle. In: Company SPP, editor. Lancaster, Pennsylvania,1941.
18. Gottlieb RW, Wallace L. Syntonic Phototherapy. J Behav Optom 2001;12(2):31-8.
19. Kaplan R. Changes in form visual fields in reading disabled children produced by syntonic (colored light) stimulation. International Journal of Biosocial Research 1983;5(1):20-33.
20. Cohen AH. Monocular fixation in a binocular field. J Amer Optom Assoc1981;52(10):801- 6.
21. Mower GD, Christen WG, Burchfiel JL, Duffy FH. Microiontophoretic bicuculline restores binocular responses to visual cortical neurons in strabismic cats. Brain Research1984;309(1):168-72.
22. Sengpiel F, Jirmann KU, Vorobyov V, Eysel UT. Strabismic suppression is mediated by inhibitory interactions in the primary visual cortex. Cerebral Cortex 2006;16(12):1750-8.
23. Tailor VK, Schwarzkopf DS, Dahlmann-Noor AH. Neuroplasticity and amblyopia: vision at the balance point. Current Opinion in Neurology 2017;30(1):74-83.
24. Hess RF, Thompson B, Baker DH. Binocular vision in amblyopia: structure, suppression and plasticity. Ophthal Physiological Optics 2014;34(2):146-62.

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