



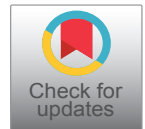
CASE REPORT

Vision Therapy as an Early Intervention Approach in Autism Spectrum Disorder Associated with Down Syndrome: A Case Report

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Abstract

Background: Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by behavioural changes in oculo-visual, cognitive, and language factors. Down syndrome (DS) impacts visual acuity and contrast sensitivity, often manifesting sensory deficits of optical or neural origin. Early identification and a multidisciplinary treatment approach are crucial for both conditions. This case aims to explore the efficacy of vision therapy in improving eye movements in a patient with ASD associated with Down syndrome.

Case report: This case report presents a 3-year 10-month-old female with Down syndrome associated with autism spectrum disorder (ASD), demonstrating significant improvements in eye movements following a structured vision therapy intervention. After two months of behavioural therapy, notable improvements were observed in fixation, eye movements, and stereopsis. Subsequent assessments at four months revealed regressed nystagmus, fusion at distances, orthophoria at distance and near, and a lag of accommodation with reduced amplitude of accommodation.

Conclusion: This case highlights the importance of early intervention and a multidisciplinary approach in managing visual challenges in individuals with ASD and Down syndrome. Patients suspected ASD should be referred to Behavioural Optometrist for binocular vision examination and for a holistic approach in the management of the condition.

Keywords

Autism spectrum disorder (ASD), Down syndrome, Vision therapy, Eye movements, Behavioural optometrist

Introduction

Down syndrome (DS) is caused by replication of all or part of chromosome 21 and affects approximately 1 in 692 individuals born in India [1] whereas autism spectrum disorder (ASD) is a range of neurodevelopmental conditions characterized by impairment of social, communication, and language with a prevalence ranging from 1:250 to 1:88 and it appears to be increasing globally [2]. Although a combination of challenges in social communication and rigid and repetitive interests and behaviours is associated with autism spectrum disorders (ASD), studies suggest that these symptoms are also present among individuals with DS [3-9].

Various studies state that the prevalence of ASD among individuals with DS is 16-42% [10-12] with most of them reporting a prevalence higher than the 1.9% (i.e. 1 in 54) in the general population [13]. Hyperopia and astigmatism are the most common refractive error among ASD with presence of exotropia [2]. Strabismus, amblyopia, accommodation defects, refractive error, eyelid abnormalities, nasolacrimal duct obstruction, nystagmus, keratoconus, cataracts, retinal abnormalities, optic nerve abnormalities, and glaucoma are common ophthalmic manifestations observed in an individual with DS with esotropia to be the most common strabismus. While some studies have found hyperopia to be the most common refractive error, some others state myopia to be more common [14].

Early identification and appropriate management of the disorders in this patient population can drastically

improve prognosis and quality of life. Vision therapy works holistically and thereby improving fixation, eye movements and behavioural aspects of an individual [15,16]. This report aims to show the efficacy of vision therapy in improving the oculomotor disorders in an individual with ASD associated with DS.

Case Report

In January 2021, a female patient, aged 3 years and 10 months, attended my vision therapy clinic. She was a known case of Down syndrome with autism

spectrum disorder [17]. Her prenatal history indicated no abnormalities, while she was delivered via C-section as a full-term baby with a normal birth weight. Post-natally, she had a history of global developmental delay and was under treatment for thyroid issues. Although partially verbal, she attended mainstream schooling. Additionally, she had been receiving occupational therapy and oral placement therapy for two years prior, which has since stopped. On examination, the findings noted are listed in Table 1.

Table 1: Clinical Examination of the child with three follow up data.

S. No	Tests	1 st Visit (After 2 months)	2 nd Visit (After 6 months)	3 rd Visit (After 9 months)
1	History taking	Poor concentration at distance	Improved fixation and concentration while watching television & at school noted by the parent and teacher	Improved hand-writing and reading speed noted by the parent
2	Best Corrected Visual acuity (Cardiff acuity)	OU: 0.3 LogMAR	OD: 0.3 LogMAR OS: 0.0 LogMAR	OD: 0.2 LogMAR OS: 0.0 LogMAR
3	Manifest refraction	OU: +1.00 DS/-0.50 DC × 180	OU: +1.50 DS/-1.50 DC × 170	OU: +1.50 DS/-1.50 DC × 170
	Cycloplegic Refraction	OU: +1.50 DS/-0.50 DC × 180	OU: +2.00DS/ -1.50 DC × 170	OU: +2.00DS/ -1.50 DC × 170
4	Anterior segment	Horizontal pendular nystagmus with chin down position	Regressed Horizontal pendular nystagmus	Regressed Horizontal pendular nystagmus
5	Posterior segment	Within normal limit	Within normal limit	Within normal limit
6	Fixation	< 5 seconds	8-10 seconds	> 10-15 seconds
7	Eye movement (NSUCO method)	Poor ability and accuracy (Score: 4)	Good ability and accuracy, Head and body movement present (Score: 10)	Good ability and accuracy with limited head movement and no body movement (Score: 18)
8	Cover test	Couldn't perform	2-3 prism Esophoria at distance and near	2-3 prism Esophoria at distance and near
9	Stereopsis with Titmus fly test	Couldn't perform	800 seconds of arc	400 seconds of arc
10	Worth four dot test	Couldn't perform	Fusion at all distances	Fusion at all distances
11	MEM	High	High	High
12	Amplitude of accommodation with Push up method	Couldn't perform	Reduced	Reduced
13	TVPS	Couldn't perform	Couldn't perform	Not age appropriate
14	Bilateral integration with Standing Snow-Angel test	Couldn't perform	Couldn't perform	Motor Overflow present
15	Piaget left-right concept	Couldn't perform	Couldn't perform	Age-appropriate
16	Diagnosis	Poor fixation and eye movements	Improved fixation, saccades and pursuits. Need to work on accommodation and stereopsis	Improved stereopsis, Reduced accommodation and visual perception
17	Management	In-office vision therapy along with home therapy for m/o & b/o fixation, eye movement and eye-hand co-ordination.	In-office vision therapy along with home therapy for further improvement in eye movements, accommodation and stereopsis	In-office vision therapy along with home therapy for improvement in phoria status, accommodation, vergence and visual perception

Abbreviation: MEM: Monocular Estimation Method

Vision therapy: Therapies were carried out to improve fixation, saccades, and pursuits for the first 2 months. These included video and object tracking and tracing, Eye-hand co-ordination through Sanet Vision Integrator software and Marsden ball, Pegboard and floor rotator which were clubbed with balance board and trampoline jumping. Along with the above therapies, software-based therapies, hart chart and minus lens sorting were included to improve stereopsis and accommodation during the next 4 months of therapy duration. Further, therapies on bilateral integration, left-right concepts and other visual perceptual skills were included along with the all the therapies conducted in the first 4 months.

Discussion

Several articles highlight the importance of early detection of autism spectrum disorder (ASD), emphasizing that subtle signs may manifest in children even before they reach 12 months of age [1]. According to research, identifying these signs early can significantly aid in intervention and management strategies. One fundamental aspect that clinicians, including optometrists, can observe is the initiation of eye contact, which typically begins around 9 months of age [1]. This observation can be seamlessly incorporated into routine optometric examinations, where optometrists can play a crucial role in the early identification and intervention of ASD [18].

A study by Jayaraman, et al. suggests that the recommended there under for an early intervention among children with global developmental delay include parents along with vision rehabilitation professionals, vision therapists, rehabilitation counsellors, special educator, orientation and mobility instructor, optometrist, low vision therapist, physical therapist, occupational therapist, speech and language therapist, and social worker [19]. Similarly, the current report also involves a set of interventional team which involves Optometrist, Ophthalmologist, Vision therapist, Speech therapist and Occupational therapist for a holistic approach to manage the condition.

Evidence from various studies show that for an improvement in vision, visual therapy on fixation, eye movements and perception are important [20-22]. At the same time, a combination of both centre-based and community-based management approach is required for patients whose requirement demands expert's intervention, but they cannot visit therapy centres due to various challenges. This approach involves an initial assessment by the expert therapists and the interventions blend in-office therapy at the centre along with home-based therapy under the direction of the therapists [23]. Thus, this supports the management plan introduced in the current case report which involves a combination of in-office and home-based vision therapy where the therapy protocol involves

working on eye fixation, eye movements and visual perception. With improvements noted in the nystagmus frequency, and eye movements, advanced evaluation on visual efficiency and therapy for improving the same was carried out.

As a result, this report drives the importance of holistic approach with multi-disciplinary approach in managing a case of down syndrome associated with autism spectrum disorder and that vision therapy plays a major role in improving vision of an individual. Early intervention with appropriate management protocol is important especially when handling individual with neurological disorders.

Conclusion

This case underscores the beneficial outcomes of using a systematic behavioural and comprehensive strategy to address visual difficulties in a patient diagnosed with ASD and Down syndrome. Appropriate timely intervention with holistic approach of especially vision therapy in collaboration with other therapies, can substantially enhance eye movements, fixation, and overall visual capabilities and in-turn the quality of life aiding an individual to lead an independent life. It is vital to conduct additional research and exploration of multidisciplinary interventions to enhance the quality of life for individuals with ASD and Down syndrome.

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