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Effectiveness of Visuo-Vestibular Rehabilitation Therapy in Vestibular Disequilibrium and Balance: Case Report

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ABSTRACT

Purpose: The purpose of case report is to reveal the effectiveness of visuo-vestibular rehabilitation therapy in balance problems as well as vestibular disequilibrium. The case involves a girl referred to Composite regional centre for developmental delay with complications of balance problem and visual discrimination.
Client description: A girl of 5 year admitted at Composite Rehabilitation Centre, Sundernagar in Dec., 2015. Her father provided with a history of Birth asphyxia and was diagnosed with developmental delay.
Measure and outcome: The physiotherapist after assessment and examination identified the complications associated with developmental delay and given the treatment at the centre and found good result in terms of recovery.
Intervention: The patient was given vestibular stimulation activities including swinging and balance activities.
Implication: This case report reinforces the significance of visuo-vestibular rehabilitation therapy which has become a mainstay in the management of patients with balance and postural problems along with visual difficulties.

Key words: Romberg sign, Visuovestibular, Sensory exercise, Balance, Gaze.

INTRODUCTION

The development of balance and gross motor functions such as head control and walking are intimately related and dependent on inputs from the vestibular, visual, proprioceptive systems. [1] The ability to maintain an upright position during standing is a useful motor skill. [2] Balance described by Nashner, is a complex process involving coordination of multiple sensory, motor and biomechanical components. An Individual senses the position of body in relation to gravity and surroundings by combining visual, vestibular and somatosensory inputs. [3] The predominance of visual-vestibular control of balance gives way to a somatosensory vestibular dependence by age three, but the transition to adult like balance responses is not complete for all sensory conditions even by age six. Since vestibular responses are associated with eye movements and hearing, they contribute to visual and auditory processing. [4] The lack of vestibular information requires the sometimes effortful substitution of visual, proprioceptive, and other signals in order to maintain balance, posture, and gaze. [5] A dysfunction of the vestibular system is commonly characterized by a combination of perceptual, ocular motor and autonomic manifestations. [6] Most children with vestibular deficits develop walking ability hence their deficits are un-noticed. However, these children avoid outdoor games. Teachers of these children often complain of in coordination, clumsiness and balance deficits which may hinder the child's optimal performance. Moreover, it is reported that the critical period of postural control development is between 4 and 6 years of age and of motor development is 8 years. [7] Vestibular rehabilitation is effective and beneficial for many patients with disequilibrium and balance disorders.[8] Vestibular physical therapy is a specialized exercise based intervention for management

of symptoms associated with vestibular dysfunction that manifests itself as dizziness and imbalance related to position or movement of the body. [8]

CASE DESCRIPTION

A girl of 5 year admitted at Composite Rehabilitation Centre, Sundernagar in Dec., 2015. Her father provided with a history of Birth asphyxia due to which she had weakness of right half including facial palsy. She was diagnosed with developmental delay early on at PRAYAS Chandigarh, started walking at age of three and half year. She was having grossly normal hearing but having some visual discrimination problem in gaze stabilization and eye sight. But, now she falls sometimes, not able to maintain balance, equilibrium and posture and not able to fix eyes on one object. She was assessed for balance and vestibular system by using clinical test of sensory integration of balance (CTSIB) and other tests at CRC Sundernagar. The clinical test for sensory integration of balance is simple test that has been devised to easily and rapidly assess the dependence of patient on various inputs and devise a rehabilitative strategy customized to each patient. [9]

PHYSICAL EXAMINATION

Oculomotor test: Normal for eye tracking
Romberg test: Romberg test with eye open - WNL but with eye closed, test was positive
Clinical test of sensory integration of balance CTSIB: Grade 3

INTERVENTION

A single case design was used to monitor response of treatment. The therapy consisted of 1 hr. session per day for 6 weeks. Vestibular stimulation activities were prescribed to patient including swinging motion in net in supine & prone position. We used four different kinds of swings to develop balance. Multiple activities are given to reinforce the vestibular system and to regain the balance. Patient was sitted on a balance ball, with a slight bounce while turning her head from side to side. Gaze stabilization exercises started from easy to complex as a progression from the patient performing side-to-side head turns while seated on a stationary chair to those while seated on a ball. Some vestibular sensory exercises prescribed were;

Visuo - vestibular sensory exercises:

1. **Sitting position**:
   - She was asked to move eyes up and down with head moving keeping head steady at midline.
   - Keeping head steady at midline with eye gaze following movements of therapist hand, take right hand and touch.
   - In crawling, she was asked to keep head steady at midline, allow eyes to gaze at alternating hand movements.
2. **Alternating from sitting to standing:** First, eyes open with eyes/head steady at midline**.** Repeat with eyes closed.
3. **Stand on one foot:** With eyes open for a few seconds and eyes/head steady at midline and do jumping activities on trampoline to strengthen vestibular system.

Post Treatment Assessment: Follow up was performed after treatment as;
Romberg test: WNL
CTSIB: No sway

RESULT & DISCUSSION

Case summary - Overall results of this study were positive; there was a significant improvement in balance and dystonic movements of child due to vestibular stimulation.
Patient symptoms - Sway was minimal along with improved range of motion of cervical spine as shown in table 1.

Table 1. R.O.M Cervical spine pre and post treatment

S. no	Range of motion (Cx spine)	Degrees (pre treatment)	Degrees (post treatment)
1	Flexion	40	45
2	Extension	55	65
3	Side flexion	35	55
4	Rotation	45	45

The results supports that balance and equilibrium difficulties experienced by child, especially falling decreased and were

results of an interaction between vestibular dysfunction and environment deprivation.

CONCLUSION

Vestibular rehabilitation therapy has become a mainstay in the management of patients with balance and postural problems.

***Declaration of Interest*:** There is no conflict of interest associated with case.
***Source of Funding*:** None
***Ethical Clearance*:** Ethical permission is obtained from committee keeping in mind all regulations related to study.

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