A Neuro-Optometric Rehabilitative Approach to Guiding Visual Development

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Cerebral Palsy (CP)

- Definition: CP is a non-progressive neurological disorder permanently affecting movement, balance, and muscle coordination
- Incidence: 1-2 per 1,000 live births
- Types:
  - **Spastic**: (70-80%) damage to motor cortex, specifically the periventricular white matter causing muscle hypertonia
  - **Dyskinetic**: (10-15%) damage to basal ganglia causing slow, uncontrolled movements of extremities and face
  - **Ataxic**: (less than 5%) damage to cerebellum causing decreased balance and coordination
- Signs/Symptoms: ataxia, hypertonia, exaggerated reflexes, often associated with epilepsy, hearing loss, impaired vision, deficits in fine and gross motor skills, speech impairments, and intellectual delays.
- Causes: brain injury or inadequate development of the fetal or infant brain, often associated with premature birth
- Prognosis: level of disability depends on the type of CP and early intervention has a better chance of over-coming disabilities
- Treatment: multi-disciplinary approach to therapy includes Physical and Occupational therapy, Speech therapy, and Vision Therapy to improve the child's capabilities and muscle control.

Accommodation in CP

- Children with CP have a significantly reduced accommodative response to near targets compared to neurologically typical children
  - **57.6%** fail to accommodate accurately[1]
  - Those with more severe intellectual and motor impairment have greater lags in accommodation
- Associated ocular findings: strabismus, amblyopia, cortical visual impairment, nystagmus, refractive error, saccadic and pursuit dysfunction, **acommodative dysfunction**, and reduced visual-perception
- Cause: it is proposed that multiple factors influence the reduced accommodative response in children with CP. In addition to the initial motor impairment, research suggests the presence of poor visual acuity, strabismus, and nystagmus also contribute to a poor accommodative response.[1]
- Treatment: Prescribe glasses with or without bifocal to help compensate and improve accuracy of accommodation
- Summary: An objective measure of accommodation should be assessed in all children with CP as routine standard of care. Failure to identify reduced accommodation will put the child at a severe disadvantage for learning and development.

Case Presentation

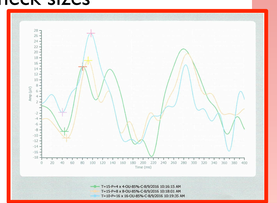
History

- ED, a 3 year-old female was referred for a visual efficiency evaluation by her speech therapist
- Chief Complaint: Mom reports ED has poor tracking and is concerned about reduced visual processing due to a congenital brain abnormality.
- Mom reports history of right eye turning in but has become less frequent recently
- ED does not make eye contact, instead preferring to fixate at people's foreheads
- ED startles easily when objects get close to her face; retained moro reflex present on initial examination
- ED has severe developmental delays in both speech and gross motor skills, similar to those of a 6-8 month old neurologically typical child. She sits up independently but does yet crawl and babbles but does not yet use words.
- Previous Eye Care: ED has had several exams, but no glasses were prescribed.
- Medical History: is significant for developmental delays and suspected cerebral palsy (CP).
- MRI as neonate revealed corpus callosum agenesis. ED has history of recurrent ear infections and has tubes in both ears as well as her adenoids removed.
- ED is completing multiple therapies to work on primitive reflexes and motor development including speech therapy, physical therapy, occupational therapy, and equine therapy.
- ED is not taking any medications and has no allergies to medications.

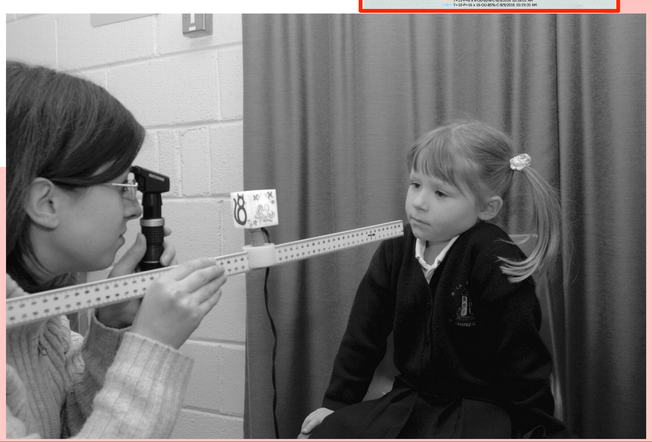
Examination

Uncorrected VA: ED resists occlusion equally, 20/40 at distance OU
CT: possible ILXT at near, hirshberg aligned and bruckner equal OU
EOM: grossly full OU
Confrontations: full to toy presentation OU
OKN Drum: slow but equal response OU
Pursuits: Jerky, poor fixation, and head movement
NPC: slow gross convergence to the nose
MEM: +1.00 or more OU
Retinoscopy: +1.50 DS OU, poor fixation
Damp Retinoscopy: +1.50 DS OU
Ocular health: Unremarkable OU

VEP: ED resisted occlusion, all trials binocular
TR OU: reliable waves on all check sizes
4x4: 22.38 mv 81.0 ms
8x8: 27.95 mv, 91.8 ms
16x16: 28.64 mv, 97.6 ms



Observations with +1.00 OU glasses:
Mom reports ED loves new glasses and never takes them off- feels like she can see much better and notices ED is more engaged, has better tracking, fixation, and eye contact and is reaching for objects more often. No strabismus has been observed.



Diagnosis & Treatment

Diagnosis:
- Accommodative Insufficiency
- Hyperopia, OU
- Poor pursuits/tracking skills

Treatment:
- Prescribed +1.00 DS OU for full time wear to improve accommodative accuracy. Although normal amount of hyperopia for her age, her inaccurate fixation and large lag on MEM point to poor focusing accuracy.
- Recommend in-office vision therapy therapy and home vision exercises to stimulate visual skills.
- Coordinate care with ED's other therapies (primitive reflex therapy, OT, PT, and SLT) and communicate findings.
- Discussed importance of comfortable and accurate near vision for best success with other therapies.
- Follow up in 6 weeks to assess progress with lenses and repeat VEP. Consider a bifocaland/or prism at next visit if MEM still reduced; can also consider adding binasal occlusion if indicated.

Conclusion

- Children with cerebral palsy are even more at risk for accommodative dysfunctions.
- It is important to assess accommodation accuracy and to not underestimate the effect that lenses can have on a patient's visual development.
- Consistent vision is important to set the foundation for the development of other skills and concurrent therapies.
- It is important that all children with CP or developmental disabilities receive a complete eye exam to assess visual skills that can impact development.

References

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