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Neuro-Optometry 101: Visual Symptoms of Brain Disorders

This course will introduce general vision practitioners to vision disorders caused by neurological syndromes. Ocular pathology is often over-emphasized in medically involved patients, and the absence of pathology does not justify the loss of visual function. This course will address common causes and types of vision disorders, their impact on rehabilitation and the optometrist's role in this process.

"Vision is our dominant sense. More than just sight is measured in terms of visual acuity, vision is the process of deriving meaning from what is seen. It is a complex, learned and developed set of functions that involve a multitude of skills. Research estimates that eighty to eighty five percent of our perception, learning, cognition and activities are mediated through vision." *Introduction to Vision & Brain Injury Thomas Politzer, O.D. Past President (Neuro-Optometric Rehabilitation Association www.nora.cc)*

"The ultimate purpose of the visual process is to arrive at an appropriate motor, and/or cognitive response. There is an extremely high incidence (greater than 50%) of visual and visual-cognitive disorders in neurologically impaired patients (traumatic brain injury, cerebral vascular accidents, multiple sclerosis etc.)" *Rosalind Gianutsos, Ph.D.*

"Visual-perceptual dysfunction is one of the most common devastating residual impairments of head injury". *Barbara Zoltan, M.A., O.T.R.*

"The majority of individuals that recover from a traumatic brain injury will have binocular function difficulties in the form of strabismus, phoria, oculomotor dysfunction, convergence and accommodative abnormalities". *William Padula, O.D.*

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I. Neurological syndromes that cause vision disorders fall into several categories. The most common types of problems are:

A. Stroke – CVA (cerebral vascular accident), hypoxic, hemorrhagic.
B. Traumatic brain injury – concussion (often not reported or diagnosed), cranial facture, post-traumatic increase in inter-cranial pressure.
C. Neurodegenerative disorders – MS, Parkinson's disease, myasthenia gravis, muscular dystrophy, Alzheimer's disease, Lyme disease, ALH.
D. Neuro-developmental disorders – Downs syndrome, autistic syndrome disorders, Fragile X, Ehlers-Danloe syndrome, cranio-facial dystrophies (Williams syndrome, Turners syndrome, etc.)
E. Neurotoxicity – lead or other heavy metal poisoning, substance abuse.
F. Anoxia – drowning (global damage), choking, anaphylaxis.

II. Major vision problems caused by neurological disorders include:

A. Visual field loss.
   i. Inability to identify or localize a target in a specific area of the visual field.
   ii. Loss is consistent with area of brain affected by stroke.
   iii. Typically the patient can see the loss – they describe things missing in their field of view or a blank area.
   iv. At home online screening for vision field loss. http://www.helpforvisionloss.com/vsty/

B. *Ocular motor disorders*.
   i. Inability to fixate.
   ii. Poor tracking/pursuits.
   iii. Loss of scanning patterns; poorly organized saccades.
   iv. Nystagmus.

C. Binocular vision disorders.
   i. Double vision.
   ii. Suppression.
   iii. Convergence insufficiency/convergence excess.

D. Strabismus.
   i. May be secondary to stroke or a de-compensation.
   ii. Usually sudden onset.
   iii. May self resolve quickly. The longer the symptoms last, the less likely to self resolve because the patient will maladapt.

E. *Extra-ocular muscle palsy*.
   i. Very disruptive in most cases.
   ii. Causes strabismus and diplopia.
   iii. Can be field specific, limiting the effectiveness of lens or surgical correction.
   iv. Response to physical therapy comparable to overall patient response.

F. *Dry eye, ptosis, lid problems.*

G. *De-compensation.*
    i. Manifestation of previously existing condition that may not have been diagnosed.
    ii. Highly disruptive to patient.
    iii. Due to other neuro-motor weakness they are no longer able to compensate.

III. Understand the impact of vision disorders on rehabilitation.

A. *Visual processing disorders*.
    i. Speed and span of perception.
    ii. Figure ground.
    iii. Memory.
    iv. Visual-auditory integration.
    v. Visual spatial perception.
        1. Depth perception.
        2. Localization.
        3. Directionality/laterality.
    vi. Visual agnosia.

B. *Post-trauma vision syndrome*.
    i. Complex syndrome involving loss of integration of visual information.
    ii. Affects ambient processing and not readily diagnosed through traditional vision exams that evaluate the focal system only.
    iii. Symptoms can mimic psychiatric symptoms. (list of symptoms)
    iv. Can be alleviated with treatment.

C. Visual-midline shift syndrome.
    i. Easily diagnosed in screening.
    ii. Affects balance and mobility.
    iii. Can be corrected with lenses or therapy.

D. *Balance* and gait anomalies are generally diagnosed and treated with physical therapy and vestibular therapy. Vision disorders affecting depth perception and spatial judgments will impair the patient's visual guidance system and disrupt locomotion. These problems need to be diagnosed and corrected before the patient can regain stability.

E. *Maladaptive postures.* Patients with visual field loss with typically adjust their posture towards the field of loss, increasing their forward gaze. Patients with neglect are more likely to turn away from the affected field, increasing the impact of the disorder. Inferior field cuts are often compensated by leaning forward and superior loss by tilting the head up and leaning back. All of these postures will increase the risk of falling. Patients with ocular motor disorders will turn in a direction that increases their functional field and reduces the impact of the palsy or paralysis.

IV. Understand the immediate goals for vision treatment and be able to implement these.

A. *Patching*. This is the most common treatment for binocular vision disorders after stroke. Occluding an eye has the secondary effect of reducing the patient's visual field and eliminating all binocular cues to depth perception. This will increase compensations an impaired patient needs to make to accomplish their goals in their other therapies. Patching is much more affective if used in a specific, limited way that maximizes the patient's field of view.

B. *Bi-nasal occlusion* (what and how).

C. *Limitations* of lens treatment.

D. Use of the patient's own lenses.

V. Understanding the long term goals of vision rehabilitation and Q.O.L. implications.

A. *Rehabilitation goals* differ from short term correction or palliative intervention. Intervention is symptom based and intends immediate relief.

B. *Long term goals* must address ADLs, independent function, mobility and communication. They may require multiple interventions and therapeutic treatment over time to stimulate neuro-plasticity.

VI. Know when and how to refer to a specialist for vision evaluation and intervention.

A. *Vision screening* – must include ocular motor evaluation, binocular vision screening (near and far), visual field screening, detailed evaluation of visual functions either by history or testing (Davis Visual Scan test).

B. *Where to refer* – use sources such as NORA, rehabilitation specialists, physiatrists, neurologists.

C. *Expected feedback* and intervention strategies – correct intervention strategies will give some immediate relief and changes in visual bases abilities over time. Follow up with the patient's therapists to know if changes are positive.

D. *Expected outcomes* – contrary to what we previously believed, neuro-plasticity is a life-long process. For severely damaged patients the goal may be to slow the degenerative process rather than to regain significant function. Medically stable patients can be expected to regain much vision, although the time to improvement and degree of recovery is individual and will be affected by many other factors. These will include general health, use of medication, nutrition, and overall level of physical activity.