REHABILITATIVE OPTOMETRY:
BINOCULAR ANOMALIES
RESULTING FROM PATHOLOGY: CVA and CLOSED
HEAD TRAUMA
Pacific University of Optometry

“FULL SCOPE” REHABILITATIVE
OPTOMETRY

GOALS
To increase the clinician's index of suspicion as to pathological etiology of binocular anomalies
To provide an approach to differential diagnosis of etiology

CEREBROVASCULAR ACCIDENTS (CVA)

General Comments
And Concepts

Causes Of Stroke
Ischemic 80%
Hemorrhagic 20%

Ocular Manifestation
EOM Palsy
Potential Visual Consequences
Perceptual/
Cognitive Changes

Palsy
Loss Or Impairment
Of Function
Paralysis? Paresis?

Red Flags
Acute Onset
Progressive Nature
"The Company It Keeps"
Post Viral
The Most Common Vascular Cause Of Cranial Nerve Palsies Is Small-Vessel Disease

Clues To Palsy
Head Posture
Past Pointing
Saccadic Changes

Horizontal Deviations With Nerve Palsy
Head Turn Is In The Direction Of The Field Of Action Of The Effected Muscle

Past Pointing

Saccades In Paresis
Reduced Velocity “Sliding” or “Floating” Saccades Limited Range of Movement

Fixation Duress
Patient fixates with an eye that has a paresis or restriction

Individual Cranial Nerve Compromise

THIRD NERVE PALSY

Presents The Most Devastating Picture Of Any EOM Palsy
Eye Won’t Go Up, Down, In Ptosis Pupil Dilated Often Intorsion

Causes IIIN Palsy

![Pie charts showing causes of third nerve palsy](image)
Congenital III N Palsy

THIRD N NEIGHBORHOOD

PCoA Aneurysm

Pupil Is Rarely Spared
(Efferent Pupillary Defect)
If Aneurysm Is Cause Of Sudden
III Nerve Palsy

Third N Nucleus

Divisional Palsies
Superior III Nerve (Levator And Superior Rectus)
Inferior III Nerve
(MR, IR, IO, Acc, Pupil)

ABERRANT REGENERATION

Netrins, Attractants And Repellants

Bilateral Lid-Gaze Dyskinesis


Causes Of Aberrant Regeneration
Congenital
Trauma
Neoplasm
ANEURYSM !!

Vascular / Ischemic
Causes Of III N Palsy
Diabetes Mellitus
Hypertension
Atherosclerosis

COMPARISON

Diabetic III
Pain precedes diplopia
Pupil involved 15%
No aberrant regeneration
Tends toward Older Pts

Compressive III
Pain
Pupil involved 95%
Aberrant regeneration
Any age

Brain Stem Signs
Dysarthria
Dysphasia
Dizziness/
Disequilibrium
Facial Numbness
Gaze Disorder

"The Company It Keeps"

4-4 Rule
Medulla 12,11,10,9
Pons 8,7,6,5
Superior Colliculus 4,3

Vertical Gaze Palsies Suggest
Direct Brainstem Involvement
MRI Shows Brainstem Better Than CT Scan

Pontine Bleed INO, RXT=WEBINO

Sample Diagnostic Testing For Stroke
MRI/CT (MRA/CTA)
Ultrasonography
Blood Work Up
Arteriogram/
Cerebral Angiography
Doppler Ultrasound

Perceptual/
Cognitive Changes

CLOSED HEAD TRAUMA

Sensory Fusion Disruption Syndrome
London/Scott 1987
Formally Fused Patient
Usually Head Trauma And Coma
Can "Superimpose" Targets,

FOURTH NERVE PALSY
Ischemic Neuropathy
Pressure From Vascular Disease, Hydrocephalus

Causes Of SOP
(Fourth) Nerve Has Longest Course Of EOM. Only Crossed Cranial Motor Nerve

Aneurysms Affect The IV Nerve More Than The VI But Less Than III

Congenital IV Nerve Palsies Are Common Shares Most Frequent Cause With Trauma

ENT Surgery May Damage Trochlear Pulley

Superior Oblique Palsy Diplopia In Downgaze, And One Horizontal Direction Head Tilt Large Vertical Fusion Amplitudes History Of Intermittent Diplopia When Tired

RSOP Habitual Head Tilt

Review Old Photographs (“Fat Scan”) Forced Primary Position

To Discover Small Vertical Deviations: Watch The Lashes
Park’s Three Step
Measure Change In Vertical Deviation In
Primary, Left/ Right Gaze, And
The Bielschowsky Head Tilt

1. Circle The 4 Muscles That May Be Underacting
2. Circle The Gaze Where The Vertical
   Deviation Increases
3. Circle The Direction Of Head Tilt That Causes The Greatest
   Increase In Vertical

“Spread Of Comitancy”

Vertical Phoria Decompensation

**Bilateral Superior Oblique Palsy**
Little Vertical In
Primary Gaze
Often Unequal
Deviation On
Lateral Gaze
Greater Than 25
p.d. “V” Pattern
May Be As Much As
20-25% of SOP

If Excyclotorsion Is Greater Than
10 Degrees Suspect Bilateral SOP

DOUBLE MADDOX ROD

Fundus Exotorsion

Double Maddox Test

Refractive Considerations
Axis of Astigmatism
May Rotate When
Measured
Monocularly
Test Using AO
Vectograph,
Humphriss, TIB, etc

“Masked” BSOP
Often Presents as Unilateral SOP
May Have No Evidence of SOP!
Following Treatment For SOP,
the Deviation Manifests in the Other Eye

Bilateral SOP May Be Caused By
Hydrocephalus Or Cerebellopontine
Tumor

SIXTH NERVE PALSY

Sixth Nerve Palsies Are The Most
Common Ophthalmoplegia

Sixth Nerve Course

Causes Of VI N Palsy

As Sixth Nerve Crosses The
Petrous Bone, It's Subject To Trauma
And Inflammation
Gradenigo Syndrome
May Originate As Otitis Media In
Children

Sixth Nerve Palsy Due To Trauma
50% resolve completely
HORIZONTAL GAZE
CONTROL
Horizontal Gaze Mediated By Paraabducens Nuclear Group In The Pons

When Multiple Cranial Nerve Palsies, Think Cavernous Sinus Or Brain Stem

Nerve Position In Cavernous Sinus

Learning From The Woodpecker
Woodpecker Drilling Behavior: An Endorsement Of The Rotational Theory Of Impact Brain Injury
May, Duster, Haber, Hirschman, Arch Neurol 6/79 pp. 370 - 373
Visual Dependency

Other Considerations

Post Traumatic Pseudomyopia
Egocentric / Midline Shift
Form of neglect?
Studies

Final Review

Fixation Duress and BSOP Can Fool You
Aberrant Regeneration Can Scare You
Woodpeckers Can Teach You