

Monocular vs Binocular Diplopia

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PARK NICOLLET PEDIATRIC AND ADULT STRABISMUS CLINIC

Monocular Diplopia

- ▶ Patient sees double vision with ONE eye open
- ▶ Second image appears as an OVERLAP or GHOST image



Monocular Diplopia

- ▶ How to test?
 - ▶ Cover test: cover each eye and ask the patient if they see single or double
 - ▶ Pinhole: monocular diplopia will likely resolve



Monocular Diplopia Causes

- ▶ Refractive
 - ▶ High astigmatism
- ▶ Tear Film Insufficiency
 - ▶ Early tear break up time
 - ▶ Dry eye syndrome
 - ▶ Abnormalities in blink
- ▶ Retinal Pathology
 - ▶ Maculopathy due to fluid, hemorrhage, or fibrosis (epiretinal membranes are the most symptomatic)
- ▶ Cornea abnormalities
 - ▶ Keratoconus
- ▶ Lens abnormalities
 - ▶ Lens opacities
 - ▶ IOL decentrations where the edge of lens is within the visual axis
 - ▶ Change in refractive error (anisometropia)
- ▶ s/p ocular surgery
 - ▶ Refractive surgery can cause irregular astigmatism and ocular aberrations
 - ▶ Polycoria after iridectomy

Monocular Diplopia

Additional Testing

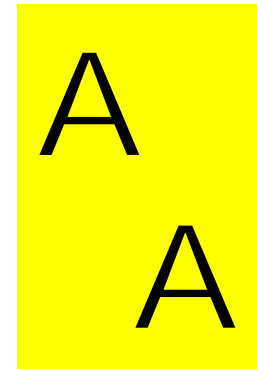
- ▶ Refractive
 - ▶ Pinhole, optical aberrations can be caused from irregular astigmatism
 - ▶ Refract with retinoscopy or over hard contact lens
 - ▶ Let patient dial in astigmatism axis
- ▶ Tear Film Insufficiency
 - ▶ Early tear film break up time or Schirmer test
 - ▶ Use artificial tear to see if symptoms resolve
- ▶ Macular Pathology
 - ▶ Fundus exam
 - ▶ OCT
 - ▶ Amsler Grid
- ▶ Cornea abnormalities
 - ▶ Slit lamp exam
 - ▶ Corneal topography instruments

Binocular Diplopia

- ▶ Patient sees double vision with BOTH eyes open



Vertical Diplopia



Vertical and Horizontal Diplopia

Binocular Diplopia

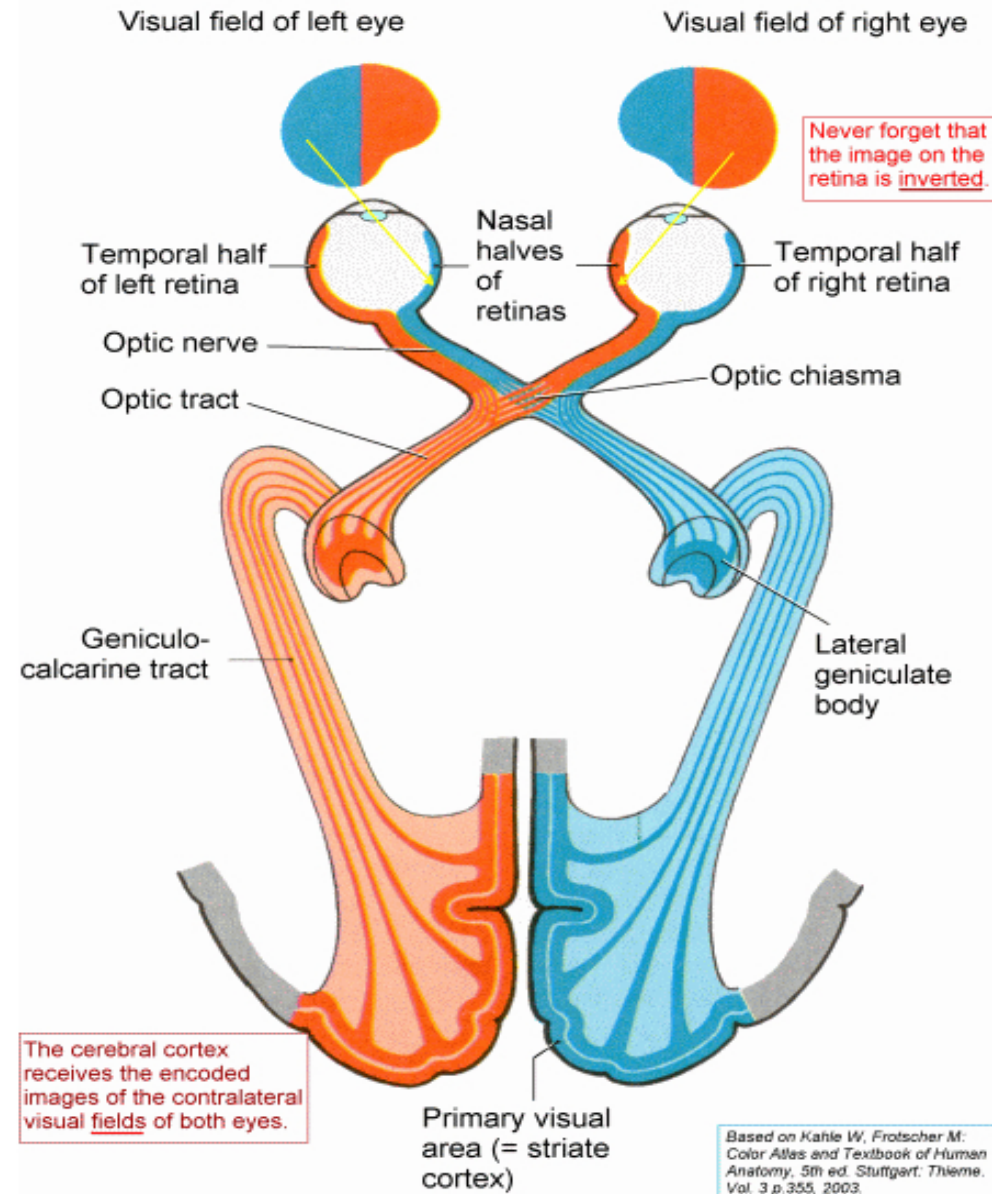
- ▶ How to test?
 - ▶ Covering EITHER eye relieves the diplopia

Binocular Diplopia

Additional Testing

- ▶ Cover test in all gazes
- ▶ Motility
- ▶ Sensory testing
- ▶ Pupils
- ▶ Visual acuity
- ▶ Manifest refraction
- ▶ Fusional amplitudes
- ▶ Double maddox rod
- ▶ Eye lid position
- ▶ Abnormal head posture
- ▶ Orbicularis oculi strength and facial sensation
- ▶ Exophthalmometry
- ▶ Color vision

Visual Pathway

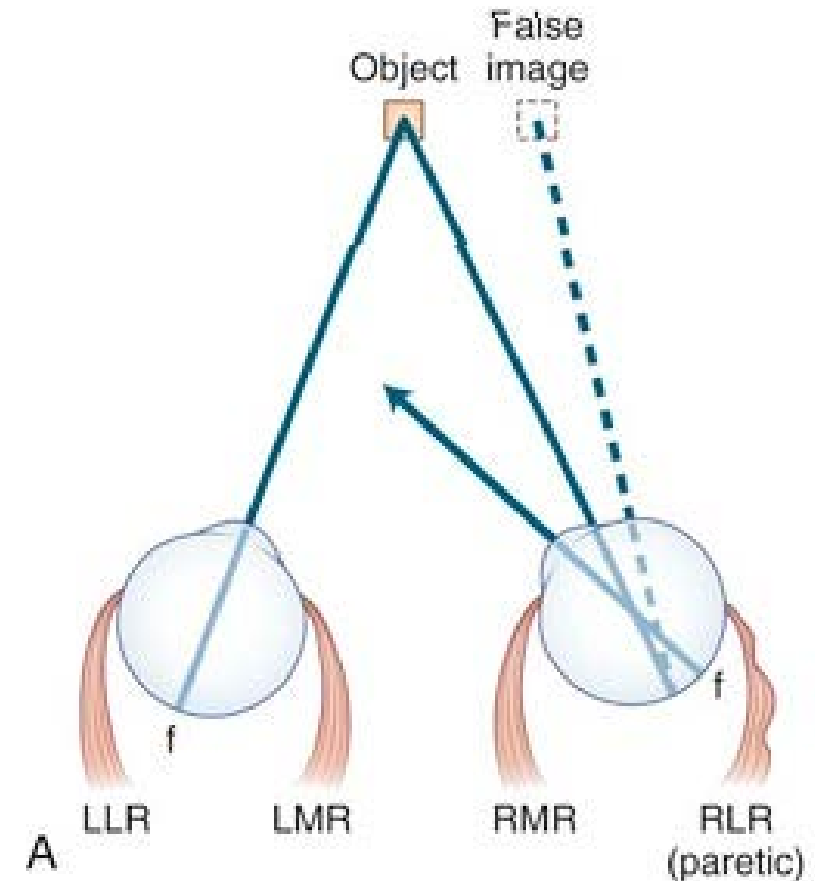


Homonymous Diplopia

Uncrossed Diplopia

Example of a right 6th nerve palsy

- Right lateral rectus results in the right eye turning in
- Image falls on the retina nasal to the fovea
- Image is projected on the temporal field

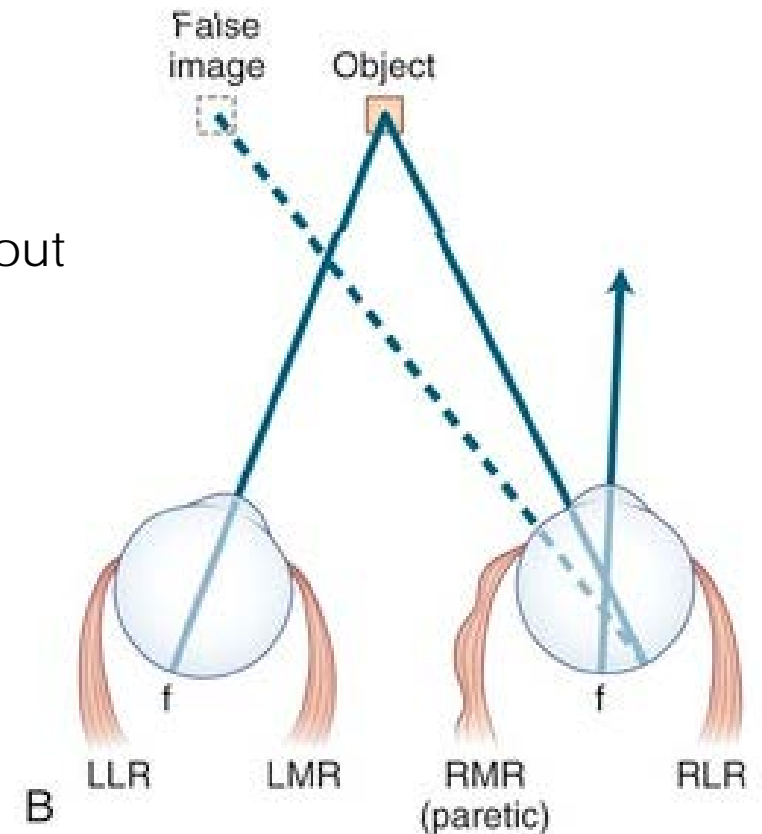


Heteronymous Diplopia

Crossed Diplopia

Example right medial rectus palsy

- Paretic right medial rectus muscle results in the right eye going out
- The image falls on the temporal side of the fovea
- Image is projected to the nasal field



Causes for Binocular Diplopia

Acquired and Urgent

- ▶ You should NOT have more than one of the following neuro-ophthalmic symptoms at one time
 - ▶ Problem with the **lid**
 - ▶ Problem with the **pupil**
 - ▶ Problem with **motility**



Causes for Binocular Diplopia

Acquired and Emergent

1. Aneurysm large, poorly reactive pupil suggesting 3rd nerve palsy (posterior communicating artery)
2. Carotid dissection horner syndrome and 3rd nerve palsy
3. Intracranial or meningeal based tumors multiple cranial nerve palsy
4. Myasthenia gravis any pupil sparing motility disturbance, fatigue, variable, ptosis, respiratory failure
5. Giant cell arteritis new onset headache, scalp tenderness, pain with chewing, diplopia

Causes for Binocular Diplopia

Acquired

3 rd nerve palsy	4 th nerve palsy	6 th nerve palsy	Restriction	Misc
Microvascular ischemia (diabetes, HTN, high cholesterol)	Microvascular ischemia (diabetes, HTN, high cholesterol)	Microvascular ischemia (diabetes, HTN, high cholesterol)	Orbital blow out fracture	Skew deviation (stroke, demyelinating)
Head trauma	Head trauma	Head trauma	Orbital myositis	INO
Demyelination (Multiple Sclerosis)	Congenital that has broken down	Demyelination(Multiple Sclerosis)	Infiltration of the orbit by cancer	
Compression (aneurysm, tumor, inflammation (sarcoidosis, vasculitis))		Compression (tumor, inflammation (sarcoidosis, vasculitis))	Acquired Brown syndrome	
Infection (meningitis)		Increased cranial pressure	Thyroid eye disease	

Causes for Binocular Diplopia

Acquired s/p ocular surgery

▶ Cataract

- ▶ Patient suppressed one eye due to poor vision and now the vision has improved so they are symptomatic of the eye misalignment
- ▶ Aniseikonia from anisometropia can lead to disparate sized images from each eye
- ▶ Trauma to extraocular muscles from peribulbar injections

▶ Scleral buckling

- ▶ Expansion of hydrogel explant material can cause restrictive orbitopathy
- ▶ Injury to muscle or scarring of Tenon's capsule

Continued s/p ocular surgery

- ▶ Glaucoma
 - ▶ Baerveldt implants can result in bleb which can involve the extraocular muscles
- ▶ Refractive
 - ▶ Beware of prism in glasses prior to surgery
 - ▶ Accommodative esotropia and intermittent exotropia can be controlled by the prescription
 - ▶ Avoid mono-vision in someone with strabismus

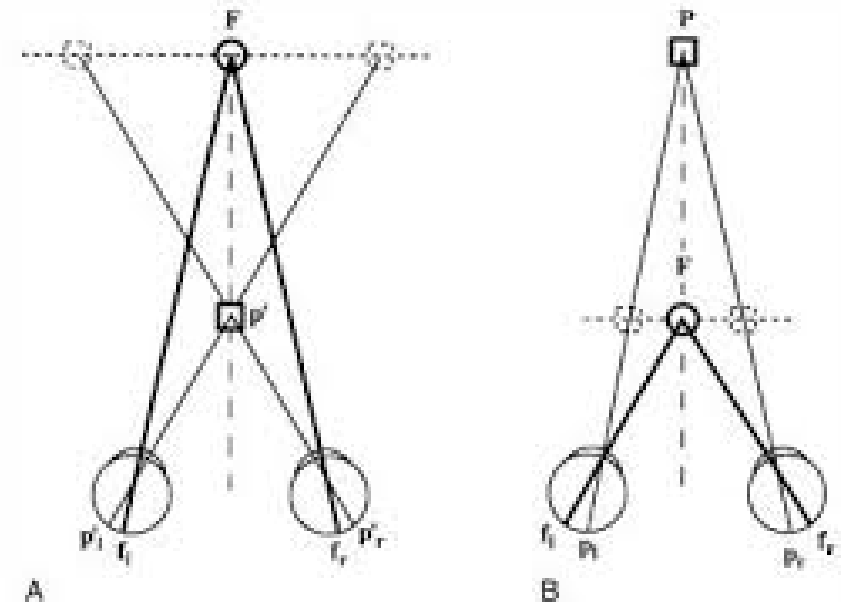
Physiologic Diplopia

- ▶ All object points lying on the horopter curve stimulate corresponding retinal elements and are seen singly. All points not lying on the horopter curve are imaged disparately. Points in Panum's area are seen stereoscopically (points are slightly disparate) and points outside Panum's space are seen double (points are disparate). **The diplopia elicited by object points off the horopter is called physiologic diplopia.** Physiologic diplopia can be demonstrated to anyone with normal binocular vision.

Physiologic Diplopia

How to elicit physiologic diplopia

- Hold a pencil at reading distance in front of your head in its midplane and select an isolated object on the wall behind the pencil.
- Fixate the more distant object, and the pencil will be seen double.
 - When fixating a distant object, a nearer object is seen in crossed (heteronymous) diplopia. Figure B
- Fixate on the pencil, it will be seen singly, but the more distant object doubles.
 - When fixating on a near object, a distance object is seen uncrossed (homonymous) diplopia. Figure A



Causes for Binocular Diplopia

Longstanding

- ▶ Congenital strabismus
- ▶ Intermittent strabismus or phorias

Monocular and Binocular Diplopia

- ▶ You can have monocular and binocular at the same time
- ▶ Treat the monocular diplopia first

Triage help

