

Abnormal Fixational Eye Movements

Chapter 2, Eye movement basics for the Clinician

I. Several categories of abnormal fixations:

Not detectable clinically: Aberrant tremor

Clinically seen:

A. Slow drift

B. Saccadic intrusions

C. Nystagmus

A. Aberrant tremor

- Not detectable on clinical examination
- Reflects functional state of the brainstem (e.g. how well its working)
- Reflects the degree of disturbance of consciousness
- Abnormalities include:
 - Different overall patterns between the 2 eyes
 - Absence of high frequency bursts
 - Irregular, low-frequency bursts of large magnitude
 - Extended periods of low-frequency movement
 - Overall reduction of the response
- Requires highly sophisticated equipment to measure; not done clinically

B. Slow drift

- Found in functional amblyopia (a reduction in acuity, usually unilateral, not correctable with refraction and not attributable to structural or pathological anomalies).
- Amplitude of up to 1 degree
- Velocity is less than 3 degrees per second
- Irregular, slow frequency (<.5 Hz)

****Clinical note: you can see these with your visuoscope→ your direct ophthalmoscope has a setting on it that has a reticule; each circle represents a different amount of degrees or prism diopter off the central target (the fovea). Someone with amblyopia will show these slow drifts as they look at your visuoscope target→ it will look like the fovea makes a slow and wavering journey all around the reticule target. This drift subsides and becomes stable with Vision Therapy, and the visual acuity also improves.

C. Saccadic intrusions

- Large fixational saccades (jumps) that intrude during foveal fixation
- Look like darting, to-and-fro movements with visuoscopy
- Several different types:
 - A. Square wave jerks
 - B. Macro square wave jerks
 - C. Macrosaccadic oscillations

A. Square wave jerks:

- “Jerk” the eye (fovea) away from the object of regards with a saccade
- 200msec later, they return the eye to the original position with another saccade
- Frequency and characteristics are not affected by age
- Present in 25% to 60% of normals! But they are not there all the time during fixation, only occasionally.

Why are these important? Because they:

- May be diagnostic for cerebellar disease IF the frequency and amplitude consistently increase
- May also be a precursor to congenital nystagmus

- May be abnormally large microsaccades?
- Patients without disease can be taught to control them with appropriate wordage.

B. Macro square wave jerk

- Larger than the “regular” square wave jerk
- Occur more frequently (2 to 3 Hz)
- Remove eye from target for shorter intervals (100msec)

Why are these important? Because they are:

- Found in cerebellar disease
- Common in Multiple Sclerosis

C. Macrosaccadic oscillation

- Produce sequence of saccades of increasing, then decreasing amplitude to either side of the fixation point
- This causes a very unstable oscillation
- Intersaccadic pauses of 200 msec

Why are these important? Because they are:

- Most commonly found in patients with cerebellar disease

D. Nystagmus Overview

- Rhythmic oscillation of the eye, usually involuntary

- May be associated with ocular anomalies such as congenital cataracts, optic atrophy, aniridia, albinism, and congenital esotropia.
- May be congenital or acquired. Acquired will perceive oscillopsia,
- Pendular...velocity of movement similar in both directions
 - Foveation is at the peak of waveform when velocity is slowest
 - Congenital is horizontal, acquired may have vertical and torsional
 - Congenital associated with albinism.
 - Acquired in myelin diseases, brainstem strokes, and monocular vision loss.
- Jerk.... A slow phase movement with rapid saccadic movement in opposite direction.
 - Three varieties of Jerk

Congenital: Binocular, similar amplitude in both eyes, usually horizontal, distinctive waveforms, damped by convergence, increased by fixation attempt, superimposition of latent component, inversion of the optokinetic reflex, associated head oscillation, no oscillopsia, gone in sleep.

Gaze evoked: similar to congenital, except slow phase velocity is decreasing. Drugs may induce, cerebellar and vestibular problems and MS. A form of gaze evoked; Latent nystagmus: dampened during binocular situations, amplified during monocular fixation. Associated with strabismus, head turn .

Vestibular jerk nystagmus: Slow phase that moves the eye away from the object of regard, followed by a foveating saccade. Horizontal when cause is peripheral, vertical when central. Fixation suppresses peripheral but not central. Worsened by changes in head position. Nystagmus increases with gaze into direction of saccade.

- Null position....direction of fixation with least intensity.

E. Special Clinical Case: Eccentric Fixation

F.

When strabismic amblyopes try to fixate a target monocularly, sometimes they use a non-foveal part of their retina. When this happens, it is termed eccentric fixation.

→EF manifests usually nasal or temporal to the fovea, although there can also be a vertical component. Why would it be important to know if the patient has EF? How will it impact their vision, if at all? What would this do to their prognosis for recovery of vision in the amblyopic eye?

- Visuoscopy is one technique that you can use clinically to assess fixation. Your direct ophthalmoscope has a certain target that is projected directly onto the fovea. This allows you to directly measure their fixational ability, how steady it is, and to see which part of the retina is being used. It also gives you a good look at the macula area. Be careful, though, not to use too much light. WHY?

Note: It invalidates the procedure if you do it with both eyes open...so be sure that they are monocular at the time.