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ABNORMAL FIXATIONAL EYE MOVEMENTS

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THIS CHAPTER INCLUDES A REVIEW OF:

- Abnormal fixational movements

ABNORMAL FIXATIONAL EYE MOVEMENTS

There are several categories of abnormal fixations:

1. Clinically undetectable:
   - Aberrant tremor
2. Clinically seen:
   - Slow drift
   - Saccadic intrusions
   - Nystagmus
3. Special clinical case:
   - Eccentric fixation

A. ABERRANT TREMOR	• Undetectable on clinical examination • Reflects functional state of the brainstem (i.e. how well it is working) • Reflects the degree of disturbance of consciousness • Specific signs include: I. Different overall patterns between the two eyes II. Absence of high frequency bursts III. Irregular, low-frequency bursts of large magnitude IV. Extended periods of low-frequency movement V. Overall reduction of the response VI. Requires highly sophisticated equipment to measure; not done clinically

B. SLOW DRIFT	• A slow drift is a movement of the eyes in the absence of fixation • 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 (< 0.5 Hz)

CLINICAL NOTE:
You can observe a slow drift using a visuoscope → Direct ophthalmoscope has a reticule which acts as a visuoscope where each circle within the reticule represents a different amount of eccentricity from the central target (the fovea) and can be measured in degrees or prism dioptres.

Someone with amblyopia will reveal these slow drifts as they look at the visuoscope target → it will look like the fovea is making a slow and wavering journey all around the reticule target. This drift subsides and becomes stable with Vision Therapy and visual acuity also improves.

C. SACCADIC INTRUSIONS	• Saccadic Intrusions are defined as large fixational saccades (jumps) that intrude during foveal fixation • Appear as darting, to-and-fro movements with visuoscopy • There are several different types of Saccadic Intrusions: I. Square wave jerks II. Macro square wave jerks III. Macrosaccadic oscillations **I. Square wave jerks** – 'Jerk' the eye (fovea) away from the object of regard with a saccade – 200msec later, another saccade returns the eye to the original position – Frequency and characteristics are not affected by age – Present in 25% to 60% of healthy eyes, but they are not there all the time during fixation, only occasionally. – May be thought of as microsaccades that are abnormally large – Patients without disease can be taught to control them.

Why are square wave jerks important?

May be diagnostic for cerebellar disease IF the frequency and amplitude consistently increase.

May also be a precursor to congenital nystagmus.

C. SACCADIC INTRUSIONS	**II. Macro square wave jerks** – Larger than 'regular' square wave jerk – Occur more frequently (2 to 3 Hz) – Remove eye from target for shorter intervals (100msec)

Why are macro square wave jerks important?

- Found in cerebellar disease
- Common in Multiple Sclerosis

C. SACCADIC INTRUSIONS	**III. Macrosaccadic oscillations** - Produce a sequence of saccades of increasing, then decreasing amplitude on either side of the fixation point - This causes a very unstable oscillation - There are intersaccadic pauses of 200 msec

Why are these important?

- Most commonly found in patients with cerebellar disease

D. NYSTAGMUS – OVERVIEW	• Nystagmus is defined as a rhythmic oscillation of the eye that is usually involuntary • May be associated with ocular anomalies such as: - Congenital cataracts - Optic atrophy - Aniridia - Albinism - Congenital esotropia. • May be congenital or acquired. Acquired will perceive oscillopsia (Vision in which objects appear to oscillate. It may be due to acquired nystagmus, loss of vestibular function, neurosis, multiple sclerosis, in superior oblique myokymia, etc.) • Nystagmus can be classified as follows: **1. Pendular Nystagmus:** - Velocity of movement is similar in both directions - Foveation is at the peak of waveform when velocity is slowest - If congenital, direction of movement is horizontal - If acquired, direction of movement may be vertical and torsional - Congenital pendular nystagmus is associated with albinism. - Acquired pendular nystagmus is associated with myelin disease, brainstem strokes and monocular vision loss.

D. NYSTAGMUS – OVERVIEW	**2. Jerk Nystagmus:** - A slow phase movement with a rapid saccadic movement in the opposite direction. - Jerk Nystagmus can be further classified as: **a) Congenital Jerk Nystagmus:** - Binocular - Amplitude in both eyes is similar - Usually horizontal - Distinctive waveforms - Dampened by convergence - Increased by attempt to fixate - Superimposition of latent component - Inversion of the optokinetic reflex - Associated head oscillation - No oscillopsia - Absent during sleep. **b) Gaze evoked Jerk Nystagmus:** - Similar to congenital except slow phase velocity is decreasing. - Drugs may induce cerebellar and vestibular problems and MS. - Latent nystagmus is a form of gaze evoked jerk nystagmus where the movement is dampened under binocular conditions and amplified under monocular conditions. - Associated with strabismus and head turn. **c) Vestibular jerk nystagmus:** - Has a slow phase that moves the eye away from the object of regard followed by a foveating saccade. - Movement is horizontal when cause is peripheral and vertical when cause is central. - Fixation suppresses the peripheral oscillation but not central. - Worsened by changes in head position; nystagmus increases with gaze directed toward the direction of the saccade. **3. Null position:** - Refers to the direction of fixation with least intensity.

E. SPECIAL CLINICAL CASE: ECCENTRIC FIXATION (EF)	When a person with strabismic amblyopia tries to fixate a target monocularly, they sometimes use a nonfoveal part of their retina. When this happens, it is termed eccentric fixation (EF). EF usually manifests either 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? If the patient has eccentric fixation, this can limit the maximum achievable visual acuity due to the density of the photoreceptors outside of the fovea. **Visuoscopy** Visuoscopy is one clinical technique that can be used to assess fixation. Direct ophthalmoscope has a specific target that is projected directly onto the fovea. This allows the practitioner to directly measure the fixational ability of the patient, how steady the fixation is and to see which part of the retina is being used. It also allows for a good view of the macula area. It is important not to use too much light. WHY? If using too much light macula could be dazzled and create abnormal fixation.

NOTE: It invalidates the procedure if you do it with both eyes open;
so be sure the examination is carried out under monocular conditions.

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