OCULOMOTOR TERMINOLOGY

Ball and Socket rotational references

Extraocular motility-- movement of the eyes due to contraction of the muscles attached to the globe. Includes saccades, pursuits, vergence, optokinetic nystagmus and vestibular ocular reflexes.

Intraocular motility- eye movements due to contraction of the muscles within the eye. Includes accommodation and pupillary responses.

Entrance pupil- image of the pupil formed by refraction at the cornea.

Line of sight- line passing from the center of the entrance pupil to the object of regard.

Center of rotation-during rotation of the eye, a point in the eye having zero velocity with respect to the eye and with respect to the orbit. (center of ball and socket).

Primary position- position of the eye from which either a purely horizontal or purely vertical movement produces no torsion. Sometimes defined less rigorously as gaze parallel to mid-sagittal plane and perpendicular to binocular baseline.

Cartesian description of gaze direction from primary position

I. <u>Horizontal and vertical components</u>

A. Monocular

Duction-movement of one eye away from primary position.

Abduction- temporalward movement of the eye (toward the ear).

Adduction- nasalward or inward movement of the eye.

Supraduction- elevation of the eye.

Infraduction-depression of the eye

B Binocular- see Hering's Law of ocular movements.

1. Conjugate or yoked

Version- a conjugate movement of the eyes or one in which there is no change in the angle between the lines of sight of the eyes.

Dextroversion- movement of both eyes to the right.

Levoversion- movement of both eyes to the left

Supraversion- elevation of both eyes

Infraversion- depression of both eyes

2. Disconjugate or disjunctive.

Vergence-a disjunctive movement or one in which there is a change in the angle between the lines of sight of the two eyes.

Convergence-a disjunctive horizontal movement in which the lines of sight of the two eyes move towards each other (+).

Divergence-disjunctive horizontal movement in which the lines of sight of the two eyes move away from each other (-).

Hyperdeviation (skew)- elevation of one eye's line of sight relative to the follow eye

Hypodeviation-depression of one eye's line of sight relative to the follow eye

II. Torsion or screw movements.

A. Monocular (reference location is upper vertical meridian)

Torsion movement- rotation of the eye about the naso-occipital (antero-posterior) axis of the eye or about the line of sight.

Extorsion- rotation of the eye about the line of sight in which to top of the eye moves temporalward.

Intorsion-rotation of the eye about the line of sight in which to top of the eye moves nasalward.

B. Binocular

1. Conjugate (Positive is dextroversion, supraversion, dextrotorsion)

Dextrotorsion-rotation of the eye about the line of sight in which to top of the eye moves rightward (also clockwise -CW).

Levotorsion-rotation of the eye about the line of sight in which to top of the eye moves leftward (also counter clock wise -CCW).

2. Disconjugate- disjunctive (Right - Left)

Incyclovergence- disjunctive movement in which both eyes intort (+).

Excyclovergence- disjunctive movement in which both eyes extort (-)

Eye position "Laws"

DeCartes- Sherrington's Law-Reciprocal innervation of antagonist muscle pairs: As agonist innervation increases, antagonist innervation decreases.

Hering's Law-Movements of the two eyes are equal and symmetrical. Equal innervation of yoked muscle pairs. "...one and the same impulse of will directs both eyes simultaneously as one can direct a pair of horses with single reins."

Donder's Law For every gaze direction the eye has a unique torsional posture, that is independent of the particular route or sequence of rotations the eye took to reach that position.

Listing's Law The eye's orientation for any given gaze position is geometrically equivalent to the situation where the eye has made a single rotation from the primary position to that gaze position about an axis in a fixed plane, known as Listing's plane, which is always (approximately) in frontal plane for all eye positions. Listing's Law is only valid for steady gaze positions, it is violated during many eye movements.