CLINICAL REPORT Guidance for the Clinician in Rendering Pediatric Care

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Evaluation of the Visual System by the Primary Care Provider Following Concussion

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Concussion is a common injury in childhood and has the potential for substantial impact on quality of life. Visual issues have been increasingly recognized as a common problem after concussion. Many children initially seek care for concussion with their pediatrician, making it even more important for pediatricians to recognize, evaluate, and refer children with visual issues after concussion. This clinical report is intended to support the recommendations in the companion policy statement on vision and concussion and provides definitions of some of the physiologic aspects of the visual system as they relate to concussion. A description of clinically feasible testing methodologies is provided in more detail to aid the clinician in assessing the visual system in a focused fashion after concussion. This guidance helps direct clinical management, including support for return to school, sports, and other activities, as well as potential referral for subspecialty care for the subset of those with persistent symptoms.

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VISUAL ACUITY

The use of an eye chart is possible in most children by 4 years of age. Picture charts or matching charts (LEA Symbols HOTV is not an abbreviation and appears in the correct place later in the sentence) can be used in preliterate children, and letter charts (early treatment of diabetic retinopathy study [ETDRS], Sloane, HOTV) can be used in literate children. The patient is tested monocularly with the opposite eye occluded at the distance recommended on the basis of the chart

used. If the child has glasses, they should be worn for acuity testing. Most children do not report 20/20 vision using standard acuity chart testing until after about 5 years of age, but at any age, visual acuity should be approximately equal between the eyes. In general, children 5 years or older who have monocular vision worse than 3 of 5 letters on the 20/30 line have abnormal results. If a distance vision chart is not available, near visual acuity testing can be accomplished using one of the standard types of near vision testing cards.[1–3]

CONFRONTATION VISUAL FIELD

With each eye covered, ask the patient to directly look at your eye or nose and test each quadrant in the patient's visual field by asking him/her to count the number of fingers that you present in the quadrant of the field being tested, or ask the patient when he or she first notices your hand while slowly moving it from out of his or her field toward the middle. It is useful for the examiner to also close one eye to confirm the patient is seeing appropriately in the field being tested.[1–3]

FACIAL SENSATION

Ask patients to close their eyes and say, "point to the area on your face where you feel me touch you." Using a tissue or cotton ball, randomly touch the patient's face. Touch the patient above each temple, next to the nose and on each side of the chin, all bilaterally. Ask the patient to also compare the strength of the sensation of both sides.[1–3]

ORBIT

In assessing the orbits for trauma, examine for proptosis and palpate for pain and irregular orbital rims. Proptosis can be assessed by estimating the amount of sclera visible between the eyelid and the cornea.[1–3]

EYELIDS

The eyelids are evaluated for edema, erythema, ecchymosis, symmetry, ptosis, and lid closure.[1–3]

PUPILS

Pupillary assessment involves eliciting direct and consensual responses to light on both sides, checking for an afferent pupillary defect, and examining the response to accommodation. The swinging light test is used to evaluate for an afferent pupillary defect. Have the patient fixate on an object at least 10 feet away and then shine a bright light on one eye, approaching it from slightly below. Then swing the flashlight back and forth between the right and left eye. A normal response is that the pupil maintains a similar size. If one pupil dilates then this is indication of an afferent pupillary defect. The response to accommodation is assessed by asking the patient to alternately look between the same 10-foot target and a second target 6 inches from the face, while illuminating both pupils from below.[1–3]

CONJUNCTIVA, CORNEA, ANTERIOR CHAMBER

Using a simple illumination instrument (penlight, office ophthalmoscope, otoscope, or flashlight in smartphone), inspect the palpebral and bulbar conjunctiva for injury by gently pulling down the lower lid and illuminating the surface of the eye while the patient looks in extreme gaze positions. The clarity of the cornea, anterior chamber, and iris details are also observed as well with the flashlight.[1–3]

FUNDUS

With the direct ophthalmoscope set at zero diopters and a circular, diffuse light, step back 2 to 3 feet from the patient and look through the ophthalmoscope, illuminating both pupils simultaneously. The examiner will notice 3 findings in the normal setting: symmetric pupils, red reflex, and corneal light reflexes. The direct ophthalmoscope may be used to view the optic disc by moving close to the patient.[1–3]

SMOOTH PURSUIT (VISUAL TRACKING OF A MOVING OBJECT)

Pursuit is checked by holding a near stimulus (target), for example, a tongue depressor with a letter or sticker attached, at 1 to 2 feet from the patient using a slow and steady movement back and forth horizontally about 160 degrees (from the patient's ear to ear) and vertically about 120 degrees (from patient's forehead to chin). Both eyes should follow the stimulus symmetrically and smoothly. Pursuit testing must be performed slowly, otherwise the oculomotor system uses catch-up saccades to maintain focus on objects moving at faster speeds. It is crucial that the test stimulus is sufficient to maintain interest so that a disinterested subject does not appear to have an oculomotor abnormality.[1,2,4–6]

SACCADES (VISUAL FIXATION SHIFTING BETWEEN STATIONARY TARGETS)

Saccades are tested with 2 near stimuli such as those used for smooth pursuit testing, one in each hand. Hold them about 2 feet apart, 1 to 2 feet in front of the patient, horizontally then vertically. Ask the patient to refixate between the 2 stimuli on command several times horizontally and then vertically. The eyes should move quickly, symmetrically, and end accurately on the stimulus.[1,2,4,5,6]

VESTIBULO-OCULAR REFLEX (VOR [MAINTAINING IMAGE FOCUS DURING HEAD MOVEMENT])

The VOR is assessed with the same near stimulus used for smooth pursuit testing. While holding the stimulus at 1 to 2 feet directly in front of the patient's nose, the patient moves his/her head horizontally for about 160 degrees (shaking his/her head) and then moving his/her head vertically for about 120 degrees, (nodding his/her head). The eyes should remain on the near stimulus throughout the head movement.[4–7]

VERSIONS (HORIZONTAL AND VERTICAL MOVEMENTS OF THE EYES UNDER BINOCULAR CONDITIONS) AND DUCTIONS (MOVEMENTS OF EACH EYE UNDER MONOCULAR CONDITIONS)

Versions and ductions are tested with an appropriate target that maintains the subject's interest and accommodation. Hold the stimulus about 2 feet in front of the patient and move in an "H" pattern to the right, left, up-right, up-left, down-right, and down-left, first under binocular conditions, then with each covered. The eyes should move equally symmetrically to the extreme positions of gaze.[1,2,4–6]

CONVERGENCE (FOCUSING WITH BOTH EYES ONTO A NEAR FIXATION TARGET)

Convergence testing is also accomplished using a small target that maintains the subject's interest and stimulates adequate accommodation. Hold the stimulus about 2 feet in front of the patient's eyes and bring the stimulus toward the face until the eyes stop converging. The eyes should continue to converge on the stimulus until about 6 cm, or approximately 2.5 inches, from the forehead. The use of a small accommodative stimulus is crucial as patients may appear to have convergence insufficiency if they fail to focus.[4–6]

ACCOMMODATION (FOCUSING WITH ONE EYE AT NEAR

Accommodation testing (the natural ability of the lens in the eye to facilitate clear vision at near fixation) is tested monocularly using a standard reading card. After occluding one eye, ask the patient to fixate on the smallest readable letter at about 2 feet away, move the card toward the eye until the patient reports blurring of that same letter. Most children will be able to keep the letter clear until 10 cm, or approximately 4 inches, from the eye.[6]

STRABISMUS (MISALIGNMENT OF THE EYES)

The monocular cover-uncover test is more accurate than corneal light reflex testing to detect the presence of strabismus. While the patient fixates on a distant visual target that appropriately stimulates accommodation (20/40 size or smaller), each eye is covered and then uncovered (right eye, then left eye), and the examiner watches carefully for any movement in the opposite, noncovered eye; such movement indicates the possible presence of strabismus. Exotropia is an outward deviation, esotropia is an inward deviation, hypertropia is an upward deviation, and hypotropia is a downward deviation of either eye during cover testing.[1–3]

RECOMMENDATIONS

For more details regarding the recommendations related to this clinical report, see the accompanying policy statement.[8]

1. After a concussion, clinicians should generally inspect for signs of trauma to the ocular structures or to the visual system.
2. Careful assessment of the visual system, including an assessment of visual acuity, the visual fields, pupillary reactions, smooth pursuit, saccades, vestibulo-oculomotor reflex, monocular accommodation, and binocular convergence, may be used to identify deficits after concussion in children.

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