Cranial Nerve Examinations

4

See Table 4.1.

Table 4.1 Cranial nerve examinations

Cranial nerve	Standard assessment	Extended testing
CN I Olfactory nerve	Patient is asked to identify odors at each nostril with eyes closed When malingering is suspected, use ammonia (testing nociceptive receptors of trigeminal nerve)	"Sniffin' sticks"/Screening 12 Test [1] Olfactory evoked potentials [2] Odor detection threshold test [3]
CN II Optic nerve	Testing visual acuity using a pocket chart for near vision [4], or counting fingers or hand movements Visual fields are tested by direct confrontation in all four quadrants for each eye (specificity 97%) Using two moving red points (i.e., pen) (sensitivity 77%), both monocular and binocular In comatose patients: blink to threat reflex [5] Color perception is tested by using Ishihara charts Pupil: observe size, shape, and symmetry Pupillary light response (afferent limb), consensual reflex, accommodation reflex Swinging flashlight test (afferent)	Direct ophthalmoscopy [6], pocket ophthalmoscope Testing visual acuity using Snellen chart (distance vision) [4] Visual evoked potentials [2] Slit lamp examination [6] Perimetry using tangent screen, Goldmann perimeter, or computerized automated perimeters [6] Optical coherence tomography (OCT) [6, 7] Scanning laser polarimetry and scanning laser tomography [6] Optic nerve sheath diameter ultrasound (ONSD) [8]
CN III Oculomotor nerve	Inspect for ptosis and miosis (Horner syndrome), mydriasis (parasympathetic) Pupillary light response (efferent limb) Swinging flashlight test (efferent limb) Pupil: observe size, shape, and symmetry Convergence reaction Usually CN III, CN IV, and CN VI are tested together: move fingers or tip of pen in H shape; observe eye movements and possible nystagmus Check if gaze to each side, gaze upwards, and gaze downwards is possible (medial rectus, inferior rectus, and inferior oblique muscle)	Pupillometry Pharmacological pupil testing Pupillography (automated swinging flashlight test) EMG of eye muscles Electrooculography (EOG) Video oculography [9] Binocular infrared oculography [9] Hess charts [9]

(continued)

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Table 4.1 (continued)

Cranial nerve	Standard assessment	Extended testing
CN IV Trochlear nerve	Check intorsion and depression in adducted position (superior oblique muscle) ("look down and in") Head tilt test (Bielschowsky test) [6]	Refer to CN III Maddox rod for testing manifest deviation [6]
CN V Trigeminal nerve	Test sensation in ophthalmic (V1), maxillary (V2), and mandibular (V3) sensory branches in the face using cotton wool Check corneal reflex Inspect masseter and temporal muscle while clenching teeth Jaw jerk	Trigeminal somatosensory-evoked potentials [2] Blink reflex Masseter reflex Masseter inhibitory reflex [2] EMG of the masseter, temporalis, and pterygoid muscle Motor evoked potentials from masseter muscle
CN VI Abducens nerve	Check abduction on both sides for function of lateral rectus muscle	Refer to CN III
CN VII Facial nerve	Evaluation of asymmetry of facial movements (raise eyebrows, close eyes, puff out cheek, reveal teeth) Corneal reflex Schirmer test of lacrimation [10] Taste in the anterior two thirds of the tongue Stethoscope test [11]	Facial motor nerve conduction studies Motor evoked potential EMG of innervated muscles Repetitive nerve stimulation Nerve excitability test (NET) [12] Maximal stimulation test (MST) [12] Blink reflex Acoustic (stapedius) reflex test [13] Impedance audiometry Electrogustometry [14]
CN VIII Vestibulocochlear nerve	Rubbing fingers by each ear Weber test, Rinne's test Check for nystagmus, also using Frenzel lenses (for fixation) Rhomberg's test, Unterberger's test Pointing test of Bàrany [11] Repositioning maneuvers: Dix-Hallpike, Epley canalith repositioning maneuver, Semont Head-thrust-test	Pure tone audiometry Brainstem evoked auditory potential Electronystagmography Vestibular evoked myogenic potentials (VEMP) testing
CN IX Glossopharyngeal nerve	Taste in the posterior third of the tongue Inspect for palatal asymmetry and uvular deviation Check for abnormal palatal sensation Test gag reflex separately on each side Valsalva maneuver Carotid sinus pressure test	Electrogustometry [14] EMG of soft palate
CN X Vagus nerve	Inspect for palatal asymmetry and uvular deviation Check for abnormal palatal sensation Check speech for hoarseness Valsalva maneuver	Laryngoscopy [15] Stroboscopy [15] Tilt table test, heart rate variability Laryngeal electromyography Barium swallow
CN XI Accessory nerve	Patient should shrug shoulders (testing for trapezius muscle) and turn head against resistance (test for sternocleidomastoid muscle)	EMG trapezius muscle Repetitive nerve stimulation Motor evoked potential Accessory motor nerve conduction studies
CN XII Hypoglossal nerve	Inspect tongue at rest in mouth and while sticking it out (check for atrophy and fasciculation) Test strength by pushing the patient's tongue against a tongue blade	EMG of the tongue Corticobulbar motor evoked potentials from tongue muscles [16] Sonography of the tongue

CN cranial nerve, *EMG* electromyography, *EOG* electrooculography, *MST* maximal stimulation test, *NET* nerve excitability test, *OCT* optical coherence tomography, *ONSD* optic nerve sheath diameter ultrasound, *VEMP* vestibular evoked myogenic potentials

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