

The head—neurological examination

Neurological examination cannot be considered in isolation from the rest of the body. For instance, poor respiratory or cardiac function can impair neurological function by causing cerebral ischaemia (hence you **cannot accurately assess 'D' until 'A, B & C' have been optimized.**) Remember focal neurological dysfunction might be related to lesions elsewhere; e. g. metastases, brain abscesses.

Neurological examination should be carried out as appropriate. The following should be considered:

- **Glasgow coma scale:** orientation, eye opening and verbal response;
- **cranial nerve examination;**
- **limb function:**
 - appearance (deformity, wasting, abnormal movement);
 - muscle tone;
 - power in each muscle group;
 - limb reflexes;
 - sensation (touch, pain, vibration, temperature) in each dermatome;
- co-ordination:
 - Rhomberg's test for equilibrium;
 - gait;
- **Higher cerebral functions:**
- language ability: expressive, receptive and nominal **dysphasia**;
- reading ability: **dyslexia**;
- writing ability: **dysgraphia**;
- calculation ability: **dyscalculia**;
- object recognition: **agnosia**;
- ability to perform specific tasks: dressing, geographical (follow route) and constructional (copy drawing) **apraxia**;
- **memory** test: immediate, short-term, long-term, verbal, and visual memory (cannot be tested if confused or dysphasic);
- **reasoning and problem solving ability**;
- **mental state:** degree of anxiety, mood, emotional behaviour, inhibition, speed of thought and response.

Examination of the unconscious patient

Neurological examination is limited in unconscious patients, but the following should be assessed:

- resuscitation status;
- Glasgow coma scale;
- pupil responses;
- eye movements and fundoscopy;
- signs of injury;
- abnormal skin colour (cyanosis, jaundice, rubor in carbon monoxide poisoning);
- needle-stick marks (drug overdose);
- smell of breath (alcohol, ketosis, uraemia, cyanide);
- brainstem reflexes;
- limb tone;
- limb movements (spontaneous, localizing, flexion, extension, or absent);
- limb reflexes and plantar response.

Glasgow coma scale (GCS)

The importance of the GCS, like many investigations, is that it is a 'snapshot' of the patient's condition at the time it was taken. To be of use it must be repeated again and again at suitable intervals. Only this way will it be possible to quickly pick up any improvements or deterioration in the patient's condition.

The GCS was devised as a means of consistently describing the depth of unconsciousness and monitoring any change. It involves assessing three responses:

- eye opening
- motor
- verbal.

Patients should be described according to the three responses, as this gives a clearer indication of their status (e.g. eye opening to speech, disorientated, and localizing pain and not just 'GCS 12').

Progression down the scale indicates a worsening condition and a worsening prognosis. Following trauma, a person who has no eye opening, no motor, and no verbal response (GCS 3) is unlikely to survive (see Table 4.1).

Glasgow coma scale in young children

In young children the modifications shown in Table 4.2 can be used.

Table 4.1 Glasgow coma scale

Eye-opening response	Motor response	Verbal response	Score
	Obeys commands		6
	Localizes pain*	Orientated‡	5
spontaneous	normal flexion	confused	4
To speech	Abnormal flexion	Words only	3
To pain	Extension	Sounds only	2
Nil	Nil	Nil	1

* Must bring hand higher than chin to supra-orbital pain.

‡ Orientated to time, place and person.

Table 4.2 Glasgow coma scale in young children

Eye-opening Response	Motor response	Verbal response	Score
	Spontaneous movement		6
	Localizes pain	Usual vocalization	5
Spontaneous	Normal flexion	Reduced vocalization	4
To speech	Abnormal flexion	Cries only	3
To pain	Extension	Moans only	2
Nil	Nil	Nil	1

When discussing the GCS make it clear which score you are using. The original GCS had a maximum score of 14 not 15. Some units may still use this score, so be clear, especially if you are transferring or receiving a patient elsewhere.

The cranial nerves

See Table 4. 3. Note the following:

- CNIII—gaze deviation and ptosis are only seen in a conscious patient.
- Pupillary inequality can occur in 20% of normal people; both pupils will react to light in this case.
- CNVII—taste is via the nervus intermedius, which joins the trigeminal (CNV3) for distribution to the tongue.
- Weber's test: place tuning fork in centre of forehead. If sound is heard best in deaf ear, deafness is conductive.
- Rinne's test: hold tuning fork by ear until sound inaudible, then move fork to mastoid process. If sound is heard deafness is conductive.

Cranial nerve (brainstem) reflexes

Pupillary reflexes

Afferent II, efferent III parasympathetic: shine a torch into each eye in turn and watch for pupillary constriction. If one eye is blind there will be no response in that pupil (direct reflex) or the opposite pupil (consensual reflex), but the affected pupil will constrict to light in the opposite eye. If there is a III palsy, that pupil will not react to light in either eye, but the opposite pupil reacts to light in both eyes.

Corneal reflex

Afferent V, efferent VII: stroke the cornea with cotton wool and watch for blinking.

Grimace reflex

Afferent V, efferent VII: press on the supra-orbital nerve at the orbital margin and watch for facial grimacing. Any limb or autonomic (pulse rate and blood pressure elevation) responses should also be recorded.

Gag reflex

Afferent IX, efferent X: stimulate the posterior pharynx and watch for gagging.

Oculocephalic and oculovestibular reflexes

Afferent VIII, efferent III, IV, and VI: these are the same reflex pathway stimulated by different methods.

In the **oculocephalic (dolls eyes) reflex** the head is turned briskly to one side; if the reflex is preserved the eyes will turn to the opposite side as if maintaining gaze on the same point. This cannot be tested on conscious patients as voluntary control over gaze predominates.

In the **oculovestibular reflex** ice cold water is irrigated into the external auditory canal, after ensuring it is not blocked by wax or that the ear drum is perforated; if the reflex is preserved nystagmus will develop due to stimulation of the semicircular canals by convection currents. This should not be tested on conscious patients as severe vertigo and vomiting will result.

Table 4.3 The cranial nerves

No	Nerve	Function	Test	Palsy
I	Olfactory	Smell	Various smell bottles (test each nostril separately)	Loss of smell (anosmia)
II	Optic	Vision	Visual activity, visual fields, pupillary responses, fundoscopy	Blind eye, visual field defect or loss of acuity, papilloedema
III	Oculomotor	Eye movements	Eye movement in all directions, pupillary responses	ptosis, eye deviated down and outwards, unreactive dilated pupil
IV	Trochlear	Eye movements	Eye movement down when looking medially	Inability to look down when looking medially
V	Trigeminal	Facial sensation Muscles of mastication	Sensation in three trigeminal divisions, corneal reflex, jaw movement	Loss of facial sensation, loss of corneal reflex Jaw weak and deviates to side of lesion of opening, wasting of mastication muscles (chronic)
VI	Abducent	Eye movements	Eye movement laterally	Inability to look laterally
VII	Facial	Facial movements Taste to anterior tongue	Facial movements Sweet, bitter, salt taste	Loss of facial movement UMN: forehead spared substances LMN: forehead affected Loss of taste

VIII	Vestibulocochlear	Hearing Equilibrium	Hearing, Weber's and Rinne's tests balance and equilibrium	Deafness nystagmus, loss of equilibrium
IX	Glossopharyngeal	pharyngeal posterior tongue sensation and taste motor to upper pharynx	pharyngeal sensation, gag reflex	Loss of gag reflex and pharyngeal sensation
X	Vagus	Visceral parasympathetic supply (extensive) Larynx and pharynx motor function	pharyngeal movement, gag reflex Laryngoscopy	Loss of gag reflex and pharyngeal movement Hoarse voice, vocal cord paralysis
XI	Accessory	Trapezius and sternomastoid motor function	Trapezius and sternomastoid power	Weakness of trapezius and sternomastoid
XII	Hypoglossal	Tongue movements	Tongue movements	Tongue deviates to side of lesion

UMN = upper motoneurone, LMN = lower motoneurone.