CLINICAL EXAMINATION OF CNS
CNS EXAMINATION

Take proper history; then proceed to the following steps in examination of CNS

• Higher functions
• Cranial nerves
• Motor system
• Reflexes
• Sensory system
• Cerebellar signs
• Skull and spine
HIGHER FUNCTIONS

Small child
- alert, active, playful
- recognizes mother, strangers etc

Older child
- conscious, oriented in time and place
- intelligence
- memory
- speech
CRANIAL NERVES

1\textsuperscript{st} – Olfactory
use oil of cloves or peppermint/asafoetida
test each nostril separately

2\textsuperscript{nd} - Optic nerve
Acuity of vision
Field of vision
Color vision
Fundus
Visual acuity

younger age: use torch or bright toy
picture book/wall pictures

> 6 yrs: Snellen chart or finger counting

Color vision: use 3 primary colors
(red, green, blue) - > 3yrs

Visual fields: confrontation test in older children
younger children by moving a light/toy

Pupils: size, shape & reflexes
direct, consensual and accommodation reflexes
Ptosis: Movements of the eyes – test in all directions. Dolls eye movements in comatose

Nystagmus: horizontal/vertical

Squint - paralytic - range of eye movements impaired vision normal

- nonparalytic /concomitant – range of eye movements normal and vision defective
Extraocular muscles

4 Recti and 2 Obliques

Superior rectus   Superior oblique
Inferior rectus   Inferior oblique
Medial rectus
Lateral rectus
Levator palpebrae superioris
<table>
<thead>
<tr>
<th>Muscle tested</th>
<th>Movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR</td>
<td>Looks laterally and upwards</td>
</tr>
<tr>
<td>IR</td>
<td>Looks laterally and downwards</td>
</tr>
<tr>
<td>LR</td>
<td>Looks laterally</td>
</tr>
<tr>
<td>MR</td>
<td>Looks medially</td>
</tr>
<tr>
<td>IO</td>
<td>Looks medially and upwards</td>
</tr>
<tr>
<td>SO</td>
<td>Looks medially and downwards</td>
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V<sup>TH</sup> – TRIGEMINAL NERVE

Motor
- ask to clench the teeth and palpate over the cheek and temple (masseters & temporalis)
- ask to open the mouth wide-jaw deviates to the paralyzed side (pterygoid)

Sensory
- test sensations over forehead, cheeks and chin (ophthalmic, maxillary and mandibular divisions)
7TH – FACIAL NERVE

Motor
- raise the eyebrows (frontalis) –wrinkling
- try to open tightly closed eyes (orbicularis oculi)
- obliteration of nasolabial fold on paralyzed side
- look for deviation of angle of mouth
- blowing of air (buccinators)
- ask for hyperacusis

Sensory
- test for taste in the anterior 2/3 rd of tongue
7TH – FACIAL NERVE

- Lower motor neuron lesion of 7th nerve results in complete lack of ipsilaterial facial movements.

- Upper motor neuron lesion – only lower half of the face is affected (upper part of the face has bilateral cortical innervation).

- Bell’s phenomenon in LMN lesion-( when the child attempts to shut the eyes, eyeball will roll upwards).
8th - VESTIBULOCOCHLEAR NERVE

Hearing assessment
  - watch test, audiometry from 3 yrs onwards
Rinne’s test
  - Weber’s test
ask for tinnitus

Vestibular nerve
  - vertigo and nystagmus on head movement
Romberg test
IXTH & XTH - GLOSSOPHARYNGEAL AND VAGUS NERVE

Nasal regurgitation of fluids and nasal twang of voice
Position of uvula
  moves to normal side in Xth nerve palsy
Palatal movement
  no movement on the affected side; pulled to normal side
  palate immobile if bilateral palatal palsy
Gag reflex – tickle the posterior pharyngeal wall and look for contraction of pharynx-afferent is IX and efferent is X
Sensory – posterior 1/3 of tongue
Bulbar palsy

LMN palsy of nerves originating from the bulb (medulla) – no jaw jerk or gag reflex pooling of secretions

Pseudobulbar palsy

UMN palsy of nerves originating from the medulla
Jaw jerk and gag reflex exaggerated
Pyramidal signs present
Tongue small and spastic
XI<sup>TH</sup> NERVE- ACCESSORY

Trapezius muscle

- Tested by shoulder shrugging against resistance
- Drooping of shoulder on paralyzed side and scapula drop to lower level

Sternomastoid

- ask the child to turn his head to one side or other against resistance
12\textsuperscript{TH} - HYPOGLOSSAL NERVE

- Ask the child to protrude the tongue - it deviates to the paralyzed side
- Fasciculation of tongue in Wernig–Hoffman disease
- Atrophy of tongue on affected side in LMN palsy
- In UMN palsy, tongue is spastic, thin and pointed
MOTOR SYSTEM

- Bulk of muscles - Atrophy in LMN lesions, Measure the size of the muscles
- Tone of muscles
- Muscle Power
- Co-ordination
- Involuntary movements if any
TONE

Tone is the resistance offered by the muscles to passive stretching

• Hypotonia – LMN lesions, spinal shock of UMN lesions, some cerebellar lesions

• Hypertonia - spasticity or rigidity
  Spasticity – pyramidal tract involvement
  unequal involvement of gravity and antigravity muscles
  Rigidity - extrapyramidal involvement
  uniformly increased in both agonist and muscle groups
Muscle tone examined by
- Inspection
- Palpation
- Passive movements
- Shake test

Small infants by different angles –
- adductor, popliteal, dorsiflexion angles etc
MUSCLE POWER - GRADING

0 – no movements
1 – flickering/feeble movements
2 – with gravity eliminated
3 – against gravity
4 – against partial resistance
5 – full strength

Tested for groups of muscles moving various joints
- neck, shoulder, elbow, wrist, intercostals, diaphragm, abdomen, hip, knee, ankle
COORDINATION MOVEMENTS

- Finger-nose test and heel-knee test in older children

- For smaller children closing a pen with cap or opening chocolate wrapper etc

- Tested only if power is > grade 3
IN VOLUNTARY MOVEMENTS

Tremor
  Fine – hyperthyroidism, anxiety
  Coarse - intention tremor
Fasciculation  - muscle bundle
Fibrillation  - single muscle fibre
Chorea  - semi purposive , sudden jerky movements
Athetosis  - slow writhing movements
Dystonia – sustained muscle contraction in abnormal postures
REFLEXES

Superficial reflexes
- Corneal/conjunctival reflex - V /VII nerves
- Abdominal reflex - T6 to T12
  stroke abdominal wall from lateral to medial side
- Cremastric reflex - stroke the medial thigh – L1,L2,
- Anal reflex - S3, S4 - stroke the perianal region
- Plantar reflex - L5,S1- stroke the lateral aspect of sole
  normal response is plantar flexion of big toe with fanning of other toes ; dorsiflexion of big toe suggests an upper motor lesion (Babinski sign)
Biceps jerk – C5,C6- with he child’s arm semi flexed at the elbow ,resting on the examiner’s arm, strike over examiner’s thumb placed over the biceps tendon
Supinator jerk – C5,C6

Arm in same position as for Biceps jerk, strike on the styloid process of radius with a hammer supination of forearm
**Triceps jerk** – C6, C7 Elbow flexed to 90 degree with wrist placed across the patient’s chest. Strike the triceps tendon above the olecranon. Extension of elbow
JAW JERK

Place the examiner’s index finger on the patient’s lower jaw and strike - exaggerated reflex indicates a lesion above the pons
KNEE JERK – L2, L3, L4

1) Patient supine, flex the knee at 120-150 degree which rests on the examiner’s left palm; tap on the patellar tendon
2) Patient sitting up legs dangling freely extension of knee
ANKLE JERK – S1, S2

Keep the lower limb everted on the bed with slight extension at knee. With the left hand of the examiner placed under the sole, dorsiflex the foot to 90 degree so as to stretch the tendo Achilles and strike on the tendon contraction of calf muscles.
CLONUS

Repetitive rhythmic contractions of a muscle evoked by a stretch stimulus

Ankle clonus – flex the patient’s knees lightly and support the popliteal fossa with left hand. Suddenly dorsiflex the fore foot with the right hand from the plantar aspect and continue to apply pressure – sustained clonic contractions occur in calf muscles

Patellar clonus - push the patella towards the foot – series of contractions of quadriceps occur
GRADING OF DEEP TENDON REFLEXES

0 – absent

1 – sluggish, present only with reinforcement (+)

2 – readily elicited, like normal ankle jerk (++)

3 – brisk, like a normal knee jerk (+++)

4 – clonus (++++)
PRIMITIVE REFLEXES

Assessment of primitive reflexes – this needs to be performed in young children and children with developmental delay. These are normally present in NB and disappear by 3 months to 1 year of life.

Moro, rooting, sucking, grasp reflex asymmetrical tonic neck reflex (ATNR) etc.
SENSORY SYSTEM

6 parameters are to be tested – touch, pain, temperature, vibration, stereognosis and position sense

> 3 yrs - only pain can be tested
Touch - light touch and pressure, tactile localization and discrimination
Pain - use pin and prick method
Temperature – test with two test tubes of hot and cold water
SENSORY SYSTEM ......

Vibration sense
  vibrating tuning fork applied to over the skin of bony prominence and ask whether the patient feels the vibration and compare with the examiner

Stereognosis
  recognition of size, shape, weight and form
  use common objects like coin, pencil etc

Sense of joint movement

Position sense
CEREBELLAR SIGNS

Nystagmus - gaze evoked
Dysarthria - staccato speech
Titubation – head nodding
Intention tremor – by finger nose test
Dysmetria and past pointing – inability to stop intended movement at the correct place
Dysdiadochokinesia- inability to carry out rapidly alternating movements
Gait ataxia
Pendular knee jerk
SIGNs OF MENINGEAL IRRITATION

Neck stiffness

Brudzinzki neck sign

Kerning's sign
SKULL AND SPINE

McEwen sign or cracked pot sign
usually seen with suture separation due
raised intracranial tension
Cranial bruit /carotid bruit
Transillumination of skull-
hydrocephalus/hydranencephaly
Spine-percussion tenderness ,gibbus, dimple,
tuft of hair
THANK YOU