

# NEONATAL NEUROLOGIC EXAM

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## Neurologic Exam

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| <b>Adult</b> <ul style="list-style-type: none"><li>■ Mental State</li><li>■ Language</li><li>■ Cranial Nerves</li><li>■ Motor<ul style="list-style-type: none"><li>■ Tone</li><li>■ Posture</li><li>■ Bulk</li><li>■ Strength</li><li>■ Movement</li></ul></li><li>■ Sensory</li><li>■ Reflexes</li><li>■ Coordination</li><li>■ Gait</li></ul> | <b>Neonatal</b> <ul style="list-style-type: none"><li>■ Mental State</li><li>■ Cry</li><li>■ Cranial Nerves</li><li>■ Motor<ul style="list-style-type: none"><li>■ Tone</li><li>■ Positions</li><li>■ Strength</li><li>■ Movement</li></ul></li><li>■ Sensory</li><li>■ Reflexes<ul style="list-style-type: none"><li>■ Deep tendon reflexes</li><li>■ Plantar reflexes</li><li>■ Primitive reflexes</li></ul></li><li>■ Head Shape, Sutures &amp; Circumference</li></ul> |
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## Mental State

- Alertness
- Behavior
  - Spontaneous movements
    - versus depressed or excessive
  - Smooth flowing movements
    - versus jerky, disorganized or asymmetric
- Attentive to environment
- Attempts to organize or comfort himself
- Habituation to repeated stimuli
  - light, rooting, glabella
- Responds to sound by quieting and perhaps turning towards sound

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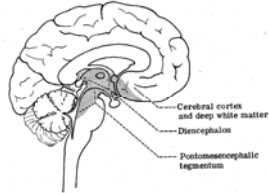
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## Consciousness

- Essential for Consciousness
  - At least one cerebral hemisphere
  - Medial hemispheric wall down to the basal forebrain
  - Striatum
  - ARAS
    - Diencephalon
    - Midbrain tegmentum
    - Rostral pontine tegmentum



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## Cry (Language)

- Observe spontaneous activity
- Crying, facial movements, asymmetry (CN 7)
- Quality and strength of cry (CN 9 and 10)
- Suck and swallow (CN 5, 7, 9, 10, 12)

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## Cranial Nerves

- Response to light (CN 2)
- Eye movements or doll's eyes (CN 3, 4, 6)
- Pupillary size and light reflex (CN 2, 3)
- Corneal reflex (CN 5, 7)
- Respond to sound (CN 8)
- Gag reflex (CN 9, 10)

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## Tone

- Resting Posture
- Upper extremities tone
- Lower extremities tone
- Bulbar tone
- Positions

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## Tone

- Resting Posture
  - For a term newborn – flexion of the extremities and adducted closely to the trunk
- Upper extremities tone
- Lower extremities tone
- Bulbar tone
- Positions

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## Tone

- Resting Posture
- Upper extremities tone
  - Passive range of motion at each joint
  - Arm traction – presence of mild flexion when wrist traction is applied to lift shoulder off the bed (absence indicated hypotonia)
  - Scarf sign – evaluate tone of shoulder girdle by pulling hand to the opposite shoulder (elbow should not cross midline of chest)
  - Arm recoil – observe recoil of biceps when first flexed and then extended
  - Hand position – typical position is fingers over thumb until about 1 month; can be opened by rubbing ulnar or dorsum aspect of hand
- Lower extremities tone
- Bulbar tone
- Positions

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## Tone

- Resting Posture
- Upper extremities tone
- Lower extremities tone
  - Passive range of motion at each joint
  - Leg traction - presence of mild flexion when ankle traction is applied to lift buttock off the bed (absence indicated hypotonia)
  - Leg recoil - observe recoil of psoas when first flexed and then extended
  - Popliteal angle - evaluate tone of the hamstrings by extending the knee when psoas is fully flexed (usually about 90 degrees)
  - Heel to ear - pulling the foot towards ear should meet resistance at the level of the chest or shoulder
- Bulbar tone
- Positions

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## Tone

- Resting Posture
- Upper extremities tone
- Lower extremities tone
- Bulbar tone
  - Neck tone - passive rotation of the neck should not go beyond the shoulders
  - Head lag - some head lag as baby is pulled to the sitting position is appropriate
  - Head control - ability to bring head upright briefly when either fully flexed or extended
- Positions

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## Tone

- Resting Posture
- Upper extremities tone
- Lower extremities tone
- Bulbar tone
- Positions
  - Prone
    - extension of neck to be able to clear airway
    - Forward flexion of biceps when arms extended by side
    - Buttocks slightly elevated
  - Ventral Suspension (neck & trunk tone)
    - Head is in the same plane as the back
    - Back show some resistance to gravity
    - Extremities have some flexion
  - Vertical suspension (shoulder girdle)
    - No slip through

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## Reflexes

- Deep tendon reflexes
- Plantar reflex
- Primitive reflexes

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## Reflexes

- Deep tendon reflexes
  - On quiet, alert infant with head midline
  - Bicep, tricep, patellar, ankle
  - Absence of DTRs with low tone & weakness is consistent with LMN disorders
  - Exaggerated DTRs with low tone is consistent with UMN disorders
- Plantar reflex
- Primitive reflexes

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## Reflexes

- Deep tendon reflexes
- Plantar reflex
  - Upgoing toe is normal until about 9 months of age
  - Stroke lateral aspect of foot
- Primitive reflexes

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## Reflexes

- Deep tendon reflexes
- Plantar reflex
- Primitive reflexes
  - Suck - strong, coordinated suck with resistance to pulling out
  - Root - stroking of cheek towards the lips elicits opening of the mouth towards the stimulus
  - Moro - abduction & extension of arms when head and shoulders dropped suddenly
  - Galant - trunk incurvation with stroking paraspinally
  - Stepping - touching of sole of foot initiates a reciprocal flexion and extension of the legs as if walking
  - Grasp - flexion and grasping of fingers or toes with finger in the palm or sole

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## Head Shape

- Cephalic index - ratio of maximum breadth of the head to its maximum length
  - Dolichocephalic - long and thin
  - Mesocephalic - medium length and breadth
  - Brachycephalic - short and broad
- Molding
- Positional plagiocephaly

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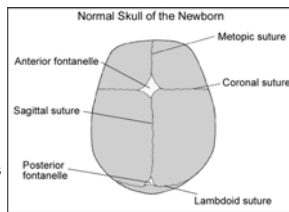
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## Head Sutures

- Adult skull is made up of 28 bones
- At birth, skull is made up of 45 separate bony elements
- Flat bones are joined together by sutures
- Palpate the sutures
- Palpate outline of anterior and posterior fontanelles
  - Anterior fontanelle can be open up to 18 months
  - Posterior fontanelle can be open up to 2 months



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## Premature Closure of Sutures

- Oxycephaly – premature closure of coronal suture + another suture or all sutures
- Plagiocephaly – flattening of one side of the skull
- Brachycephaly – premature closure of coronal suture
- Scaphocephaly – premature closure of sagittal suture (most common)
- Trigonocephaly – premature fusion of the metopic suture

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## Scaphocephaly (Sagittal)



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## Brachycephaly (Coronal)



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## Trigonocephaly (Metopic)



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## Head Circumference

- Measure the occipital-frontal head circumference
- Most accurate measurements are obtained with a plastic tape measure
- Plotted on a standardized head growth chart for the appropriate sex
- <http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/background.htm>

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## Glasgow Coma Scale (GCS)

- Published in 1974 by Graham Teasdale and Bryan J. Jennett at the University of Glasgow
- Neurological scale to objectively record conscious state of the person for initial and continuing assessment
- 3 elements of the scale for total of 15 points
  - Best eye response (4 points)
  - Best verbal response (5 points)
  - Best motor response (6 points)

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### Sarnat & Sarnat Clinical Staging of Perinatal Hypoxic Ischemic Brain Injury (1976)

	Stage 1	Stage 2	Stage 3
Mental State	Hyperalert	Lethargic or obtunded	Stuporous
Cranial nerves	Weak suck	Weak or absent	Absent
Tone & Posture	Normal tone Mild distal flexion	Mild hypotonia Cortical thumbing Strong distal flexion	Flaccid Intermittent decerebration
Deep Tendon Reflexes	Mildly brisk	Brisk	Absent
Primitive Reflexes	Weak suck Strong Moro	Weak or absent suck Weak & incomplete Moro Overactive Doll's & Tonic neck	Absent
Autonomic Reflexes	Sympathetic activation Pupils – increase	Parasympathetic activation Pupils – small Profuse secretions Increase GI motility	Both systems suppressed
Seizures	None	Common	Uncommon
EEG	Normal	Early - low voltage delta & theta Late – periodic pattern Seizure – focal or multi-focal	Early - periodic with burst suppression Late - isoelectric
Duration	Less than 24hrs	2-14 days	Hours to weeks
Prognosis	Less than 24 hrs No sequelae	Good prognosis if recovery within 5 days	Microcephaly, MR, CP, seizures

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