**Neurological examination in Children**

Alsayouf, Hamza, MD

---

**Strategies for Exam**

- First: Stop, Look, and Listen.
- Second: Make it a Game.
- Third: Save the Worst for Last

**General Physical Examination**

- Somatic growth
- Search for dysmorphic features
- Eye examination
- Skin search
- Abdomen
- Spine
- Abdominal exam

---

**Signs of abnormal Neurological exam**

- 1. Delay in acquiring age specific milestones.
- 2. Hypotonia or Hypertonia.
- 3. Dysmorphic features.
- 4. Strong family history of neurological diseases.
- 5. Family concerns/School concerns.
- 6. Prenatal screens.

---

http://www.youtube.com/watch?v=Q3NjkRbb5c4&feature=related
Neurodevelopmental Screen/exam

- **Cognitive**
  - 2-3 mos: not alert to mother.
  - 6-7 mos: not searching for dropped subject
  - 8-9 mos: not playing peek-a-boo
  - 12 mos: does not search for hidden object
  - 15-18 mos: no interest in cause and effect games

- **Motor**
  - 7 mos: does not roll (later roll ??)
  - 6-7 mos: not sitting up
  - 15 mos: not walking
  - 2 yr: not climbing up steps
  - 3 yr: unable to stand on one foot
  - 4 yr: not hopping
  - 5 yr: unable to balance on one foot for 5-10 sec.

- **Language**
  - 6 mo: Not babbling
  - 9 mo: no dada/mama
  - 18 mo: has < 3 words with meaning
  - 2 yr: no 2 word phrases
  - 2.5 yr: no personal pronouns
  - 3.5 yr: speech only half understandable
  - 4 yr: no prepositions
  - 5 yr: not using proper syntax in short sentences
1. Dysmorphic features: midface.

VI) “Boy with a Puppet” or “A child with a drawing” by Giovanni Francesco Caroto (1480-1556).

Eye exam

Conjunctiva: telangiectasia

Cornea:
- Swirls: Fabry’s disease
- Opacities: Hunter’s (MPS II), Cockayne syndrome, Maroteaux-Lamy
- Amyloidosis V

Iris: Coloboma; Aicardi Syndrome

Lens: Dislocation; Homocystinuria

Retina: Retinitis Pigmentosa

Pigmented lesions: TSC.

Skin Exam

2. Cutaneous findings:
- Café au lait spot
- Axillary freckling
- Neurofibroma
- Shagreen patch
- Ash leaf
- Adenoma sebaceum
- Angiokeratoma
- Darkly pigmented swirling marks
- Blisters
-wart
- Pigmented nevus
- Port wine stain

GM2 gangliosidosis: Tay-sachs disease
Quiz

How among those people was called the elephant man:
2. James Madison.
3. Lord Byron.
5. None of the above.
6. All of the above.

(1862-1890)
"Elephant Man"

• Spine
  – Abnormal curvatures
  – Dimples or Sinus tracts

• Cardiac exam
  – Blood pressure, Murmurs
  – Rate, Rhythm (autonomic systems)

• Gastrointestinal
  – Hepatosplenomegaly
    • Clue to storage diseases

Neuro Exam

• A. Skull
  – Frontal bossing in "peroxisomal disorders: ZWS"
Neuro Exam

B. Mental Status:
Mental status in children is developmentally based.
Level of alertness
Level of cooperation
Reaction to stimuli
Irritability vs. Docility
Awake, and sleep cycles

C. Cranial Nerve Exam:
1. Infants and New Born:
   - CN II, III, IV, VI: Optical Blink reflex, Pupillary, Corneal
   - Doll’s eye maneuver
   - Gaze and track (hold infant up)
   - Rooting reflex
   - Sucking reflex
   - Facial asymmetry and forehead wrinkle
   - Acoustic Blink reflex
   - Doll’s eye maneuver
   - CN IX, X: swallowing and gag reflexes.
   - CN XII: Coordinated suck and swallowing.

2. Young Children:
   - CN II: Snellen chart, picture chart, visual field: let him focus on object in front of his eyes then wave hand in the periphery.
   - CN III, IV, VI: follow an object, doll with his eyes.
   - CN V: chewing movement, touch face e cotton.
   - CN VII: observe facial movement, show teeth, puff cheeks
   - CN VIII: turn to sounds, whisper, hearing screen.
   - CN IX, X: Gag reflex.
   - CN XI, XII: shrug shoulder, stick out tongue.
Neuro Exam

A. Infant Motor Exam:
   1. Inspection and palpation:
      Resting position.
      Abnormal posture, twitching, jerking.
      Poor head control.
      Spontaneous movement, asymmetry.
      Extremities for asymmetry and muscle bulks.
      Muscles palpation.

2. Motor Tone:
   First year of life
   Pull test, ventral and vertical suspension.

Dubowitz, V. Muscle Disorders in Childhood, Philadelphia, 1978, WB Saunders


Neuro Exam

- Primitive and postural Reflexes

Part of motor system examination.
Evaluate posture and movement of infants.
Observe for smoothness, symmetry, time of appearance and disappearance.
Primitive reflexes usually develop in utero but postural reflexes develop later in infancy.

1. Primitive and postural Reflexes

- Evaluate posture and movement of infants.
- Observe for smoothness, symmetry, time of appearance and disappearance.
- Primitive reflexes usually develop in utero but postural reflexes develop later in infancy.

2. Deep Tendon Reflexes (DTR):

- Knee jerk present at birth
- Brachioradialis and Achilles develop around 6 months of age.
- Babinski sign is positive up to 24 months (why?)
- You can use a finger instead of a reflex hammer.
- 1-2 ankle clonus is normal for infants.
- Interpret findings as for adults.
Neuro Exam

- B. Motor exam in young children:
  - Assess developmental milestones (Denver II, Ages and Stages).
  - Observe gait and fine motor during play and assess gross motor skills like standing up, running and holding a toy when you pull it.
  - Perform DTR.
  - Always look for asymmetry.

The man in the photo is:
1. Napoleon I of France
2. DR. Wassem Fathalla
3. Desire Magloire Bourneville
4. ES Roach
5. All of the above.

Neuro Exam

- Sensation:
  - In infants see reaction to touch and painful stimuli.
  - In older children you can ask them to close eyes and localize the touch.
  - You can use a tuning fork for deep sensation.
  - Sensory exam in young children and infant is not very helpful in the majority of cases.
Neuro Exam

- Cerebellar signs:
  Hypotonia and decreased or absent DTR can be a sign of cerebellar disease.
  In infants see how do they reach for objects, if there is any tremor or dysmetria.
  Look for head or trunk titubation.
  In older children:
  give me high 5 for UE and kick my hand in LE.
  Observe gait and hopping.
  Observe for any nystagmus.

Soft Neurological Signs

- Neurological "soft signs" (NSS) are defined as minor abnormalities in the neurological examination in subjects with no other features of fixed or transient neurological disorders.
- Multiple soft neurological signs may be associated with learning disability.
- They are nonfocal and provides clues to CNS deficit or maturation delay.
  - stereognosis 5 yrs
  - Graphesthesia 8 yrs
  - Finger-nose test 7 yrs

http://www.youtube.com/watch?v=79NZUidN38Q

http://library.med.utah.edu/pedineurologicexam/html/newborn_n.html
A mother reports that her 10 month old boy is right handed because he reaches for most objects with that hand. She asks you if this is normal for his age. What should your answer be?

- A. Take it easy Mam, it is normal.
- B. It's a little early but probably normal and you don't worry about it any more.
- C. It's a little early but I can tell ya probably normal. It's something that needs to be watched over time, you know.
- D. It's abnormal for a baby to have a hand preference at this age.

On examination, a 6-month old girl has a Moro, Galant, and an asymmetric tonic neck reflex. She doesn't support weight on her feet and in ventral suspension, she makes no attempt to extend her head or lower extremities. What is your clinical assessment given these findings?

- A. Persistence of the primitive reflexes for this age is normal.
- B. The patient is too young for postural reflexes.
- C. The patient most likely has developmental delay with an upper motor neuron lesion.
- D. The patient has hypotonia from neuromuscular weakness.

What would be the finding on the neurological examination if a baby has central or cerebral hypotonia?

- A. Low tone on passive range of motion with preserved deep tendon reflexes.
- B. Poor suck and root with low tone when crying.
- C. Low tone when crying or at rest.
- D. Low tone with diminished deep tendon reflexes.
At what age would you be concerned about an infant that is not walking?

- A. 12 months
- B. 14 months
- C. 16 months
- D. 18 months

Measuring the head circumference of a 10-month-old should be saved for the last of the examination for which of the following reasons?

- A. The infant’s cooperation is best at the end of the examination
- B. Infants this age usually resist having a tape measure placed around their head.
- C. The parent can best hold the infant at the end of the examination.
- D. The measurement is most accurate when done at the end of the examination.