Neonatal Physical & Gestational Age Assessment

Kristi Browning, MSN, RN, NNP-BC
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No conflicts of interest to disclose regarding this presentation.

Objectives

- Review characteristics, etiologies, risks and complications associated with the preterm, term, late preterm and post-term infants as well as AGA, SGA and LGA infants
- Discuss IUGR and symmetrical vs asymmetrical
- Discuss abnormal findings on newborn assessment

Classifications of neonates

Gestational Age:

Preterm	< 37 weeks
Late Preterm	34+0 to 36+6 weeks
Term	37+0 to 41+6 weeks
Post Term	>42+0 weeks

Birth Weight:

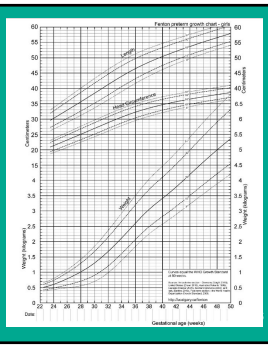
LBW	<2500g
VLBW	<1500g
WLBW	<1000g

Postnatal Assessment

Ballard Exam:
- Used to determine GA after birth
- Physical, neurological characteristics
- Accurate +/- 2 weeks gestation

Growth: Plot birth measurements on standardized growth chart
- **AGA:** 10th-90th %iles for GA
- **SGA:** <10th %ile for GA
- **LGA:** >90th %ile for GA

Microcephaly: OFC <10th %ile
Macrocephaly: OFC >90th %ile
Charts available: Lubchenco, Fenton, Olsen, WHO



Ascension

Small for Gestational Age (SGA)

Etiology:
Maternal, Placental, Fetal factors

Constitutionally small: ~70% of SGA infants
- Naturally small, normal development/growth
- No increased obstetrical or neonatal risks

Intrauterine/Fetal Growth Restriction: ~30% of SGA
- Failure to grow as expected **in utero**
- Increased perinatal morbidity and mortality

IUGR & SGA: similar but NOT same
- IUGR: ultrasound finding in utero
- SGA: clinical finding, size at birth.

IUGR/FGR

Symmetric IUGR: all measurements proportionally smaller
- Etiology: Fetal, maternal, placental

Asymmetric IUGR: "Head/brain sparing" - Weight < length, OFC
- Etiology: Placental insufficiency, extrinsic factors late in pregnancy

Characteristics:
- Thinner, "wasted appearance"
- Umbilical cord thin
- Loose, peeling skin
- Decreased subcutaneous fat

Neonatal Complications:
- Hypoglycemia
- Hypothermia
- Polycythemia/hyperviscosity
- Hypoxia
- Infection

Large for Gestational Age

Etiology:
- Infant of diabetic mother (IDM)
- Genetics: Beckwith-Wiedemann
- Familial: large parents
- Postmature
- Hydrops fetalis

Macrosomia: "large body"
- Excessive fetal growth
- >4500g

Increased mortality at >5000g

Neonatal Complications:
- Birth injury
- Respiratory distress
- Hypoglycemia
- Polycythemia

Associated Risks based on GA

Preterm: <37 weeks
- Risks related to immaturity of body systems
- RDS, NEC, PDA, hypoglycemia, thermal instability, sepsis/infections, IVH, long-term complications

Late preterm: GA ≥ 34 and < 37 weeks.
- Temperature instability, hypoglycemia, respiratory distress, apnea & bradycardia events, feeding difficulties, hyperbilirubinemia

Post-term: >42 weeks
- Risks associated with placental insufficiency
- NRFHT with labor, meconium aspiration, pulmonary hypertension, HIE, birth injury, macrosomia

Physical Maturity

Physical Features	24-28 weeks GA	Near term GA	Post-term GA
Skin	Thin, translucent, blood vessels apparent, fragile, pink/red color	More layers of skin/less fragile, blood vessels harder to see,pink color	Dry, peeling, superficial cracking
Hair/Lanugo	Fine, thin; lanugo +	Coarse,thick; <lanugo	Absence of lanugo
Transverse creases on soles of feet	No creases, faint red marks	Anterior ⅓ ~32 wks; anterior ⅔ by 36 weeks	Creases cover entire sole of foot
Breast tissue	Minimal, flat, no bud	Slight raised areola bud	Full areola, palpable tissue
Ear	Flat pinna, stays folded	Pinna form, easy recoil	Thick cartilage, stiff ear
Genitalia	Male: empty scrotum, no rugae Female: prominent clitoris and labia minora	Male: testes descend, rugae on scrotum Female: labia majora larger than minora	Male: testes pendulous, deep rugae Female: labia majora cover clitoris, minora

Physical Examination of the Neonate

Newborn Physical Examination

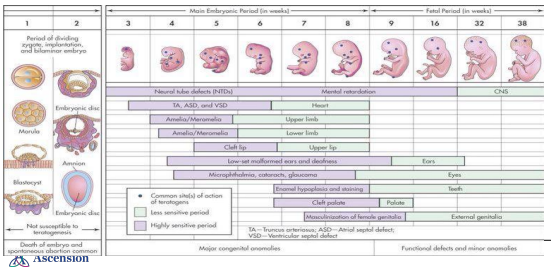
Assessment: Evaluate thoroughly
- Consistent, systematic routine
- General appearance tells a lot!
- Delivery: evaluate for birth injuries

Congenital anomalies:
- Structural: how the body was built
- Functional/Developmental: how the body functions
  - May not be identified at birth
  - Vision, hearing, cerebral palsy, etc

Remember: Large range of variations of “normal”!

"He looks a bit like both of you."

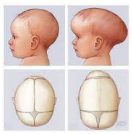
Embryogenesis & anomalies



Head

Craniosynostosis: immobile sutures, premature closure of sutures

Plagiocephaly: Asymmetrical; flat on one side



Fontanelles

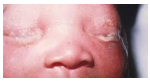
Large anterior fontanelle

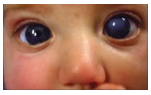
Bulging Fontanelle

Sunken Fontanelle

Eyes

Conjunctivitis: inflammation, infection of the conjunctiva of the eye, may be present at birth
Subconjunctival hemorrhage: small broken blood vessels in the conjunctiva
Blue sclera: extreme prematurity; osteogenesis imperfecta
Infantile cataracts: cloudy lens
Congenital glaucoma: increased ocular size

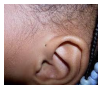




Ears

Low-set ears: various syndromes/chromosomal abnormalities

Preauricular pits/sinus: pinpoint openings at base of helix/ front of tragus



Preauricular ear appendages (tags): one or multiple; vary in size

Nose

** Neonates – obligate nose breather **

Patency of nostrils:
- Pass suction catheter down each side
- Occlude each nare, observe for distress
  - Choanal atresia/stenosis
  - Iatrogenic: edema, secretions
  - Positional nasal deformity: compression from birth process – resolve without treatment

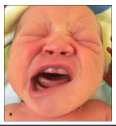
Flat nasal bridge:
- Associated with Trisomy 21, FAS, Fragile X syndrome


Mouth and Tongue

Natal teeth: Mobile/poor root formation

Tongue:
- Macroglossia: large - generally part of syndrome – Beckwith-Wiedemann
- Protruding tongue – tri 21; BW

Asymmetric Crying Facies:
- Facial nerve compression (trauma)
- Congenital hypoplasia of depressor anguli oris muscles

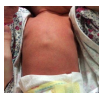


Chin & Neck

Micrognathia: small chin
Retrognathia: recessed chin
Thickened Nuchal fold: increased thickness of skin at back of neck
Torticollis: tight or short sternocleidomastoid muscle

Chest

Abnormal Shape/Size of Chest:
- Large or barrel-shaped chest
- Prominent xyphoid
- Chest wall depressed or funnel-shaped: pectus excavatum



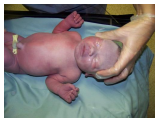
Enlarged breasts:
- Effects of maternal estrogen, transient

Heart and Cardiovascular system

Murmurs: grade I-VI, softest to loudest

Pulses:

- Weak pulses
- Absent femoral pulses; upper stronger than lower
- Bounding pulses
- Palmar pulses



Hemodynamic abnormalities:

- Capillary refill >3 seconds
- Hypotension

EKG:

- Abnormal rhythm, HR <80 or >220 sustained

Abdomen

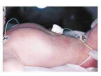
Abnormal:

Shape: Scaphoid, distended, low abdominal muscle tone

Appearance: Dusky, erythematous, enlarged/engorged vessels

Bowel sounds: Absent/hyperactive → ? obstruction

Palpation: Hard, tense, distended abdomen



Liver: Enlarged, palpable >2 cm below right costal margin

Spleen: >1 cm below left costal margin is abnormal

Kidneys: Absence of palpable kidney, enlarged kidneys

Bladder: Distended, palpable, anuria/oliguria - ?obstruction

Umbilicus

Umbilical cord: Sign of fetal growth

Single umbilical artery:

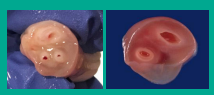
- Possible renal/cardiac anomalies

Patent urachus:

- Urine draining from umbilicus; embryologic connection between bladder and umbilicus

Umbilical hernia:

- Bulge r/t weakness in abdominal muscle

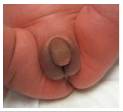


Genitalia and anus

Genitalia: Appearance changes with gestational age
- Variations more common than pathologic conditions
- Females may have more reddish color, edematous labia majora after birth, especially if breech
  - Hymenal, white discharge normal
- Males may have scrotal enlargement from birth or hydrocele

Ambiguous genitalia:
- If gender unclear, do NOT assign sex
- Requires further evaluation

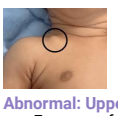
Anus:
- Abnormal position

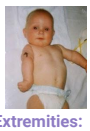


Back, spine, and extremities

Abnormalities, possible underlying defect:
- Sacral pits/dimples/tracts
- Skin tags
- Abnormal hair distribution or hair tufts
- Unusual pigmentation
- Asymmetry of gluteal fold

Extremities





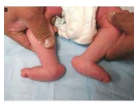
Abnormal: Upper Extremities:
- Fracture of clavicle or humerus
- Brachial plexus injury: Erb's palsy – "waiter's tip"

Hands and digits:
- Syndactyly: webbing
- Polydactyly: supernumerary digits
- Single palmar crease - normal variant; also seen trisomy 21

Extremities

Lower extremities abnormalities:
- Talipes equinovarus: club foot - positional or structural
- Rocker-bottom foot – arch looks like rocker bottom

Hips:
- Developmental dysplasia of the hip
  - Asymmetrical creases of buttocks/thighs
  - Barlow and Ortolani maneuvers

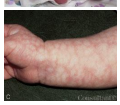




Neuromuscular

Abnormal:
- **State:** Lethargic, stupor, coma (decreased arousal, responses)
- **Reflexes:** Absent/altered
- **Movement:** Asymmetrical
- **Tone**
  - **Hypotonia:** decreased flexion
  - **Hypertonia:** increased flexion
- **Cry:** high-pitched
- **Tremors, jitteriness:** stop with gentle pressure

Coarse tremors and brief chin trembling are **normal

Color

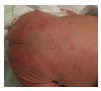
Acrocyanosis: cyanosis of hands & feet; normal first 48 hours

Mottling: normal; hypothermia, systemic illness

Harlequin color: color on alternate sides of body: pale & red

Yellow: jaundice, abnormal first 24 hours of life

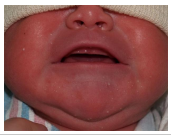
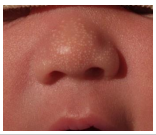
Skin




Erythema toxicum: **"newborn rash"**

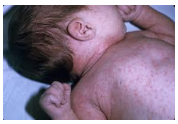
- Most common rash
- Scattered yellow papules, erythematous base
- Appears 2-3rd day of life; resolves 1st week

Milia: tiny, white, solitary papules

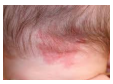
Sebaceous hyperplasia: yellow-white tiny raised papules; "Newborn acne"

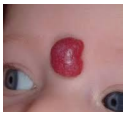
Skin



Miliaria: "heat rash" tiny pink bumps, clear blisters; blocked sweat glands

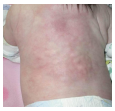
Nevus simplex: "stork bites", "angel kiss", "salmon patch"; a capillary malformation





Hemangioma: capillary formation

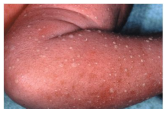
Subcutaneous fat necrosis: firm, mobile, reddened nodules of inflamed fat tissue



Skin

Transient neonatal pustular melanosis:

- Benign, transient, non-erythematous rash
- 3 stages:
  1. Pustules
  2. Ruptured pustules; scaling/halo-like
  3. Hyperpigmented macules



Slate grey nevus/ congenital dermal melanocytosis

- *Most common birth mark *
- (Historically called Mongolian spots)
- Common in darker skin and Asian newborns

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https://med.stanford.edu/newborns/professional-education/photo-gallery/skin.html

All pictures within presentation were retrieved from the world wide web.

Questions?