



# Physical Assessment of the Newborn: Part 3

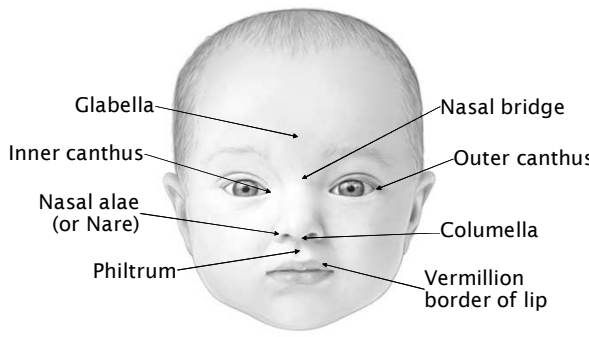
THE S.T.A.B.L.E.<sup>®</sup> Program 

**Part 1: Gestational Age Assessment**  
**Part 2: Physical Assessment – Growth, Vital Signs, Skin, Head**  
**Part 3: Physical Assessment – Face, Eyes, Ears, Nose, Mouth, Chest and Lungs, Heart, Abdomen, Genitourinary, Musculoskeletal**

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**Part 3: Physical Assessment – Face, Eyes, Ears, Nose, Mouth, Chest and Lungs, Heart, Abdomen, Genitourinary, Musculoskeletal**

### Face • Anatomic Landmarks




Labels: Glabella, Nasal bridge, Inner canthus, Outer canthus, Nasal alae (or Nare), Columella, Philtrum, Vermillion border of lip.

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### Face


▶ Evaluate facial symmetry and features



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### Face • Injury


Forceps Marks



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### Face • Injury

- ▶ Assess for symmetry when crying
  - Asymmetry → cranial nerve injury
- ▶ Extent of injury
  - Eye involvement → ophthalmology evaluation

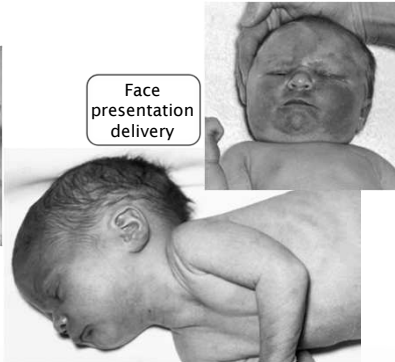


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# Physical Assessment of the Newborn: Part 3

## Face • Injury

Bruising



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## Face • Abnormal Findings

Moebius Syndrome

- ▶ Congenital facial paralysis
- ▶ 7<sup>th</sup> cranial nerve (facial) commonly involved
  - Affects facial expression, sense of taste, salivary and lacrimal gland innervation
- ▶ Other cranial nerves may also be involved
  - 5<sup>th</sup> (trigeminal – muscles of mastication)
  - 6<sup>th</sup> (eye movement)
  - 8<sup>th</sup> (balance, movement, hearing)

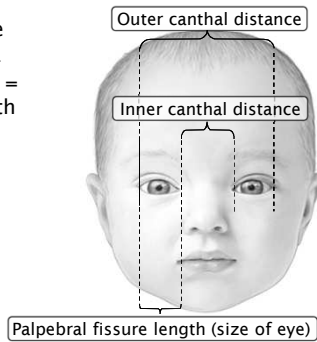


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## Eyes • Normal Findings

Position, Size, Distance

- ▶ Normal eye spacing → inner canthal distance = palpebral fissure length

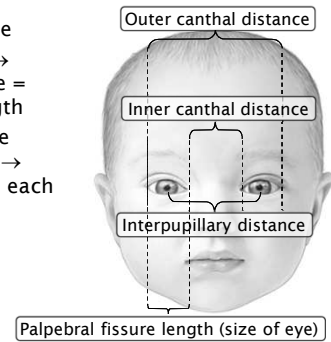


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## Eyes • Normal Findings

Position, Size, Distance

- ▶ Normal eye spacing → inner canthal distance = palpebral fissure length
- ▶ Interpupillary distance (midpoints of pupils) → distance of eyes from each other

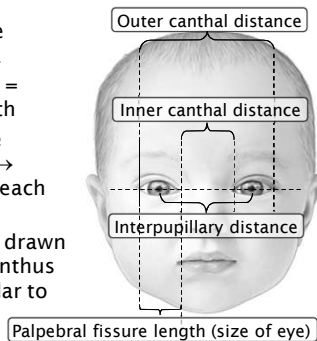


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## Eyes • Normal Findings

Position, Size, Distance

- ▶ Normal eye spacing → inner canthal distance = palpebral fissure length
- ▶ Interpupillary distance [midpoints of pupils] → distance of eyes from each other
- ▶ *Palpebral slant* → line drawn from inner to outer canthus should be perpendicular to sagittal plane of face

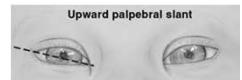


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## Eyes • Abnormal Findings

Upward-slanting Palpebral Fissures

- ▶ Outer canthus *higher* than inner canthus
- ▶ Normal for Asian descent
- ▶ May correlate with chromosomal abnormality including Trisomy 13 and 21



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# Physical Assessment of the Newborn: Part 3

## Eyes • Abnormal Findings

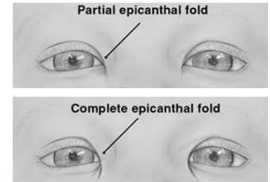
- Downward-slanting Palpebral Fissures
- ▶ Outer canthus *lower* than inner canthus
  - ▶ Seen in infants with Treacher Collins and Noonan syndrome



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## Eyes • Abnormal Findings

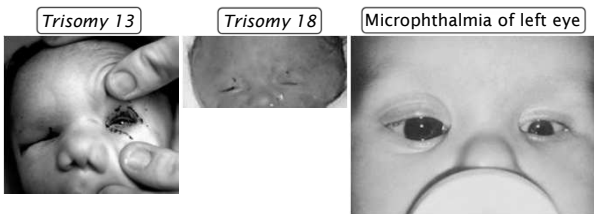
- Epicantal Fold
- ▶ Skin of upper eyelid covers inner canthus (corner) of eye and ends in the skin of lower lid
  - ▶ May disappear as bridge of nose grows
  - ▶ Normal → Asian descent and some non-Asian infants
  - ▶ May correlate with chromosomal abnormality or syndrome → Trisomy 21 and other syndromes: Turner, fetal alcohol, Noonan, Rubinstein-Taybi, Williams, and infants with phenylketonuria (PKU)



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## Eyes • Abnormal Findings

- Microphthalmia
- ▶ Small palpebral fissure



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## Eyes • Abnormal Findings

- Hypotelorism
- ▶ Eyes unusually close together → decreased distance between orbits
  - ▶ Evaluate interpupillary distance → midpoints of the pupils
  - ▶ May be associated with central nervous system malformation



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## Eyes • Abnormal Findings

- Hypertelorism
- ▶ Eyes are too far apart → ↑ distance between orbits
  - ▶ To evaluate, measure interpupillary distance
  - ▶ Often seen in infants with craniofacial syndromes



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## Eyes • Normal Findings

- Pupils and Red Reflex
- ▶ Pupils equal, round, reactive to light (PERRL)
  - ▶ Red reflex present bilaterally



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# Physical Assessment of the Newborn: Part 3

## Eyes • Abnormal Findings

### Absent or Unequal Red Reflex

- ▶ Corneal opacities
  - Glaucoma
  - Sclerocornea
- ▶ Cataracts
  - Bilateral - absent red reflex
  - Unilateral - unequal red reflex
- ▶ Tumors (e.g., retinoblastoma)
- ▶ Mucous or foreign body in tear film

Sclerocornea



Unilateral congenital cataract



Bilateral congenital cataracts



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## Eyes • Abnormal Findings

Blocked lacrimal duct



Conjunctivitis



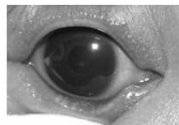
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## Eyes • Abnormal Findings

### Coloboma

- ▶ Missing tissue in eye - cleft, "keyhole" shape, or "cat's-eye" pupil
- ▶ Locations → eye lid, cornea, iris, lens, ciliary body, retina, choroid, optic nerve
- ▶ Microphthalmia is common
- ▶ May be isolated finding or observed with CHARGE association, 22q11 deletion, Trisomy 13 and 18, Treacher Collins, Walker-Warburg
- ▶ Full ophthalmologic evaluation indicated



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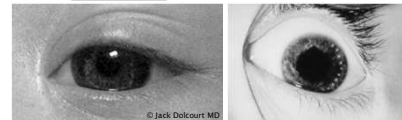
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## Eyes • Abnormal Findings

### Brushfield Spots

- ▶ White / grayish spots on the surface of iris in a partially or fully concentric ring
- ▶ More frequently seen in Trisomy 21, but may also be a normal variant

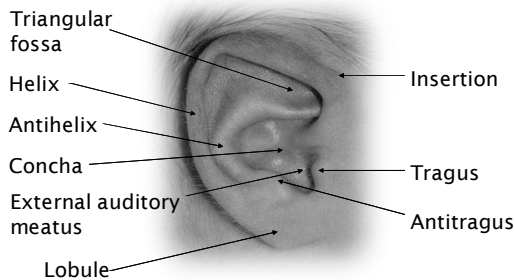
Trisomy 21



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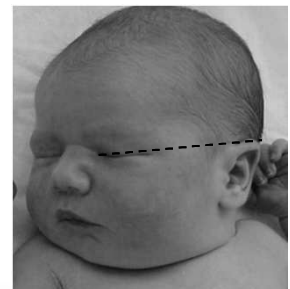
## Ears • Anatomic Landmarks



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## Ears • Position

- ▶ *Normal* → insertion of ear falls above line drawn from inner to outer canthus of eye



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# Physical Assessment of the Newborn: Part 3

## Ears • Position

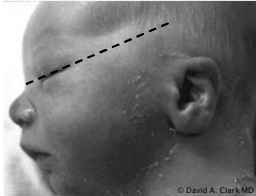
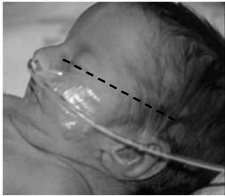
Abnormal → Low Set

- ▶ Insertion of ear falls below line drawn from inner to outer canthus of eye
  - Assess for chromosomal abnormalities or syndromes



Pierre Robin Sequence

Trisomy 8

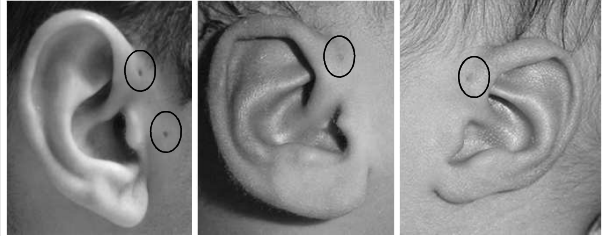


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## Ears • Minor Anomalies

Preauricular Pits



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## Ears • Minor Anomalies

Preauricular Skin Tags

- ▶ Usually an isolated benign finding
- ▶ Evaluate for family history of deafness
- ▶ Renal workup may be indicated if other dysmorphic features or risk factors present



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## Ears • Abnormal Findings

- ▶ **Microtia** - external portion of ear does not form properly → impacts size, shape, location of pinna and ear canal
- ▶ **Anotia** - complete absence of pinna and ear canal

Microtia

Anotia



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## Ears • Abnormal Findings



Treacher Collins Syndrome  
Microtia, abnormally shaped, aural atresia



Goldenhar Syndrome  
Microtia, aural atresia

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## Ears • Abnormal Findings

Beckwith-Wiedemann Syndrome  
Extra creases of earlobe and indentations into posterior helix

Trisomy 13  
Microtia / abnormal helix



Trisomy 18  
Microtia / auditory canal atresia

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# Physical Assessment of the Newborn: Part 3

## Airway Obstruction

### Choanal Atresia

- ▶ One or both nares are obstructed
- ▶ Cyanotic at rest but 'pinks up' with crying
- ▶ If bilateral, may need oral airway or endotracheal intubation



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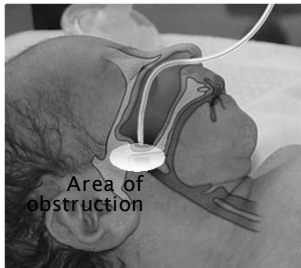


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## Airway Obstruction

### Choanal Atresia

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## Mouth

- ▶ Lips
- ▶ Gums
- ▶ Cheeks
- ▶ Tongue
- ▶ Palate - hard, soft



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## Mouth • Common Findings

### Epstein Pearls

- ▶ Milia on midline of hard palate
- ▶ Usually grouped, firm, movable, opaque and white
- ▶ Very common → 85% of newborns
- ▶ May take several months to resolve



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## Mouth • Abnormal Findings




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# Physical Assessment of the Newborn: Part 3

## Mouth • Abnormal Findings

Macroglossia



Beckwith-Wiedemann Syndrome

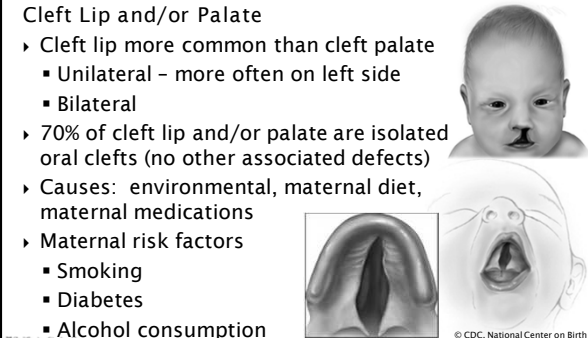
Congenital hypothyroidism

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## Mouth • Abnormal Findings

### Cleft Lip and/or Palate

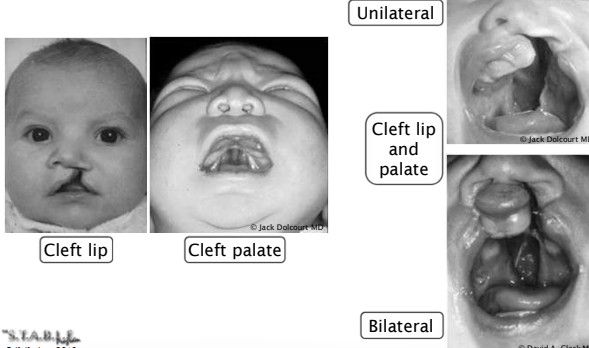
- ▶ Cleft lip more common than cleft palate
  - Unilateral - more often on left side
  - Bilateral
- ▶ 70% of cleft lip and/or palate are isolated oral clefts (no other associated defects)
- ▶ Causes: environmental, maternal diet, maternal medications
- ▶ Maternal risk factors
  - Smoking
  - Diabetes
  - Alcohol consumption



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## Mouth • Abnormal Findings



Unilateral

Cleft lip and palate

Bilateral

Cleft lip

Cleft palate

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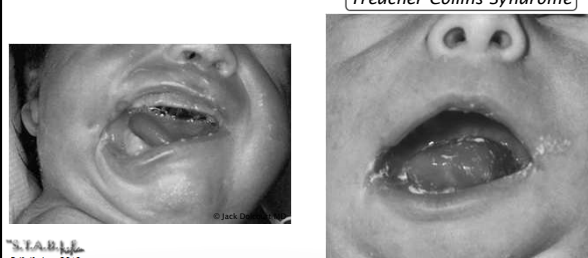
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## Mouth • Abnormal Findings

### Lateral Facial Cleft → Macrostomia

Treacher Collins Syndrome



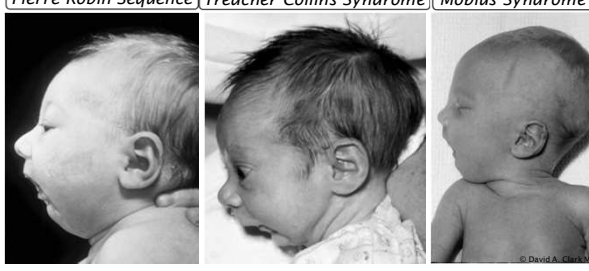
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## Mouth & Chin • Abnormal Findings

### Micrognathia

Pierre Robin Sequence Treacher Collins Syndrome Mobius Syndrome



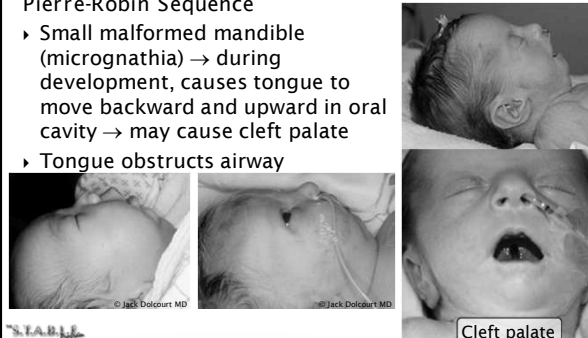
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## Mouth & Chin • Abnormal Findings

### Pierre-Robin Sequence

- ▶ Small malformed mandible (micrognathia) → during development, causes tongue to move backward and upward in oral cavity → may cause cleft palate
- ▶ Tongue obstructs airway



Cleft palate

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# Physical Assessment of the Newborn: Part 3

## Neck • Abnormal Findings

- ▶ Short
- ▶ Nuchal thickening
- ▶ Webbing
- ▶ Torticollis
- ▶ Masses

Pierre Robin Sequence  
short neck

Trisomy 21  
nuchal thickening



## Neck • Abnormal Findings

- ▶ Short
- ▶ Nuchal thickening
- ▶ Webbing
- ▶ Torticollis
- ▶ Masses

Turner's Syndrome  
webbed neck



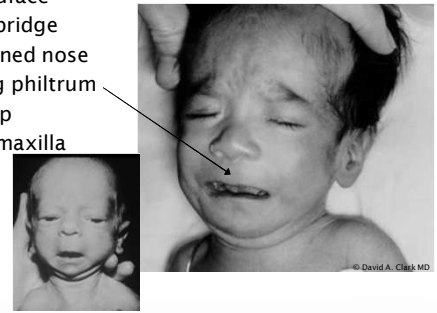
## Neck • Abnormal Findings

- Cystic Hygroma
- ▶ Collection of lymphatic fluid → soft, fluctuant swelling that transilluminates
  - ▶ Evaluate for chromosomal and cardiac abnormalities
  - ▶ May compress trachea → ensure patent airway



## Head and Face • Abnormal Findings

- Fetal Alcohol Syndrome
- ▶ Flattened midface
  - ▶ Broad nasal bridge
  - ▶ Short, up-turned nose
  - ▶ Smooth, long philtrum
  - ▶ Thin upper lip
  - ▶ Hypoplastic maxilla



## Head and Face • Abnormal Findings

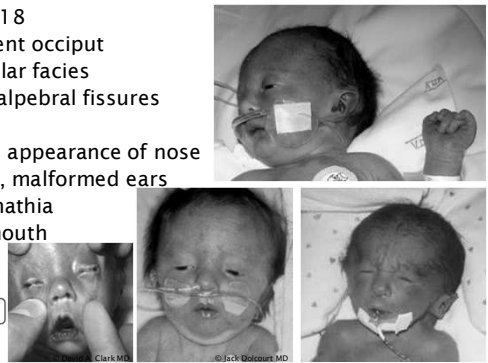
- Trisomy 21
- ▶ Short round head
  - ▶ Flat facial profile
  - ▶ Epicanthal folds
  - ▶ Brushfield's spots
  - ▶ Up-slanting palpebral fissures
  - ▶ Short, flat nasal bridge
  - ▶ Protruding tongue
  - ▶ Short, narrow palate
  - ▶ Small, low-set ears
  - ▶ Short neck, excess nuchal folds



## Head and Face • Abnormal Findings

- Trisomy 18
- ▶ Prominent occiput
  - ▶ Triangular facies
  - ▶ Small palpebral fissures
  - ▶ Ptosis
  - ▶ Pinched appearance of nose
  - ▶ Low-set, malformed ears
  - ▶ Micrognathia
  - ▶ Small mouth

Fused eyes





# Physical Assessment of the Newborn: Part 3

## Head and Face • Abnormal Findings

### Trisomy 13

- ▶ Microcephaly, sloping forehead
- ▶ Holoprosencephaly
- ▶ Central facial anomalies
  - Cleft lip, palate
  - Anophthalmia, microphthalmia, hypotelorism, cataracts, coloboma of iris
  - Midface hypoplasia
- ▶ Broad, bulbous nose
- ▶ Low-set, malformed ears
- ▶ Scalp → wide sagittal sutures and fontanels, cutis aplasia



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## Head and Face • Abnormal Findings

### Trisomy 13

Microphthalmia



Anophthalmia, Holoprosencephaly



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## Clavicle • Fractures



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## Chest • Abnormal Findings

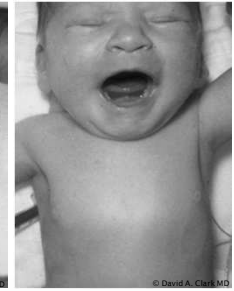
### Shape

- ▶ Broad
- ▶ Narrow
- ▶ Bell shaped
- ▶ Short

Short sternum



Turner Syndrome  
Broad chest and wide spaced nipples



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## Chest • Abnormal Findings

### Breasts and Nipples

- ▶ Placement
- ▶ Shape
- ▶ Pigmentation
- ▶ Secretions
- ▶ Inflammation

Accessory nipple



Gynecomastia



Mastitis



Wide spaced nipples



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## Chest and Airway • Abnormal Findings

### Respiratory Effort

- ▶ Abnormal
  - Tachypnea
  - Nasal flaring
  - Grunting
  - Retractions



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# Physical Assessment of the Newborn: Part 3

## Chest and Airway • Abnormal Findings

### Retractions

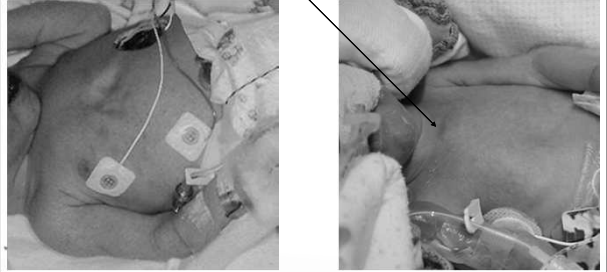
- ▶ Intercostal - between the ribs
- ▶ Substernal - under the sternum



## Chest and Airway • Abnormal Findings

### Retractions

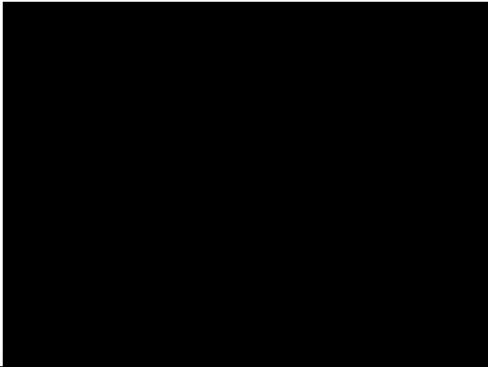
- ▶ Subcostal - below the rib cage
- ▶ Suprasternal - above the sternum



## Chest and Airway • Abnormal Findings

### Respiratory distress

Click on video to replay (with sound)

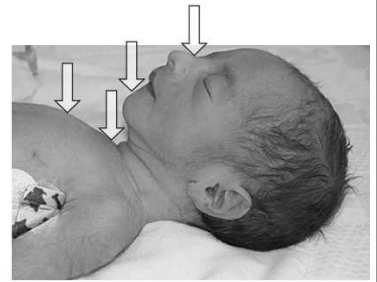


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## Chest and Airway • Abnormal Findings

### Airway Obstruction

- ▶ Nose
- ▶ Mouth and jaw
- ▶ Larynx or trachea
- ▶ Bronchi

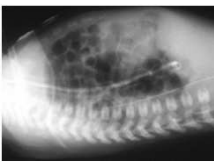
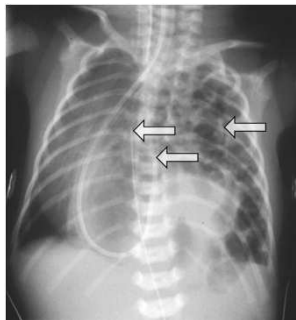


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## Chest and Airway • Abnormal Findings

### Diaphragmatic Hernia

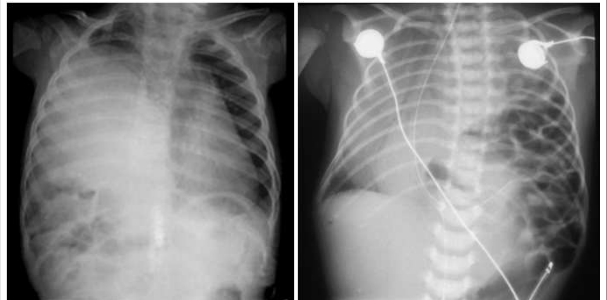
- ▶ Defect in diaphragm → allows bowel in chest
- ▶ UAC tip → aorta shifted to right
- ▶ Gastric tube tip → in stomach in chest



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## Chest and Airway • Abnormal Findings

### Diaphragmatic Hernia



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Hernia on right

Hernia on left

# Physical Assessment of the Newborn: Part 3

## Chest and Airway • Abnormal Findings

### Diaphragmatic Hernia

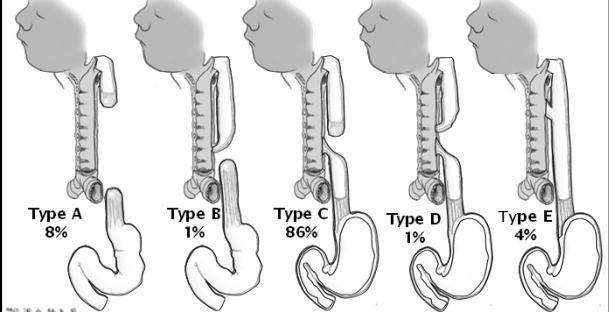
- ▶ Presentation
  - 85% occur on left side
  - Usually severe respiratory distress
  - Scaphoid (sunken) abdomen, barrel chest → especially as bowel fills with air
  - Bowel sounds may be heard in chest
  - If left hernia → heart sounds heard in right chest
- ▶ Stabilization
  - Insert gastric tube to prevent air from entering stomach and intestine
  - Intubate and provide gentle ventilatory support



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## Chest and Airway • Abnormal Findings

### Esophageal Atresia / Tracheoesophageal Fistula

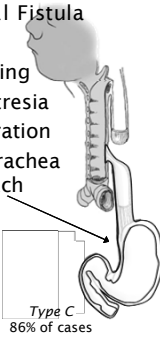


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## Chest and Airway • Abnormal Findings

### Esophageal Atresia / Tracheoesophageal Fistula

- ▶ Signs
  - Choking, coughing, cyanosis with feeding
  - Excessive salivation → if esophageal atresia
  - Respiratory distress secondary to aspiration
  - Abdominal distension → fistula from trachea to stomach → air cannot escape stomach
- ▶ Maternal history
  - Polyhydramnios suggests esophageal atresia or bowel obstruction



Type C  
86% of cases

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## Chest and Airway • Abnormal Findings

### Esophageal Atresia / Tracheoesophageal Fistula

- ▶ Assess for VATER / VACTERL association

- Vertebral abnormalities
- Anal atresia
- Cardiac anomalies
- Tracheoesophageal fistula / Esophageal atresia
- Renal and/or radial anomalies
- Limb dysplasia

# of Systems Affected	Percentage of Cases
3	75%
4	25%
5	uncommon

Congenital Heart Disease 75% of cases of VACTERL



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## Chest and Airway • Abnormal Findings

### VACTERL Association

Esophageal atresia,  
duodenal atresia,  
dextrocardia,  
fused ribs on left



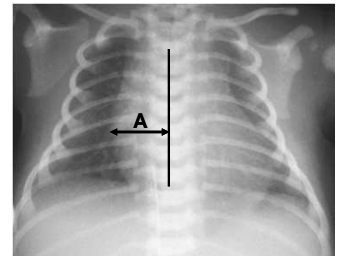
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## Cardiac • Evaluation

### Heart Size →

### Cardiothoracic Ratio

- ▶ A = widest horizontal diameter of heart right of midline



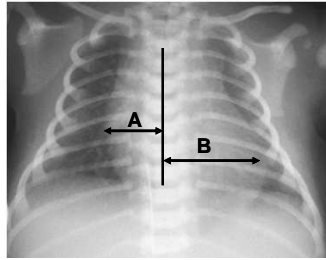
⚠ Ensure x-ray reflects good inspiration and infant is not rotated

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# Physical Assessment of the Newborn: Part 3

## Cardiac • Evaluation

- Heart Size →  
 Cardiothoracic Ratio
- ▶ A = widest horizontal diameter of heart right of midline
  - ▶ B = widest horizontal diameter of heart left of midline

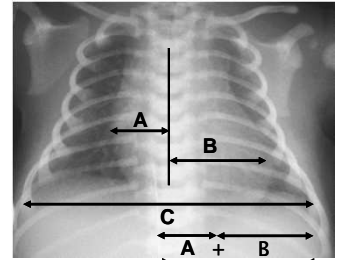


▲ Ensure x-ray reflects good inspiration and infant is not rotated

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## Cardiac • Evaluation

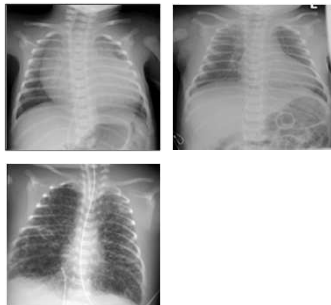
- Heart Size →  
 Cardiothoracic Ratio
- ▶ A = widest horizontal diameter of heart right of midline
  - ▶ B = widest horizontal diameter of heart left of midline
  - ▶ C = widest internal diameter of chest at or just below base of heart
  - ▶ Normal in neonate =  $A + B < 60\%$  of C



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## Cardiac • Evaluation

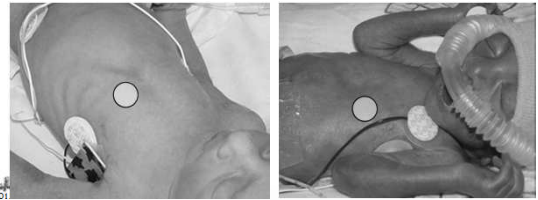
- Heart Size →  
 Cardiothoracic Ratio
- ▶ Enlarged → myocardial dysfunction, congestive heart failure
  - ▶ Small or compressed → poor filling, poor cardiac output



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## Cardiac • Evaluation

- Precordial Activity → Normal
- ▶ “Quiet” chest area immediately above heart
  - ▶ Point of maximal impulse (PMI)
    - 5<sup>th</sup> intercostal space
    - Lower left sternal border (LLSB)



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## Cardiac • Evaluation

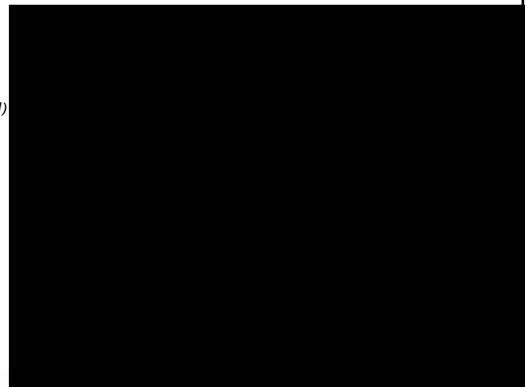
- Precordial Activity → Abnormal
- ▶ Hyperactive precordium
  - ▶ PMI shifted to right
    - Dextrocardia
    - Tension left pneumothorax
    - Diaphragmatic hernia
  - ▶ PMI shifted to left → tension right pneumothorax



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## Cardiac • Evaluation

Click to replay  
 (no sound)



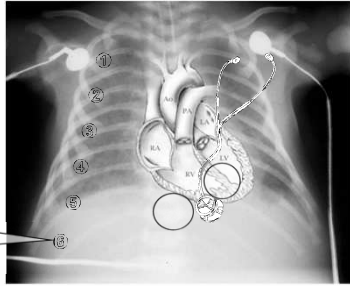
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# Physical Assessment of the Newborn: Part 3

## Cardiac • Evaluation

First Heart Sound → S1

- ▶ Closure of mitral and tricuspid valves
- ▶ End of atrial systole
- ▶ Heard best
  - 5<sup>th</sup> intercostal space at the left midclavicular line or
  - Lower left sternal border (LLSB)

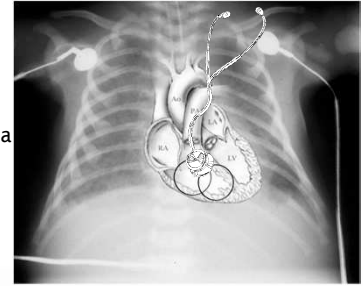


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## Cardiac • Evaluation

Second Heart Sound → S2

- ▶ Closure of aortic and pulmonic valves = A2, P2
- ▶ End of ventricular systole
- ▶ Heard best
  - Upper left sternal border (ULSB)
  - Pulmonic valve area



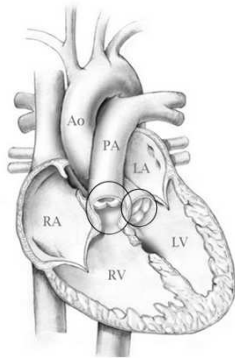
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## Cardiac • Evaluation

Murmur

- ▶ Sound caused by turbulent blood flow due to:
  - Blood forced through narrowed areas
  - Valvular stenosis

PS



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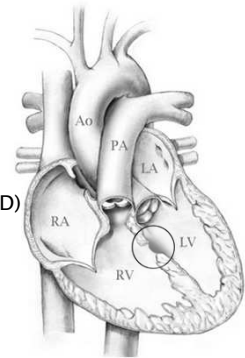
## Cardiac • Evaluation

Murmur

- ▶ Sound caused by turbulent blood flow due to:
  - Blood forced through narrowed areas
  - Valvular stenosis
  - Ventricular septal defect (VSD)

Soft, higher pitched

Harsh, lower pitched



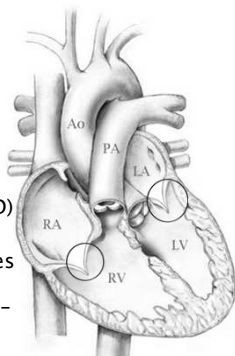
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## Cardiac • Evaluation

Murmur

- ▶ Sound caused by turbulent blood flow due to:
  - Blood forced through narrowed areas
  - Valvular stenosis
  - Ventricular septal defect (VSD)
- Regurgitation through incompetent or abnormal valves
- Flow across normal structures - anemia

Ebstein's



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## Cardiac • Evaluation

Murmur → Intensity Grading

- 1: Barely audible
- 2: Soft but audible
- 3: Moderately loud, no thrill
- 4: Loud, associated with thrill → vibratory sensation
- 5: Audible with stethoscope barely touching chest
- 6: Audible with stethoscope not touching chest

See the S.T.A.B.L.E. Cardiac Module for an in depth review of congenital heart disease

Palpating for thrill



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# Physical Assessment of the Newborn: Part 3

## Cardiac • Abnormal Findings

Ectopic Cordis

- › Split sternum – heart protrudes outside the chest
- › Intracardiac anomalies common
- › High mortality rate



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## Abdomen • Normal Findings

- › Appearance → full, slightly rounded
- › Color → no discoloration
- › Bowel sounds active
- › Palpation → soft and non-tender, no organomegaly
- › Stool → meconium passage within 1<sup>st</sup> 48 hours of life
- › Emesis → minimal, non-bilious, non-projectile



Normal meconium stool



Stool at 3 days, breast fed infant



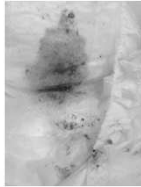
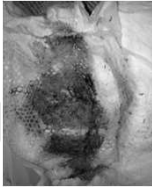
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## Abdomen • Abnormal Findings

- › Appearance → scaphoid, distended, visible loops
- › Color → erythema, bluish discoloration
- › Bowel sounds → hypo or hyperactive
- › Palpation → firm, tender
- › Stool → blood in stool or frankly bloody
- › Emesis → bilious, projectile, large volume

Bile stained emesis in 4-day old with volvulus

Blood in stool



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## Abdomen • Abnormal Findings

Scaphoid Abdomen

Congenital diaphragmatic hernia



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## Abdomen • Abnormal Findings

Distended Abdomen

Visible bowel loops - bilious gastric drainage



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## Abdomen • Abnormal Findings

*Listenaea* Abdomen



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# Physical Assessment of the Newborn: Part 3

## Abdomen • Abnormal Findings

### Bowel obstruction

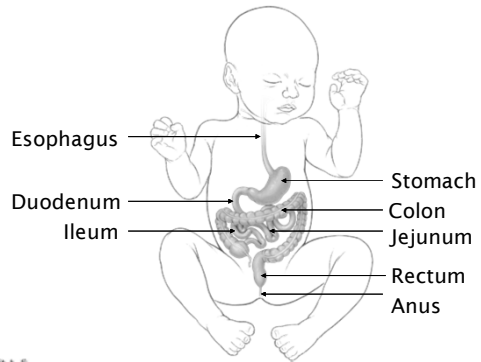


Pneumoperitoneum – free intra-abdominal air

Pneumatosis intestinalis

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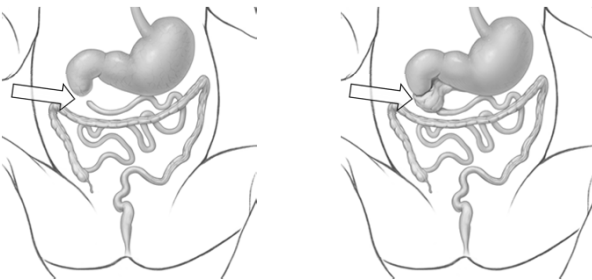
## Abdomen • Normal Anatomy



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## Abdomen • Abnormal Findings

### Duodenal Atresia



Complete atresia

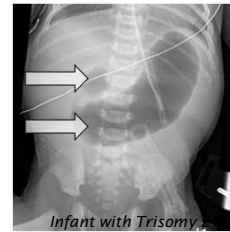
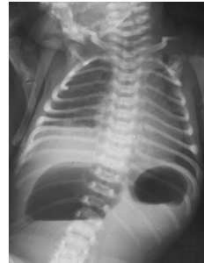
Partial or complete obstruction secondary to *annular pancreas*

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## Abdomen • Abnormal Findings

### Duodenal Atresia

#### ▶ “Double-Bubble” sign



Infant with Trisomy 21

Distended gas filled stomach and mildly distended gas filled duodenal bulb / No bowel gas in rest of bowel

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## Abdomen • Abnormal Findings

### Jejunioleal Atresia

- ▶ Atresia may be in ileum, jejunum or both
- ▶ Small bowel is dilated with gas prior to area of atresia

Type IIIa  
Jejunioleal  
Atresia

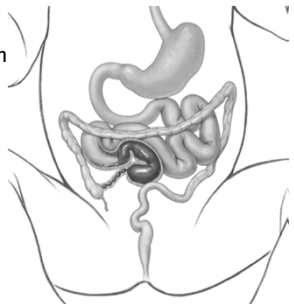


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## Abdomen • Abnormal Findings

### Meconium Ileus

- ▶ Impassated meconium obstructs the terminal ileum
- ▶ Pellets of hard meconium prevent passing of gas or stool
- ▶ Majority of cases caused by a lack of pancreatic enzymes → necessary to digest intestinal contents
- ▶ Evaluate for cystic fibrosis



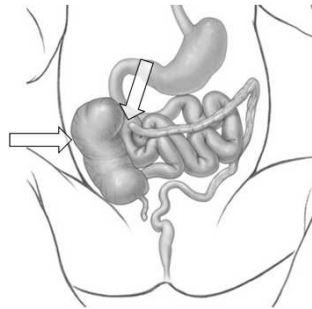
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# Physical Assessment of the Newborn: Part 3

## Abdomen • Abnormal Findings

### Colonic Atresia

- ▶ Note dilated small intestine and colon up to area of atresia

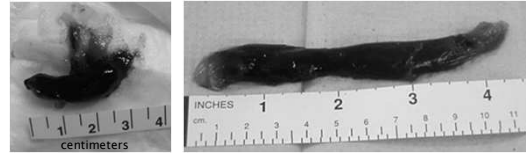


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## Abdomen • Abnormal Findings

### Meconium Plug Syndrome

- ▶ More common in preterm infants and infants of diabetic mothers
- ▶ Poor intestinal motility → thick inspissated meconium obstructs colon
- ▶ Small percentage of infants may have cystic fibrosis

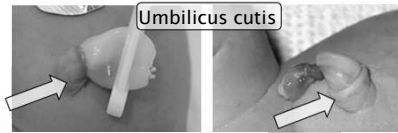


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## Abdomen • Normal Findings

### Umbilical Cord

- ▶ Two arteries
- ▶ One vein
- ▶ *Umbilicus cutis* → normal variant
  - Periumbilical skin extends up sides of umbilical cord
  - Forms an outpouching when cord falls off
  - Differentiate from umbilical hernia



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## Abdomen • Abnormal Findings

### Wharton's Jelly Cyst

- ▶ May occur at any location along cord
- ▶ Irregular shape and located between vessels
- ▶ 20% are associated with structural (omphalocele, patent urachus, hydronephrosis) or chromosomal abnormalities

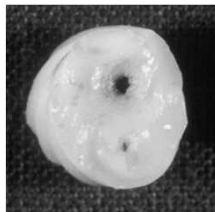


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## Abdomen • Abnormal Findings

### Single Umbilical Artery

- ▶ Two vessel cord → 1 artery, 1 vein
- ▶ Incidence
  - Singleton: 5 to 10/1,000 births
  - Twin gestation: 35 to 70/1,000 births
- ▶ ↑ Risk for chromosomal abnormalities and congenital malformations, especially genitourinary system



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## Abdomen • Abnormal Findings

### Umbilical Cord → True Knot

- ▶ ↑ Risk of intrauterine demise due to cord compression or birth asphyxia due to tightening of knot at delivery



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# Physical Assessment of the Newborn: Part 3

## Abdomen • Abnormal Findings

### Omphalitis

- ▶ Infection of umbilical stump → usually presents around 3<sup>rd</sup> day of life
- ▶ Erythema, edema, tenderness
- ▶ Discharge may be foul smelling
- ▶ May be localized infection or spread to abdominal wall, peritoneum, umbilical or portal vessels, liver



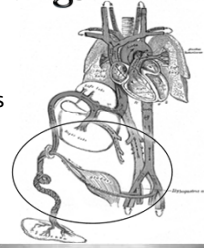
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## Abdomen • Abnormal Findings

### Patent Urachus

- ▶ *Urachus* → embryonic connection between fetal bladder and umbilicus
  - Postnatally becomes fibrous cord
- ▶ *Patent urachus* → hollow tube connecting bladder and umbilicus
  - Urine seen exiting umbilicus
- ▶ Differentiate from *granuloma* → soft tissue, 3 - 10 mm, dull red or pink, vascular and granular, treated with silver nitrate cauterity until base is dry



Patent urachus

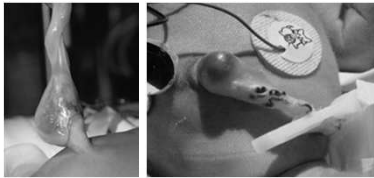
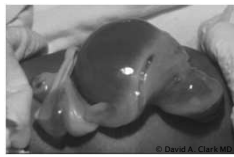
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## Abdomen • Abnormal Findings

### Omphalocele

- ▶ Abdominal wall defect → abdominal contents herniate into base of umbilical cord
- ▶ Covered by membranous sac → umbilical cord connects to central portion of membrane
- ! Can be subtle → carefully assess all cords before clamping

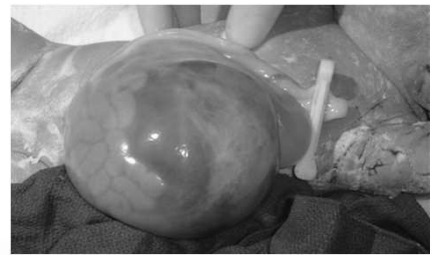


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## Abdomen • Abnormal Findings

### Omphalocele

- ▶ High incidence (50 to 75%) of significant chromosomal, cardiac, gastrointestinal, genitourinary, musculoskeletal, central nervous system anomalies

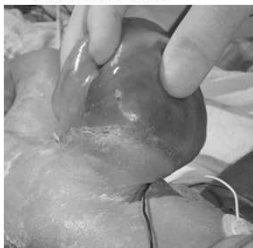


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## Abdomen • Abnormal Findings

### Omphalocele

- ▶ Membranous sac protects herniated organs unless it becomes torn



See Stabilization Folder for initial care guidelines

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## Abdomen • Abnormal Findings

### Gastroschisis

- ▶ Defect in abdominal wall to RIGHT of umbilical cord
- ▶ No peritoneal sac protects herniated organs
- ▶ 5 to 10% incidence associated defects



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# Physical Assessment of the Newborn: Part 3

## Abdomen • Abnormal Findings

Gastroschisis - Initial Care



See Stabilization Folder for initial care guidelines

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## Abdomen • Abnormal Findings

- Hernia
- ▶ Umbilical
  - ▶ Inguinal



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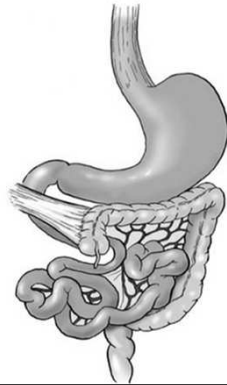
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## Abdomen • Abnormal Findings

Malrotation

- ▶ Mesentery fails to attach to entire posterior abdominal wall
- ▶ Instead abnormally attaches in region of duodenum → Ladd's bands



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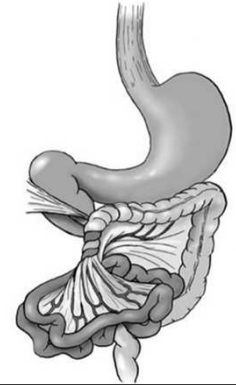
## Abdomen • Abnormal Findings

Malrotation

- ▶ Mesentery fails to attach to entire posterior abdominal wall
- ▶ Instead abnormally attaches in region of duodenum → Ladd's bands

Midgut Volvulus (twisting)

- ▶ Clockwise rotation with strangulation → blood supply to small intestine cut off



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## Abdomen • Abnormal Findings

Midgut Volvulus



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## Abdomen • Abnormal Findings

Midgut Volvulus



Surgical evaluation Time 1  
Necrotic bowel



Reevaluation 24 hours later  
Some bowel recovery  
Necrotic bowel resected

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# Physical Assessment of the Newborn: Part 3

## Abdomen • Abnormal Findings

### Midgut Volvulus – Presentation

- ▶ Bilious emesis
- ▶ Abdominal exam
  - Soft or tender
  - May or may not be distended
- ▶ With progressive vascular compromise of intestine, ischemia causes:
  - Significant pain
  - Bloody stools
  - Shock and metabolic acidosis



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## Abdomen • Normal Findings

### Liver

- ▶ Normal size  $\leq 2$  cm below right costal margin
- ▶ Located in right abdomen

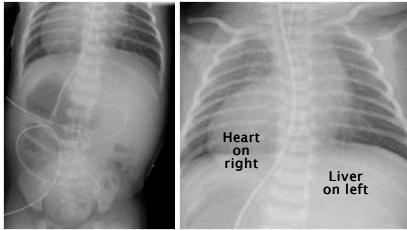


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## Abdomen • Abnormal Findings

### Liver

- ▶ *Midline location* → asplenia or polysplenia syndrome
- ▶ *Left abdomen location*
  - Heart in right side → situs inversus totalis – usually normal heart
  - Heart in left side usually indicates complex CHD



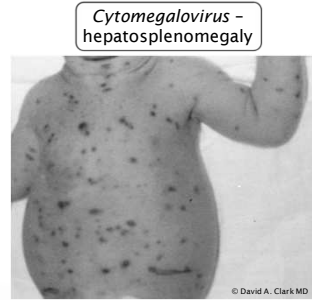
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## Abdomen • Abnormal Findings

### Liver Enlargement



*Biliary atresia* – liver enlargement and acholic stool



*Cytomegalovirus* – hepatosplenomegaly

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## Abdomen • Abnormal Findings

### Liver

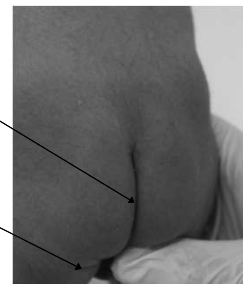
- ▶ Auscultate over liver
- ▶ If bruit heard → may indicate arteriovenous malformation (AVM) secondary to large hepatic hemangioma
  - AVM may precipitate high output congestive heart failure



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## Spine • Assessment

- ▶ Gluteal or natal cleft
  - Groove between buttocks from sacrum to perineum
- ▶ Gluteal fold



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# Physical Assessment of the Newborn: Part 3

## Spine • Assessment

- ▶ Inspect from base of skull down to coccyx and between gluteal cleft
  - Skin disruption → evaluate for underlying mass
  - Dimples, pits
  - Unusual pigmentation (outside of mongolian spots)
- ▶ Palpate for
  - Vertebral alignment
  - Abnormal curvature → scoliosis, lordosis, kyphosis



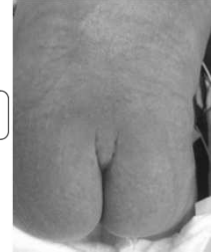
Abnormal thoracic vertebral column

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## Spine • Assessment

- Coccygeal Pit → common and harmless
  - ▶ Located within gluteal cleft
  - ▶ Skin visualized at base

Y-shaped gluteal cleft, sacral pits



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## Spine • Assessment

- Pit versus Sinus**
- ▶ Stretch the skin lateral to dimple
  - ▶ If skin can be seen covering entire dimple this is a *coccygeal pit* → benign finding
  - ▶ If base of dimple cannot be visualized → *dermal sinus*
- Dermal Sinus** → may communicate with spinal canal
- ▶ Associated with occult spinal dysraphism and ↑ risk for meningitis
  - ▶ Locations → lumbosacral, occipital
  - ▶ Never probe area → risk of introducing infection

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## Spine • Abnormal Findings

- Spinal Dysraphism**
- ▶ Term used to describe congenital malformation of spine or spinal cord
  - ▶ *Open lesions*: neural tube exposed → myelomeningocele, meningocele, anencephaly
  - ▶ *Closed lesions*: defect covered by skin → dermal sinus tract, tethered spinal cord, myelocystocele, spinal cord lipoma, lipomeningocele (and more)
- Occult Spinal Dysraphism (OSD)**
- ▶ Synonym used for *closed lesions* → skin covered neural tube defect

Myelocystocele



Lipomeningocele



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## Spine • Abnormal Findings

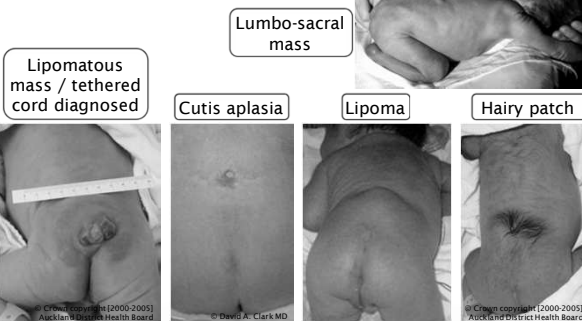
- Occult Spinal Dysraphism (OSD)**
- ▶ Most have an associated cutaneous abnormality:
    - Tuft of hair
    - Atypical dimple
    - Skin tag or tail-like appendage
    - Lipoma
    - Hemangioma
    - Cutis aplasia or dermal sinus tract
    - Port-wine stain (concerning especially if other lesions present)
  - ▶ ≥ 2 congenital midline skin lesions → strongest marker of OSD



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## Spine • Abnormal Findings

Occult Spinal Dysraphism (OSD)



Lumbo-sacral mass

Lipomatous mass / tethered cord diagnosed

Cutis aplasia

Lipoma

Hairy patch

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# Physical Assessment of the Newborn: Part 3

## Spine • Abnormal Findings

### Sacral Dimple

- ▶ < 5 mm in size, midline, and ≤ 2.5 cm from anus **not** associated with OSD\*
- ▶ > 5 mm in size, deep, > 2.5 cm from anus **may** indicate OSD\* (especially if combined with other lesions)

\*OSD: Occult (closed) Spinal Dysraphism



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## Spine • Abnormal Findings

### Spina Bifida Occulta

- ▶ One or more of the vertebrae are malformed
- ▶ Small gap in spine, but is covered by skin
- ▶ Spinal cord and nerves usually normal
- ▶ Usually does not cause any nervous system disability



From: <http://www.cdc.gov/ncbddd/spinabifida/facts.html>

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## Spine • Abnormal Findings

### Open Spinal Dysraphism → Meningocele

- ▶ Spinal fluid and meninges protrude through abnormal vertebral opening
- ▶ No neural elements (spinal cord)
- ▶ May or may not be covered by a layer of skin
- ▶ Usually no nerve damage, but outcome is variable



From: <http://www.cdc.gov/ncbddd/spinabifida/facts.html>

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## Spine • Abnormal Findings

### Open Spinal Dysraphism → Myelomeningocele

- ▶ Sac of fluid protrudes through back and **does** contain spinal cord and nerves
- ▶ Moderate to severe disability → may affect bowel and bladder continence and sensation in legs or feet



From: <http://www.cdc.gov/ncbddd/spinabifida/facts.html>

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## Spine • Abnormal Findings

### Myelomeningocele Evaluation

- ▶ Membrane intact versus ruptured
- ▶ Size and location of lesion
- ▶ Tone, spontaneous movements, reflexes
- ▶ Presence or absence of anal wink
- ▶ Ability to void and empty bladder
- ▶ OFC, sutures, fontanel for hydrocephalus



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## Spine • Abnormal Findings

### Myeloschisis

- ▶ Most severe form of myelomeningocele
- ▶ Complete exposure of nerves and tissues



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# Physical Assessment of the Newborn: Part 3

## Spine • Abnormal Findings

Myelomeningocele – Initial Care



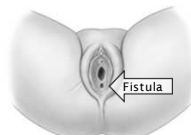
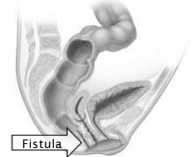
See Stabilization Folder for initial care guidelines

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## Anorectal Malformation • Female

Imperforate Anus

- Meconium from a fistula external to hymen but not on perineal skin indicates *rectovestibular fistula* → most common type of imperforate anus in females



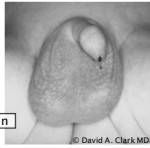
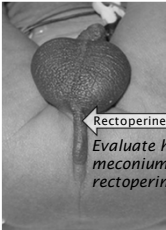
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## Anorectal Malformation • Male

Imperforate Anus

- May have low or high lesion
- Watch for meconium from fistula

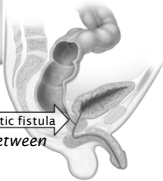


Rectoperineal fistula location

Evaluate here for meconium → would indicate rectoperineal fistula

Rectoprostatic fistula

Rectoprostatic fistula → between distal bowel and urethra



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## Genitourinary • Normal Findings

- Urine output → majority of term, well newborns void within 24 hours of life
  - Volume increases as enteral intake is established
  - Male urine stream: straight, forceful, continuous
- Palpation
  - Kidneys – smooth, equal in size

Normal urine output from urethra



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## Genitourinary • Abnormal Findings

Delay in Urination

- 24 to 48 hours of life → evaluate for
  - Palpable bladder
  - Abdominal mass
  - Hydration status
- > 48 hours of life is concerning
  - Further workup to evaluate for impaired renal function is indicated

Distended bladder



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## Genitourinary • Abnormal Findings

Eagle-Barrett Syndrome – “Prune-Belly Syndrome”

- Renal and urinary tract abnormalities
  - Ureters dilated and tortuous – reflux common
  - Bladder enlarged
  - Infection common secondary to urinary stasis
- Deficiency of abdominal wall musculature → protruding, thin-walled abdomen with wrinkled skin



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# Physical Assessment of the Newborn: Part 3

## Genitourinary • Abnormal Findings

Eagle-Barrett Syndrome - "Prune-Belly Syndrome"

- ▶ Intestinal malrotation common
- ▶ Less common → limb and cardiac anomalies
- ▶ 95% of cases are male infants
  - Bilateral cryptorchidism



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## Genitourinary • Abnormal Findings

Oligohydramnios Sequence → Potter's Syndrome

- ▶ Oligohydramnios (little amniotic fluid) or anhydramnios (no amniotic fluid produced) secondary to renal agenesis or severe renal structural disorders
- ▶ Results in fetal compression and impaired fetal breathing and lung development



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## Genitourinary • Abnormal Findings

Bladder Exstrophy and Epispadias

- ▶ *Bladder exstrophy* → inner posterior wall of bladder protruding through a defect in anterior pelvic wall
- ▶ Repair before 48 hours may be more successful because of maternal hormone relaxin
- ▶ *Epispadias*
  - Male: short, wide penis with urethral opening on dorsal surface
  - Female: urethral opening between bifid clitoris and labia



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## Genitourinary • Abnormal Findings

Bladder Exstrophy and Epispadias (male infants shown)



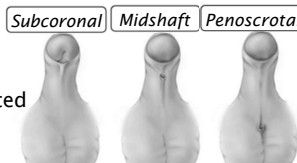
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## Male Genitalia • Abnormal Findings

Hypospadias

- ▶ *Subcoronal* → urethral opening near head, but not at tip of penis
- ▶ *Midshaft* → urethral opening located on shaft of penis
- ▶ *Penoscrotal* → urethral opening where penis and shaft of penis and scrotum meet
- ▶ Circumcision contraindicated in newborn period → skin will be needed for surgical correction



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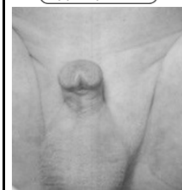
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## Male Genitalia • Abnormal Findings

Coronal hypospadias

Subcoronal hypospadias

Epispadias



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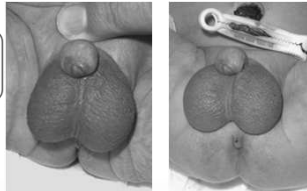
# Physical Assessment of the Newborn: Part 3

## Male Genitalia • Abnormal Findings

### Chordee

- ▶ Ventral curvature of the penis
- ▶ May also have hypospadias
- ▶ Circumcision is contraindicated in newborn period → skin will be needed for surgical correction

Chordee with hypospadias and bifid scrotum



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## Male Genitalia • Abnormal Findings

### Genital Hypoplasia

Micropenis and cryptorchidism (undescended testes)



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## Male Genitalia • Abnormal Findings

### Hydrocele

- ▶ Fluid collection in the scrotum → smooth / non-tender, unilateral or bilateral
- ▶ Transillumination → confirms fluid-filled contents
- ▶ Most resolve by 1 year



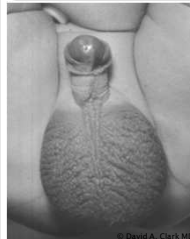
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## Male Genitalia • Abnormal Findings

Incomplete fusion of scrotal/labial folds



Absent right testicle



Cryptorchidism



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## Male Genitalia • Abnormal Findings

### Testicular Torsion

- ▶ Usually occurs prenatally
- ▶ Testicle may be:
  - Nontender
  - Firm
  - Indurated
  - Swollen
- ▶ If acutely occurred → extremely tender to palpation
- ▶ If longstanding → may not show any signs of pain



Right testicle is affected  
Note: subtle discoloration and size difference

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## Female Genitalia • Abnormal Findings

Bruising and edema from breech vaginal delivery




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# Physical Assessment of the Newborn: Part 3

## Female Genitalia • Abnormal Findings


**Vaginal prolapse**




**Pseudo menses**



**Virilization due to congenital adrenal hyperplasia (CAH)**



**Redundant vaginal mucosa, vaginal skin tag**

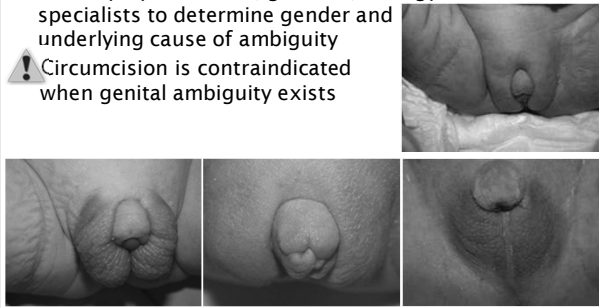


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## Genitalia • Ambiguous

▶ Work-up by endocrine, genetics, urology specialists to determine gender and underlying cause of ambiguity

! Circumcision is contraindicated when genital ambiguity exists

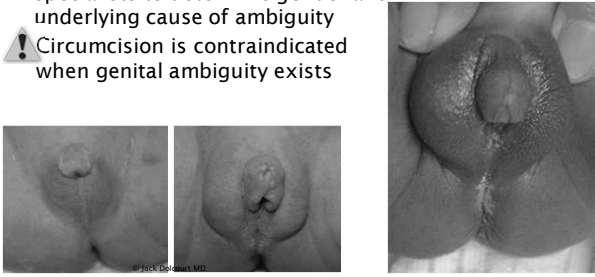


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## Genitalia • Ambiguous

▶ Work-up by endocrine, genetics, urology specialists to determine gender and underlying cause of ambiguity


! Circumcision is contraindicated when genital ambiguity exists




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## Extremities • Fractures

**Femur**



**Humerus**




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## Extremities • Abnormal Findings

**Breech Presentation**

▶ Evaluate for developmental dysplasia of hip



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## Extremities • Abnormal Findings


**Developmental Dysplasia of the Hip (DDH)**

▶ Dislocation of femoral head from hip socket (acetabulum)

▶ 1 to 2 per 1,000 births

▶ Risk factors

- Female → secondary to additional estrogen production which increases ligamentous laxity
- Breech presentation
- Oligohydramnios → restricted movement
- Positive family history



+ Galeazzi sign if unilateral dislocation

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# Physical Assessment of the Newborn: Part 3

## Extremities • Abnormal Findings

Developmental Dysplasia of the Hip (DDH)

▸ Signs

- May have no noticeable difference
- If unilateral, uneven skin folds of thigh or buttocks and shorter leg on side of hip dislocation

▸ Occurs on

- Left side 60%
- Right side 20%
- Both sides 20%



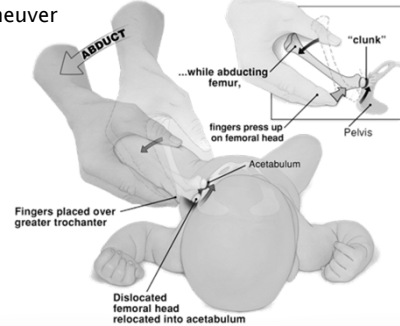
+ Galeazzi sign if unilateral dislocation

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## Extremities • Abnormal Findings

Developmental Dysplasia of the Hip (DDH)

▸ Ortolani Maneuver

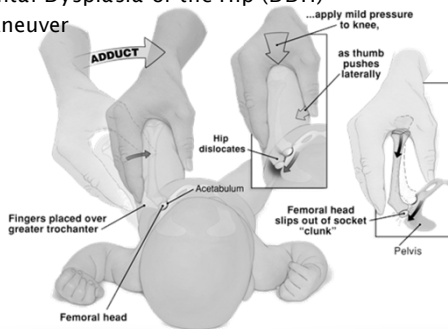


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## Extremities • Abnormal Findings

Developmental Dysplasia of the Hip (DDH)

▸ Barlow maneuver



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## Extremities • Abnormal Findings

Brachial Plexus Injuries

- Stretching or tearing of the plexus → nerves originating from C5 to T1
- May have history of macrosomia, difficult delivery with traction and lateral neck flexion secondary to:
  - Shoulder dystocia
  - Prolonged vaginal extraction
  - Breech presentation with traction of shoulder
  - Difficult vertex presentation with turning away of head
- Usually unilateral → right side affected more often
  - Also evaluate for fracture of clavicle or humerus

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## Extremities • Abnormal Findings

Brachial Plexus Injuries - 3 types

1. Erb Palsy

- Most common form, involves C5, C6, at times, C7
- Partial paralysis of shoulder muscles
- Arm adducted, internally rotated and pronated, extension of elbow, wrist flexed → "waiter's tip" position
- Reflexes
  - Asymmetrical Moro, absent on affected side
  - Biceps reflex weak or absent
  - Grasp usually present



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## Extremities • Abnormal Findings

Brachial Plexus Injuries - 3 types

1. Erb Palsy

- Improvement usually seen within first few days of life and complete recovery by 1 to 18 months



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# Physical Assessment of the Newborn: Part 3

## Extremities • Abnormal Findings

Brachial Plexus Injuries – 3 types

2. Klumpke

- ▶ C8 and T1 injury
- ▶ Forearm and hand involved → wrist and finger extension weak, hand flaccid, grasp reflex absent, deep tendon reflex present

3. Complete Palsy

- ▶ Injury of all plexus nerves, all reflexes absent

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## Extremities • Abnormal Findings

Arthrogryposis Multiplex Congenita

- ▶ Multiple joint contractures present at birth

- Evaluate for any condition limiting fetal movement → neuromuscular disease, brain malformations, chromosomal defects, genetic syndromes, lesions of central nervous system

- ▶ ~ 150 different syndromes associated with multiple congenital contractures

- ▶ Involved muscles are replaced partially or completely by fat and fibrous tissue



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## Extremities • Abnormal Findings

Arthrogryposis Multiplex Congenita

- ▶ Upper and lower extremities involved in 40% of cases

- ▶ Shoulders → adducted, internally rotated

- ▶ Elbows and wrists → flexion/extension contractures, radial deviation

- ▶ Hands → thumb deformities, rigid interphalangeal joints

- ▶ Hips → abduction, external rotation, contractures, dislocation of hip(s)

- ▶ Knees → extension/flexion contractures

- ▶ Bilateral club foot



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## Extremities • Abnormal Findings

Achondroplastic Dwarfism

- ▶ Macrocephaly, prominent forehead, flat nasal bridge

- ▶ Average size torso

- ▶ Short arms and legs (especially upper arms and thigh area)

- ▶ Fingers short, with abnormal appearance at times – extra space between the middle and ring fingers – “trident” hand

- ▶ Bowed lower legs



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## Extremities • Abnormal Findings

Achondroplastic Dwarfism

- ▶ May be inherited or spontaneous mutation (both parents without dwarfism)

- ▶ Genetic bone disorder

- ▶ Most common type of dwarfism – short-limbed dwarfism

- ▶ Normal intelligence



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## Extremities • Abnormal Findings

Thanatophoric Dysplasia

- ▶ Lethal congenital skeletal dysplasia

- ▶ Features

- Large head

- Short neck

- Narrow thorax

- Short limbs

- Short, small fingers

- Bowed extremities



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# Physical Assessment of the Newborn: Part 3

## Extremities • Abnormal Findings

Amniotic Band Syndrome

- ▶ Constriction
- ▶ Amputation

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## Extremities • Abnormal Findings

Triploidy

Claw hand

Cornelia de Lange Phocomelic

Asymmetric shortening of 1<sup>st</sup> and 2<sup>nd</sup> fingers

Zellweger Syndrome Ulnar deviation

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## Extremities • Abnormal Findings

Hypoplasia of right thumb

Bifid thumb

Rubinstein-Taybi Broad thumb

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## Extremities • Abnormal Findings

Polydactyly

- ▶ Evaluate for bone in stalk connecting digit to hand

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## Extremities • Abnormal Findings

Syndactyly

Fingers

Toes

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## Extremities • Abnormal Findings

Rocker bottom feet

Dorsiflexed hallux

Club feet

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# Physical Assessment of the Newborn: Part 3

## Extremities • Abnormal Findings

**Zellweger Syndrome**  
Prominent knees

**Oral-facial-digital Type 2**  
Duplication of hallus

**Goltz Syndrome**

**Smith-Lemli-Opitz Syndrome**  
Syndactyly, polydactyly

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## Extremities • Abnormal Findings

Lymphedema  
▶ Turner's Syndrome

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## Extremities • Abnormal Findings

Trisomy 21

- ▶ Short, broad hands and feet
- ▶ Simian crease across palm
- ▶ Wide space between great and 2<sup>nd</sup> toe

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Simian crease

## Extremities • Abnormal Findings

Trisomy 18

- ▶ Overlapping, tapered fingers
- ▶ Hypoplastic nails
- ▶ Rocker-bottom feet

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## Extremities • Abnormal Findings

Trisomy 13

- ▶ Polydactyly
- ▶ Syndactyly
- ▶ Tapered, thin fingers
- ▶ Short hallux (great toe)
- ▶ Rocker bottom feet

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