BIRTH INJURIES

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WHAT IS A BIRTH INJURY?

OUTCOMES

- Define birth injury
- State the causes of birth injuries
- Manage common birth injuries

DEFINITION

- Injuries to the infant resulting from mechanical forces during birth (compression, traction)
- ***Physical injury sustained during the birth process***
- Can coexist with hypoxemic-ischemic insult - may predispose to each other

INCIDENCE

- In 1970 ~ 64 deaths/100 000 births related to birth trauma
- In 1985 ~ 7.5 deaths/100 000 births related to birth trauma
- 88% decline
- Birth trauma causes < 2% of neonatal deaths
- Average ~ 6 - 8 injuries/1000 births

PREDISPOSING FACTORS

- Primigravida
- Cephalopelvic disproportion
- Small maternal stature
- maternal pelvic anomalies
- Prolonged or rapid labor
- Arrest of descent of presenting fetal part
- Oligohydramnios

- Resuscitation with CPR

- Abnormal presentation (breech/face)
- Use of forceps or vacuum extraction
- Versions
- VLBW infant or extreme prematurity
- Macrosomia
- Large fetal head
- Fetal anomalies
- Fetal neuromuscular disease
- HIE

BIRTH INJURIES

- **Soft Tissue Injuries** (Abrasions, Bruising, Fat Necrosis, Lacerations)
- **Extracranial Bleeding** (Caput succedaneum, Cephalohematoma, Subgaleal Hematoma)
- **Intracranial Bleeding** (Subarachnoid, Epidural, Subdural, Cerebral, Cerebellar)
- **Nerve Injuries** (Facial and Cervical Nerve Roots, Horner Syndrome, Recurrent Laryngeal Nerve)
- **Fractures** (Clavicle, Humerus, Femur, Skull)
- **Dislocations**
- **Torticollis** (Sternocleidomastoid injury)
- **Eye Injuries** (Sub-conjunctival and Retinal Hemorrhage)
- **Solid Organ Injury** (liver, spleen, kidney, adrenal glands)

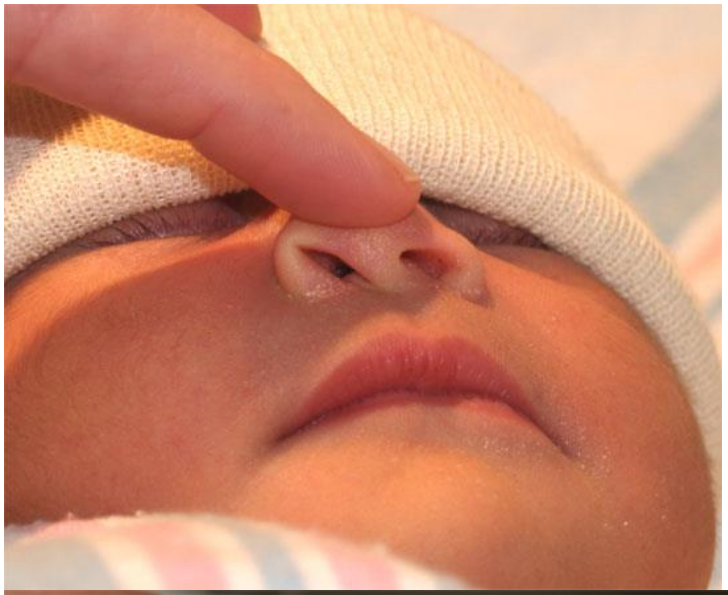
SOFT TISSUE INJURIES

- Bruises and Petechiae
  - Can be seen in the GU area in breech presentations
  - Can be seen around the head and neck when there is a nuchal cord or precipitous delivery
  - Appearance of new bruises or petechiae after delivery warrants further investigation to r/o sepsis/DIC or bleeding disorder

SOFT TISSUE INJURIES

- Fat Necrosis
  - Well-circumscribed firm nodule with purplish discoloration
  - Usually occurs after forceps use, but can occur at other sites of trauma
  - Resolves spontaneously over weeks to months

NASAL DEFORMITIES



- < 1% of nasal deformities are due to actual dislocations of the triangular cartilage of the nasal septum
- Differentiate from positional deformities by manually moving the septum to midline and observe the resultant shape of the nares
  - True dislocation = marked asymmetry of the nares persists; consult ENT
  - Failure to recognize a true dislocation can lead to permanent deformity

TORTICOLLIS

- Lateral tilt of the neck and head typically due to a tight sternocleidomastoid muscle
  - Head and neck tilt toward the involved side and chin is turned away from the involved side
- Most common causes:
  - Congenital Muscular Torticollis: fibrosis of the sternomastoid muscle from uterine packing problem
  - Vertebral Anomalies: Klippel-Feil syndrome (congenital anomalies of the cervical spine)

TORTICOLLIS

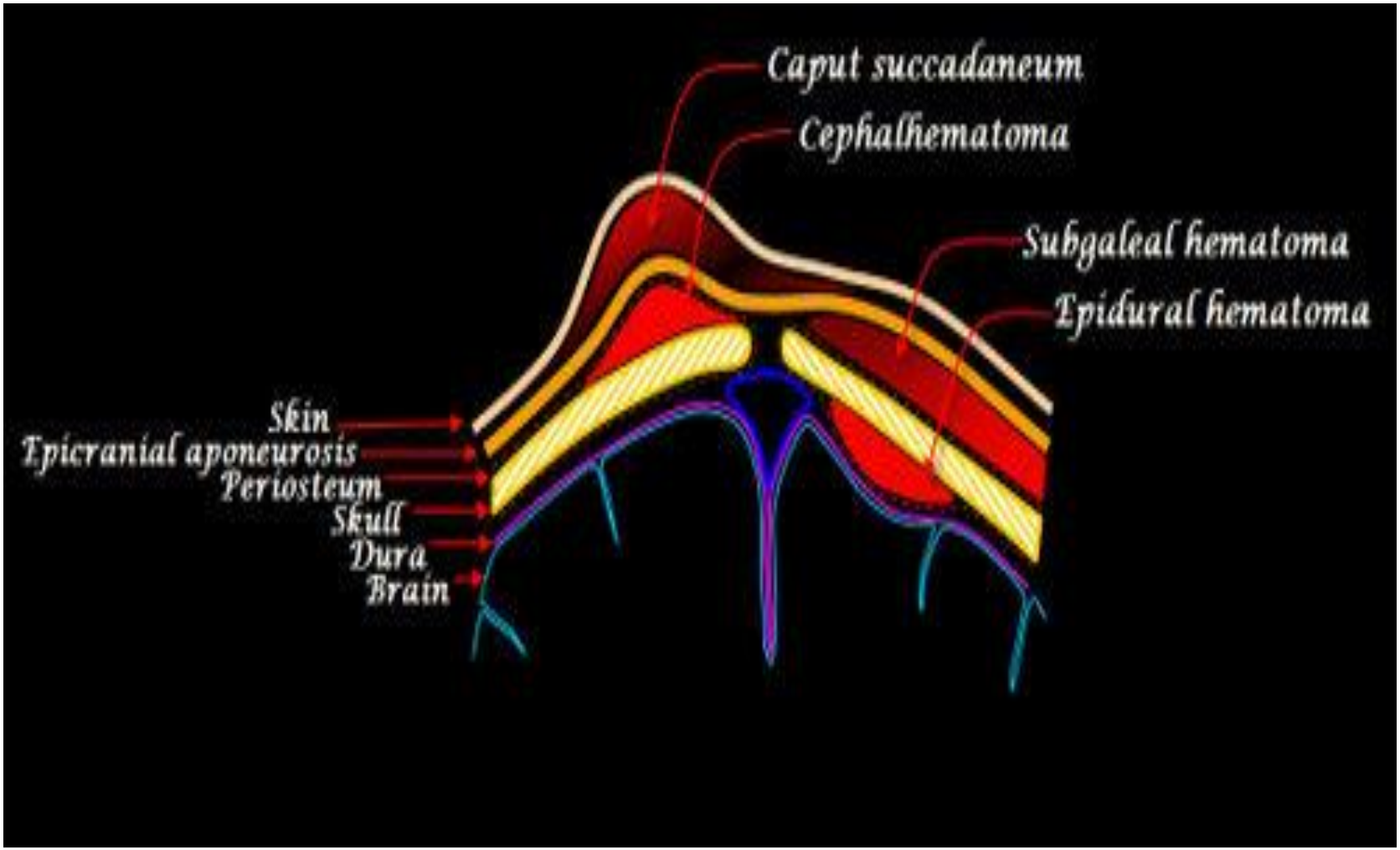
- Diagnosis
  - Usually made clinically, may palpate mass in the muscle early in postnatal period
  - Examine infant for other congenital anomalies
  - Radiographs of the cervical spine should be done to rule out any vertebral anomalies if there is no response to stretching exercises of the sternomastoid muscle
- Treatment
  - Stretching exercises are successful in 90% of the cases
  - Surgical correction may be considered in resistant cases after 1 year of age

TORTICOLLIS

HEAD TRAUMA

- Hemorrhages
  - Extracranial
    - Caput succedaneum
    - Cephalhematoma
    - Subgaleal Hemorrhage
  - Intracranial
    - Epidural
    - Subdural
    - Subarachnoid
- Fractures
  - Linear
  - Depressed

EXTRACRANIAL HEMORRHAGE



CAPUT SUCCEDANEUM

- Common after prolonged labor
- Accumulation of blood/serum above periosteum
- Soft tissue swelling / edema / petechiae / ecchymoses
- Crosses suture lines

CEPHAL HEMATOMA

CEPHALHEMATOMA

- Occurs after prolonged labor and instrumentation
- Secondary to rupture of blood vessels traversing skull to periosteum
- Often fluctuant swelling, well demarcated, does not cross suture lines, no overlying skin discoloration
- Most often unilateral, but can be bilateral
- Possible skull fractures, sometimes elevated ridge
- With linear fractures, risk for leptomeningeal cyst

SUBGALEAL HEMORRHAGE

SUBGALEAL HEMORRHAGE

- Occurs between periosteum and epicranial aponeurosis
- Most often with difficult vacuum or forceps extraction
- 1 in 2,000 deliveries (1/200 vacuum)
- Boggy fluid collections with a fluid wave beneath the scalp
- Hemorrhage extending from above the eyes to the neck, frequently displacing ears anteriorly
- Presents with pallor, tachycardia, tachypnea, mottling, hypotension, hypotonia -- hemorrhagic shock
- Can cause consumptive coagulopathy
- Prognosis correlates with the degree of brain ischemia following delayed or incomplete correction of blood loss and hypotension

SKULL FRACTURES

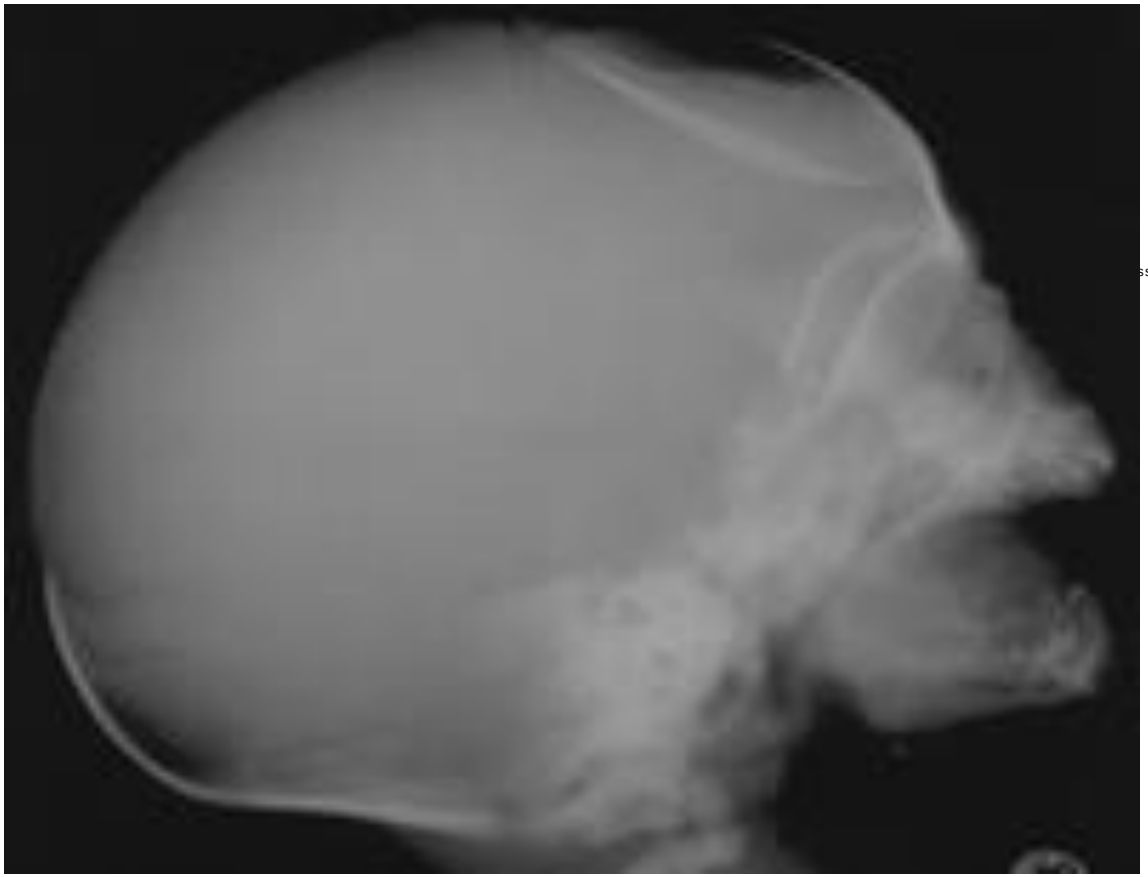
- Mostly linear, often with cephalhematoma
- Usually after prolonged labor or forceps delivery
- Fetal skull pressed against symphysis, sacral promontory or ischial spine
- Risk of leptomeningeal cyst
- Follow up Xrays ~ 2 months after injury

SKULL FRACTURE

LEPTOMENINGEAL CYST

Skull fracture with dural tear leads to herniation of pia and arachnoid layers (leptomeninges) through the dural tear. CSF pulsations lead to progressive erosion of skull around the fracture site. Margins of fracture still apparent months after injury. Greater diastasis of the fracture as time goes on.

DEPRESSED SKULL FRACTURE

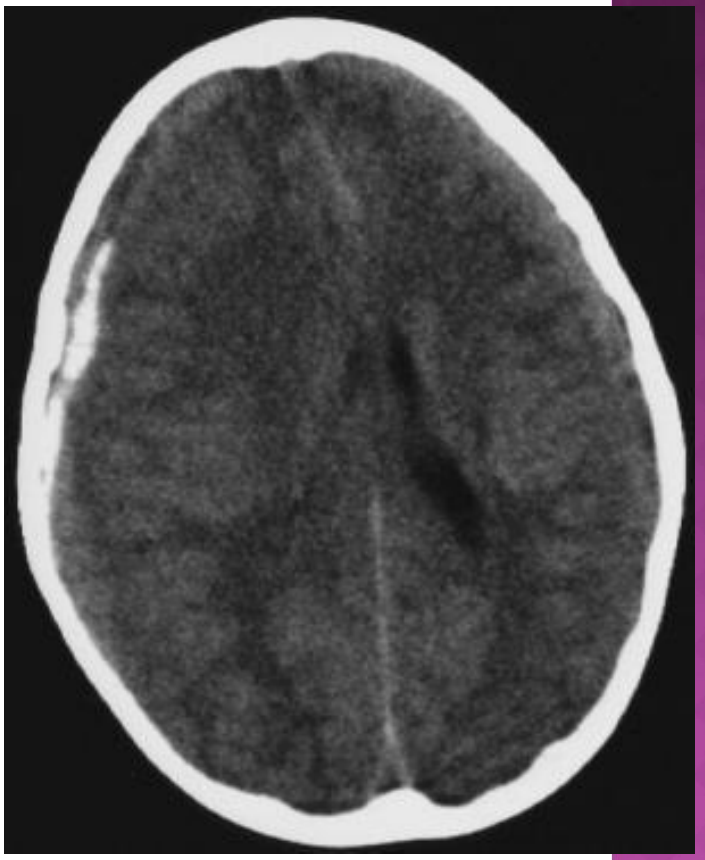


INTRACRANIAL HEMORRHAGES

- **Epidural**:
  - ✓ Rare
  - ✓ Usually associated with fractures
  - ✓ Irritability, lethargy, and seizures progress to signs of increased ICP and ultimately uncal herniation
  - ✓ Diagnosed by CT
- **Subdural:**
  - ✓ Diagnosed by CT
  - ✓ May be due to rupture of the straight sinus, vein of Galen, transverse sinus, inferior sagittal sinus, or superficial bridging vessels
  - ✓ Symptoms within 24 hours of birth : apneas, seizure activity, altered state, irritability, focal neurologic signs, loss of consciousness
  - ✓ With midline shift : consider neurosurgical Tx
  - ✓ Can cause secondary cerebral infarction due to arterial compression
  - ✓ Infants may develop normally or have persistent focal neurologic findings, including hydrocephalus

INTRACRANIAL HEMORRHAGES

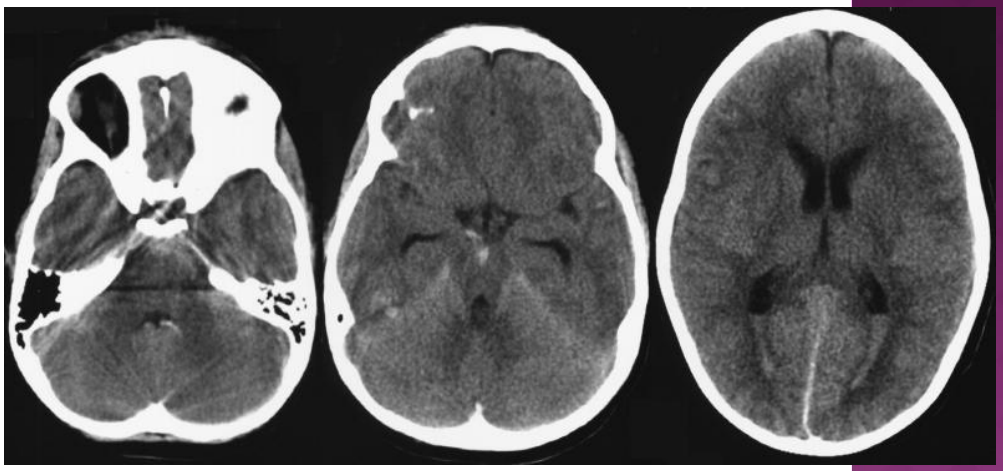
Epidural Hematoma



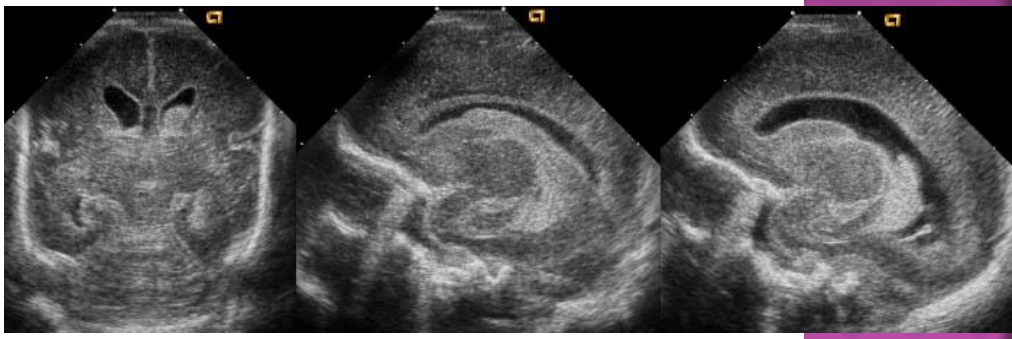
Subdural Hematoma

INTRACRANIAL HEMORRHAGES

- **Subarachnoid**:
  - ✓ often asymptomatic
  - ✓ apnea
  - ✓ irritability and seizures
  - ✓ CSF bloody
  - ✓ CT diagnosis



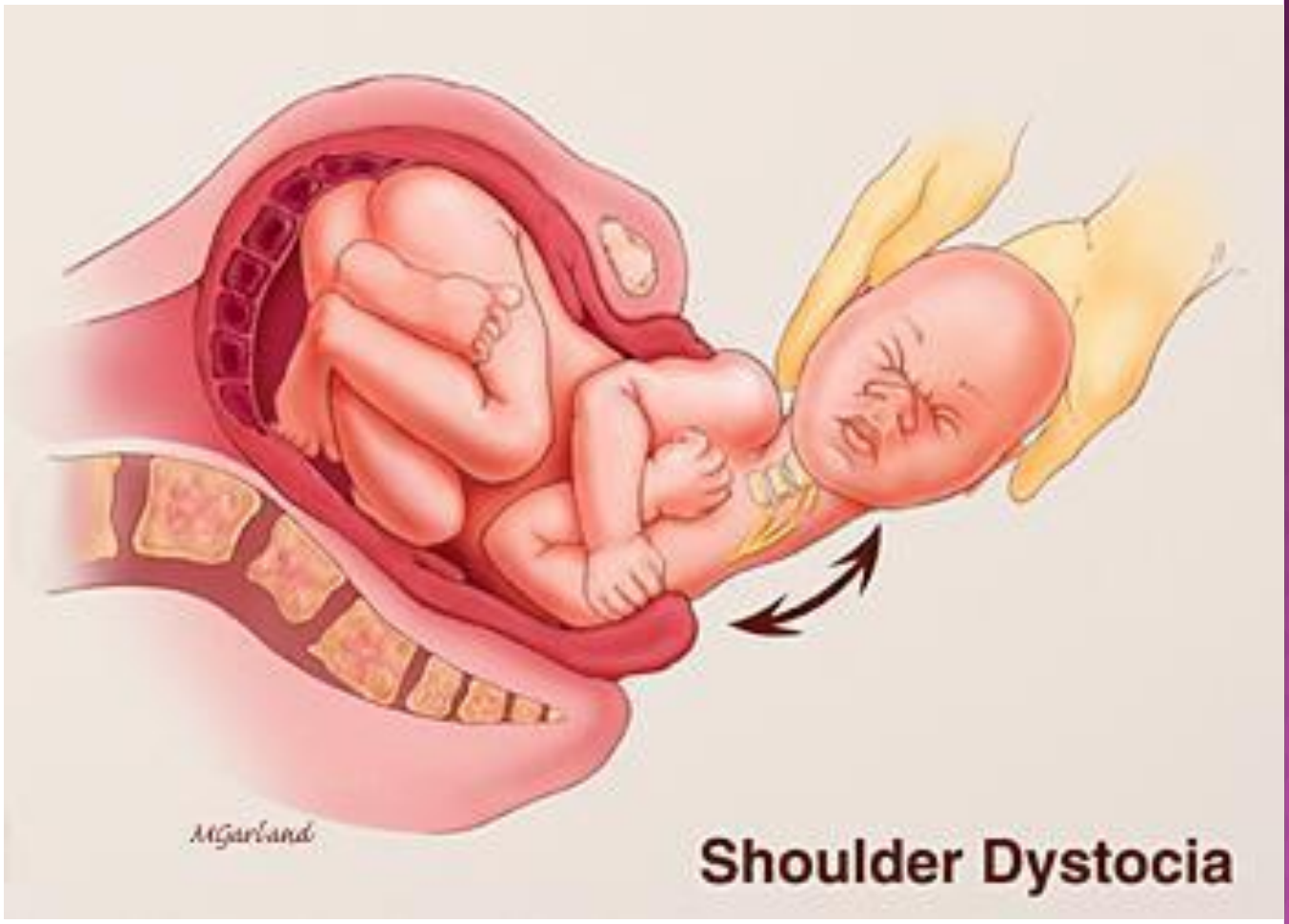
- **Intracerebellar:**
  - ✓ Can present with signs of brainstem compression
- **Intraventricular:**
  - ✓ Mostly premature infants
  - ✓ Less likely caused by intrapartum factors
  - ✓ Risk of post-hemorrhagic hydrocephalus



TRAUMATIC NERVE & SPINAL CORD INJURIES

- Spinal Cord
  - ✓ Rare
  - ✓ Associated with mid-forceps rotations and difficult breech extractions
  - ✓ Lesion varies from localized hemorrhage to complete destruction of the cord at one or more levels
  - ✓ Clinical presentations are paralysis and areflexia of the lower extremities with variable upper extremity involvement, distended bladder, respiratory failure, stillbirth or rapid neonatal death
  - ✓ In 2/3 of cases, HIE is associated
  - ✓ Look for vertebral fracture or dislocation that may be amenable with neurosurgical intervention
  - ✓ Improved prognosis for lesions below T4

TRAUMATIC NERVE & SPINAL CORD INJURIES



TRAUMATIC NERVE & SPINAL CORD INJURIES

- Peripheral Nerve
  - ✓ Brachial plexus injuries in 0.5 to 2.5 per 1,000 live births
  - ✓ Caused by stretching or rupture of the cervical nerve roots from traction on the neck during delivery with subsequent edema / scarring
  - ✓ Risk factors are BW > 4,500g, shoulder dystocia, breech, multiparity, and assisted deliveries
  - ✓ Upper arm palsy (**Erb-Duchenne**) is the most common and caused by damage to the 5^{th} and 6^{th} cervical nerve roots
  - ✓ Isolated lower arm palsies (**Klumpke**) is rare and involves the 8^{th} cervical and first thoracic nerve roots
  - ✓ Damage to the sympathetic outflow via nerve root T1 can result in a **Horner's Syndrome** with miosis, ptosis, anhidrosis, and enopthalmos
  - ✓ Injuries resolve within days to 4 weeks after birth. Surgery may be indicated if there is no return of function by 4.5 months of age

BRACHIAL PLEXUS PALSY

Figure 2. Classic phenotype associated with an upper brachial plexus lesion.

BRACHIAL PLEXUS PALSY

- Three forms - depending on site and extent of trauma
  - 5th and 6th cervical roots - upper arm (Erb-Duchenne) = most common form
  - 8th cervical and 1st thoracic roots - lower arm (Klumpke) = extremely rare
  - Paralysis of entire arm = rare
- Evaluation :
  - Xrays to r/o fractures of clavicle or humerus and to r/o epiphyseal detachment of humerus
  - US to r/o posterior dislocation of humerus epiphysis

BRACHIAL PLEXUS PALSY - SYMPTOMS

- Upper (Erb) paralysis:
  - Adduction, internal rotation, extended elbow, pronated forearm, wrist flexion
  - Moro, biceps, radial reflexes absent, grasp intact
  - Possible additional phrenic nerve (from 3rd/4th/5th cervical root) palsy
- Lower (Klumpke) paralysis
  - Intrinsic hand muscles and long flexors - hand paralyzed
  - No grasp reflex, but present deep tendon reflexes
  - Frequently with ipsilateral Horner's syndrome (enophthalmus, ptosis, miosis, anhidrosis) - cervical sympathetic fibers from1st thoracic root affected

BRACHIAL PLEXUS PALSY - THERAPY

- Prevent contractures - passive range of motion with physical therapy involved
- Neurological/neurosurgical consultation
- Consider MRI to r/o avulsion of nerve root
- Reevaluate progress every month
- If no improvement by end of 3rd month, consider surgical exploration in 4th month

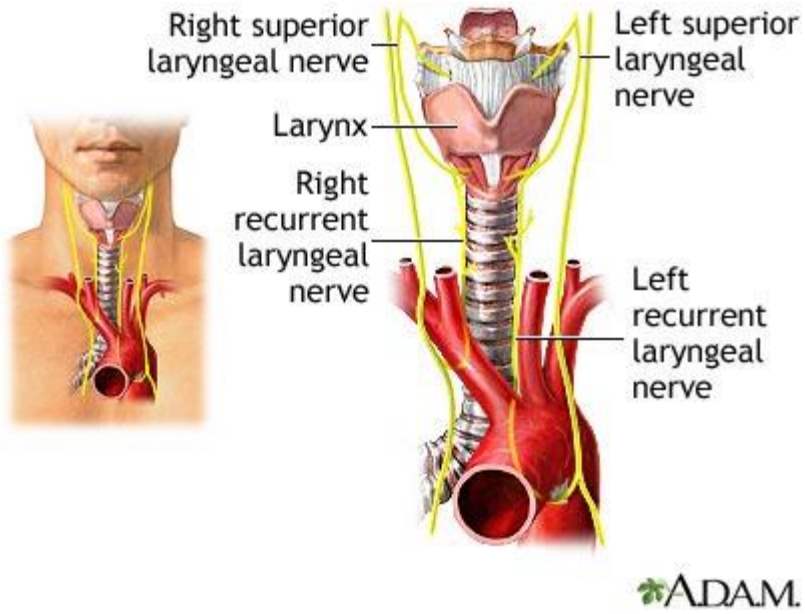
HORNER'S SYNDROME

Figure 1: Left pupillary miosis, marked hypochromia of the left iris, ipsilateral mild ptosis and left hemifacial anhidrosis

PHRENIC NERVE PALSY

- Lateral hyperextension of neck causes overstretching or avulsion of 3rd, 4th and 5th cervical roots which supply phrenic nerve
- Respiratory distress, risk of infection, elevated hemidiaphragm, paradoxical diaphragmatic movement, atelectatic areas
- If no improvement within one month, recovery unlikely and plication needs to be considered

LARYNGEAL NERVE INJURY



- Laryngeal nerve is part of vagus nerve - in neck behind jugular vein and carotid artery
- 10% of vocal cord paralysis caused by birth trauma
- Hoarse cry, stridor
- Risk for aspiration, feeding problems
- Recovery often over 4 - 6 weeks, sometimes longer

FACIAL NERVE PALSY

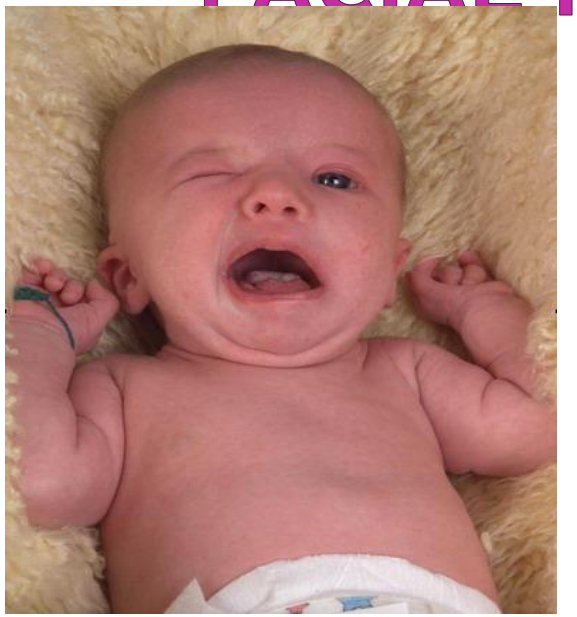
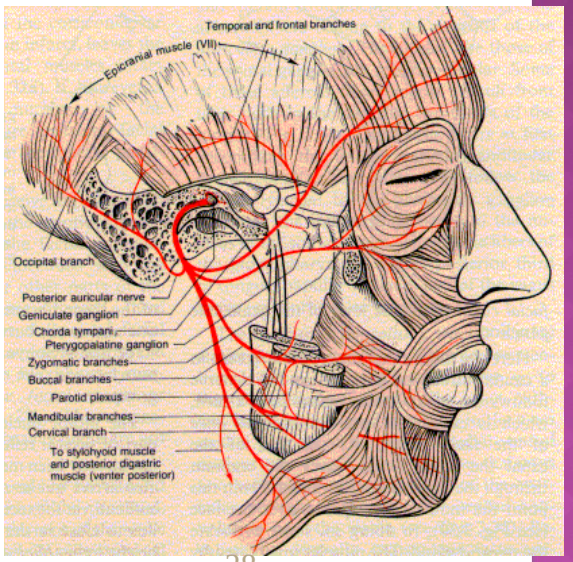


FIGURE 3. Asymmetry caused by facial nerve paralysis, with inability to close eye, naso-labial fold flattening, and inability to move lips on the affected side. Newborns with facial nerve paralysis have difficulty effecting a seal around the nipple and consequently exhibit drooling of milk or formula from the paralyzed side of the mouth.



FACIAL NERVE PALSY

- Etiology :
  - Compression of peripheral portion of facial nerve
  - Compression either by forceps or by pressure against sacral promontory
- Symptoms :
  - Paralyzed side smooth, corner of mouth drooping, persistently open eye, and smooth forehead on side of damage
- Differential diagnosis :
  - Central paresis - affecting opposite side, does ***not affect*** orbicularis orbi and forehead muscles, caused by damage in posterior fossa
  - Nuclear agenesis (Mobius syndrome) - frequently bilateral, face motionless, other cranial nerves affected as well
  - Congenital absence or hypoplasia of depressor muscle of the angle of the mouth
- Prognosis :
  - Generally good, recovery usually occurs within the first month
  - Surgery reserved for those with clear severing of the facial nerve
- Protect cornea with moisturizing drops

BONE FRACTURES

- ✓ Incidence of clavicular fracture is 0.5% to 1.5% of live births
- ✓ Humerus is the most common long bone fracture
- ✓ Treated by limiting mobility of the affected arm

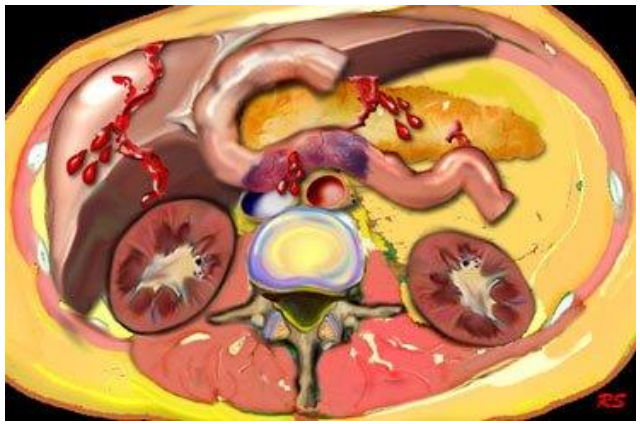
EXTREMITY FRACTURES

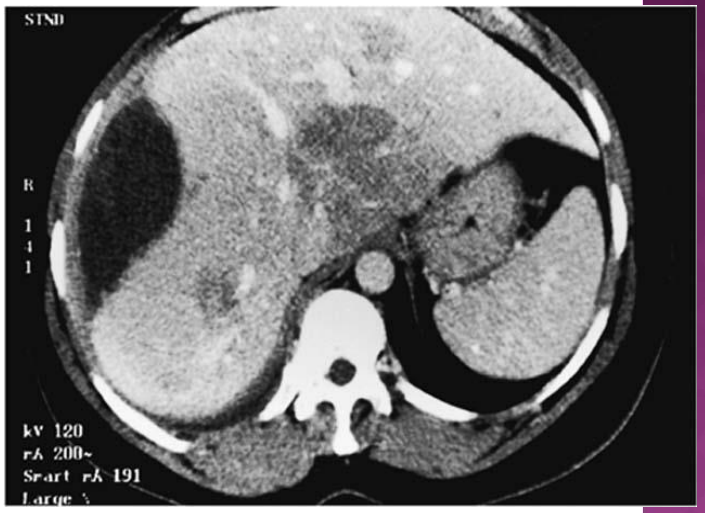
or

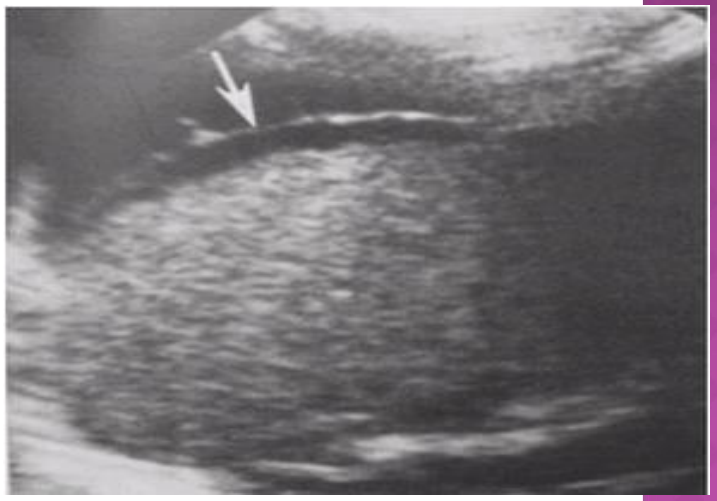
CLAVICULAR FRACTURE

TI

SUBCAPSULAR LIVER HEMORRHAGE







SUBCAPSULAR LIVER HEMORRHAGE

- At risk : IDM, erythroblastosis fetalis, breech delivery, resuscitation
- Anemia, pallor, poor feeding, tachycardia, tachypnea
- Abdominal distension, blueish discoloration, hematoperitoneum, shock
- Diagnosis : ultrasound and subsequent laparotomy
- Therapy : surgery ASAP, PRBC / FFP / Platelet transfusions