

# Torticollis & Plagiocephaly

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\* Valley Kids Therapy\*



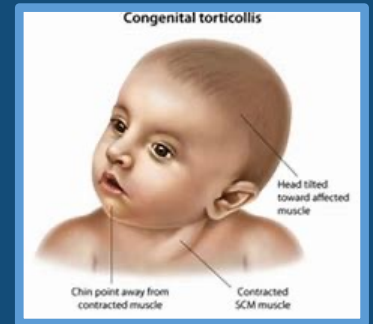
# Objectives

- Define torticollis & plagiocephaly
- Identify types of torticollis
- Identify how torticollis affects development
- Differentiate craniosynostosis vs plagiocephaly
- Understand when to refer where with abnormal head shape
- Summarize treatment for craniosynostosis vs plagiocephaly
- Identify where to ask questions regarding torticollis and plagiocephaly



# Torticollis

- Torticollis (cervical dystonia / spasmodic torticollis) is defined as a type of movement disorder in which the muscles controlling the neck cause sustained twisting or frequent jerking.
  - “Twisted neck”
- Pediatric = “Congenital Muscular Torticollis”: <sup>1</sup>
  - Congenital fibrosis of the sternocleidomastoid muscle in the newborn, causing rotation of the infant's head to the opposite side. The condition usually becomes evident in the first 2 weeks of life. Treatments include physical therapy or, in refractory cases, surgical division of the muscle.      Synonym: fibromatosis colli



# Congenital Muscular Torticollis

## Causes:

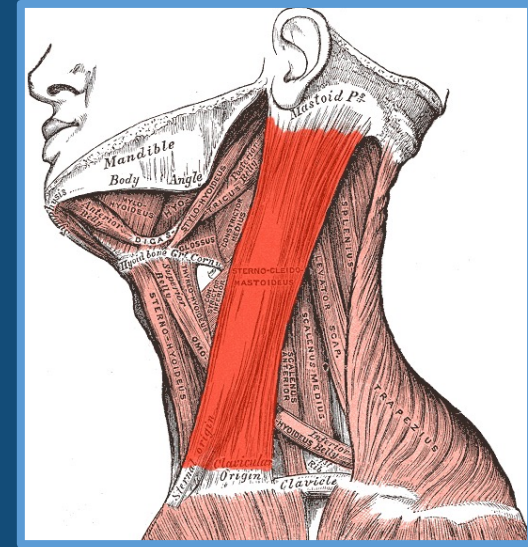
### May be related to:

- Intrauterine malpositioning (Xiong 2019)
- Ischemic event and compartment syndrome (Xiong 2019)
- Maldevelopment of the fetal SCM (Chen 2014) (Xiong 2019)
  - New evidence = “developmental disease” (Xiong 2019)
- Birth trauma – used to be considered primary, but no evidence (Xiong 2019)
  - Evidence is for intrauterine and prenatal reasons
- Muscular fibrosis (tumorous or bands) are present (Li D 2018)
  - Even when unable to palpate, ultrasound evidence
  - Important to not ignore head tilt when there is no palpable tumor or band.



# Congenital Muscular Torticollis

- Sternocleidomastoid Lesion (Han 2019)
  - Non-lesion Group (non palpable mass):
    - Better prognosis
    - Later initial visit to physiotherapy (mean age at first visit 146 days )
    - Shorter duration of treatment (mean therapy time 66 days)
    - More limited in head tilting than head rotation
    - Tilting and rotation of the head to the same direction was observed
  - Lesion Group (palpable mass):
    - First visit was initiated earlier (mean age 55 days)
    - Longer duration of treatment (mean therapy time 117 days)



# Torticollis Assessment

- Age of Detection (Lee 2013)
  - Earlier is better
    - Infants diagnosed earlier received intervention earlier
    - Infants diagnosed earlier had shorter duration of rehabilitation
- Range of motion (Lee 2013)
  - Initial cervical range is an important prognostic factor
    - More limited range = longer treatment duration
    - Determines rehabilitation outcome





# Torticollis Assessment

- PIQ
  - Posture in positions
  - Initiation and Inhibition
  - Quality and Quantity



	Supine	Prone	Sitting	Standing	Quadruped	Kneeling
Posture in positions						
Initiates						
Can't Do						
Quality						

# Torticollis Assessment

- Developmental Assessment
  - Full Developmental Screen
    - Gross Motor Skills: Quantity and quality of movement. SYMMETRY.
    - Fine Motor Skills: Quantity and quality of movement. SYMMETRY
    - Visual Motor Skills: Tracking – horizontal, vertical & rotational. Conjugate Vision.
    - Cognitive Skills: Play skills
    - Social Skills: Interaction skills
    - Sensory System: Infant regulation skills
  - Neurological System
  - Alignment: In supine, prone, supported sitting.
  - Hip Screen.
  - Assess Full Musculoskeletal System: From nose to toes 😊
  - Feeding Skills





# Torticollis Assessment

## Initiation and Inhibition

Observe what movements the child initiates

- What functional movements can they do?
  - Can they feed themselves?
  - Rotate to reach for objects?
- What parts of their body are they using for the movements?
- What is inhibiting them from initiating other movements?
  - Are they stuck in one position?
  - Is this a primitive reflex?
- Can they sustain and terminate movements?
- What transitions do they initiate?



# Torticollis Assessment

## Quality and Quantity

- How do they initiate the movements
  - Body part flexion, extension, dissociation?
- Where is the head in relation to the body during transitions?
- Are they using one side of their body more than another?
- Are they using mass patterns of flexion or extension?
- What is the speed of their movements?
- Are they using a more immature pattern of movement?
- Is there any change in respiratory pattern?



# Torticollis Assessment

- Neurological Assessment
  - Cerebral Palsy?
  - Primitive Reflexes
- Vision Assessment – Ocular Torticollis
  - Superior Oblique Palsy / Trochlear Nerve Palsy
  - Strabismus
  - Amblyopia
  - Nystagmus



# Torticollis Assessment

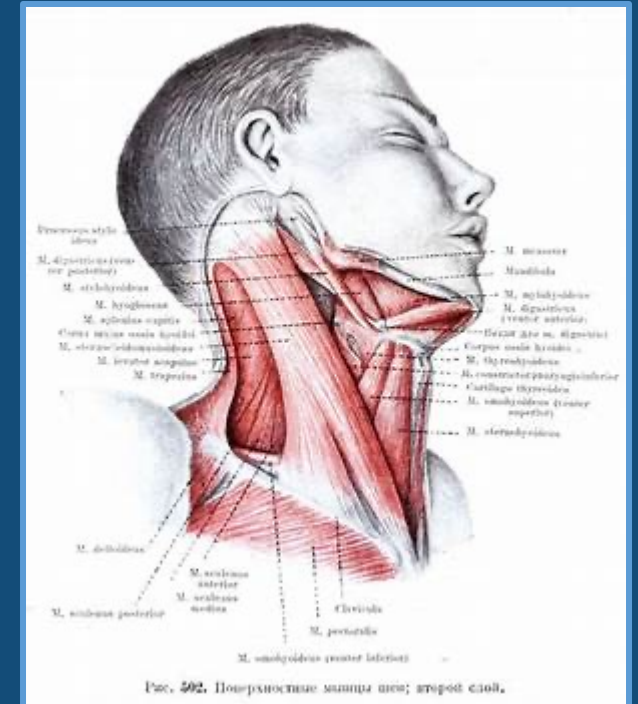
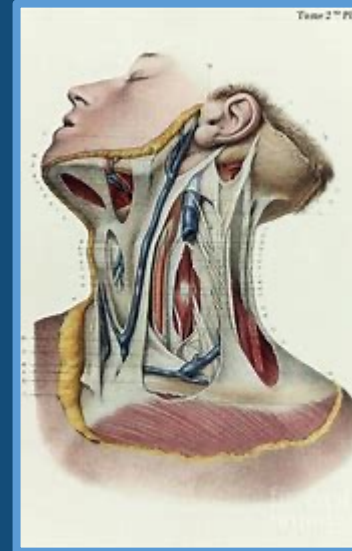
- Hip Assessment
  - Hip Screen – Correlated to dysplasia of the hip. 12.5% coexistence
    - Among CMT – 3.7% diagnosed with hip dysplasia
    - Among DDH – 5.9% - 9% diagnosed with CMT
- Foot Alignment
  - Talipes Equinovarus
  - Metatarsus Adductus





# Torticollis Assessment

- Feeding
  - Oral motor asymmetries
  - Fascial tightness in neck / torso
  - Latch quality
  - Tongue / lip tie



# Torticollis Treatment

- Factors that effect Rehabilitation Duration
  - Thicker SCM (Jung 2015) (Han 2011)
  - Lower Birth Weight (Jung 2015) (Heidenreich 2019)
  - History of Breech Delivery (Jung 2015) (Heidenreich 2019)
  - Motor Asymmetry (Heidenreich 2019)
  - Earlier treatment = Decreased duration (Lee 2015)
- Factors that don't affect (Jung 2015)
  - Mass site
  - Sex
  - Methods of Delivery





# Torticollis Treatment

- Back-to-sleep program started in 1992, with 40% decrease in SIDS and increase in posterior plagiocephaly and torticollis!!!!
- Prone positioning for 1 hour and 21 minutes a day when awake for 4 month olds = significant differences in milestone achievement.
  - –hands and knees
  - –active extension
  - –sitting skill progression
  - –prone positioning helps with other anti-gravity and weight bearing skills



# Torticollis Treatment

- Stretching
  - Types:
    - Static stretching: End range hold of muscle tension
    - Dynamic stretching: Movement in/ out of end range muscle tension
    - PNF Stretching: Stretching muscle with co-contraction of muscle group - alternating
- Duration (Konrad 2016)
  - Shorter duration – 60-120 seconds = change in muscle tissue
  - Longer duration – 10+ minutes = change in tendon properties
- Torticollis:
  - Program = duration 90 seconds x 6-9 times per day
  - Higher frequency = greater improvement (He 2017)



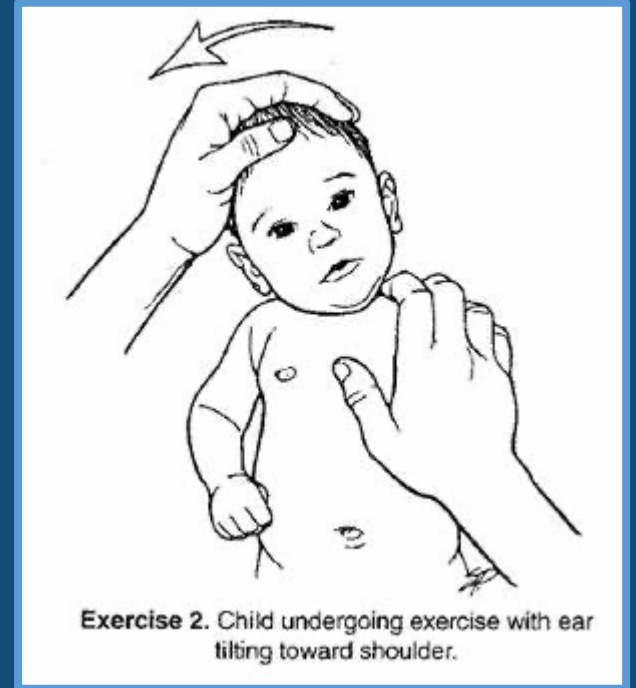
# Torticollis Treatment

- Stretching
  - Rotation – Rotate towards the tilted side
    - Shoulder alignment is important
    - “Chin over shoulder” goal in supine is goal
    - Rotating to the left will elongate the left SCM



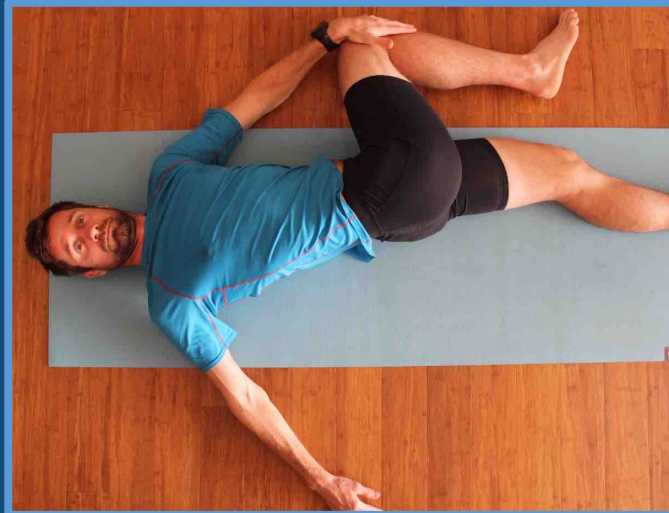
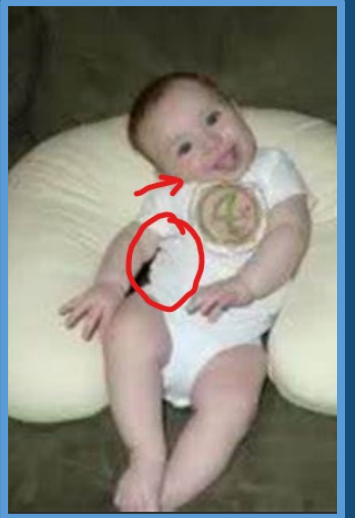
# Torticollis Treatment

- Stretching
  - Lateral Sidebend – Rotate towards the tilted side
    - Left ear towards left shoulder will stretch right SCM



# Torticollis Treatment

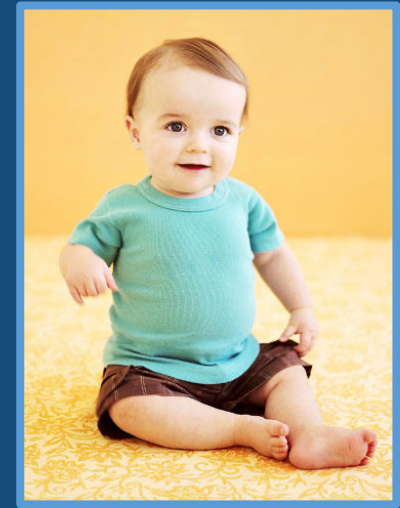
- Torso alignment / stretching
  - Rotational movements aid in lateral sidebend stretching
  - In the lumbar spine, rotation occurs opposite of sidebending
    - Left lateral rotation = right sidebend





# Torticollis Treatment

- Strengthening
  - Head Righting





# Torticollis Treatment

- Functional Movement Patterns
  - Focus on symmetry



# Torticollis Treatment

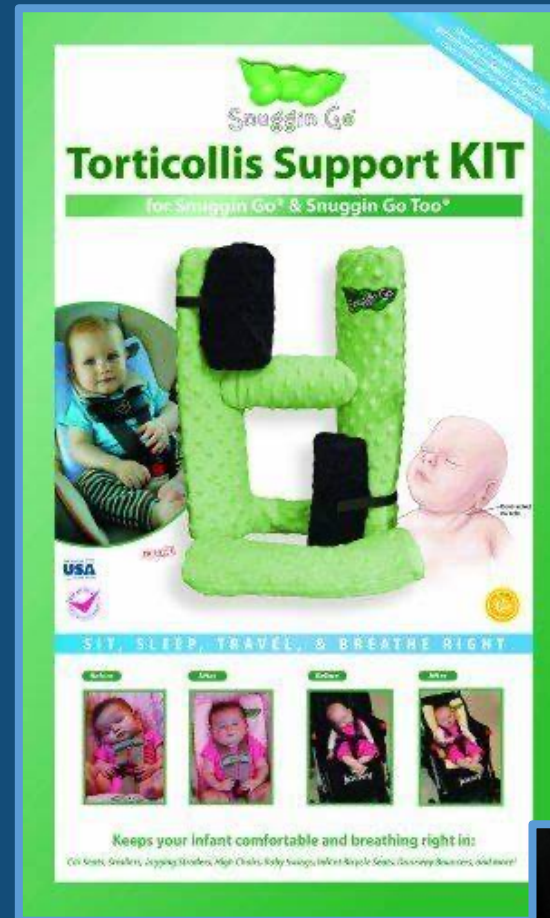
- Taping (Ohman, 2015)
  - Significant effect when placed on effected side.





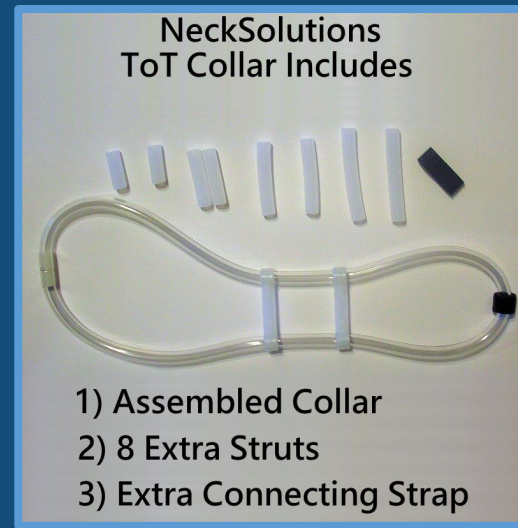
# Torticollis Treatment

- Positioning Devices



# Torticollis Treatment

- Collars
  - TOT & Custom Fabricated (SCH)





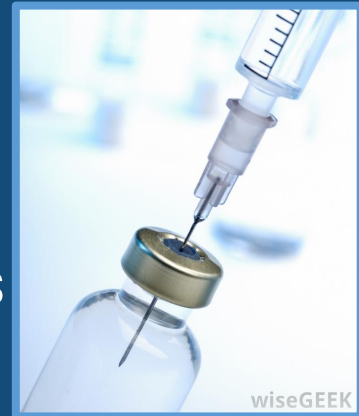
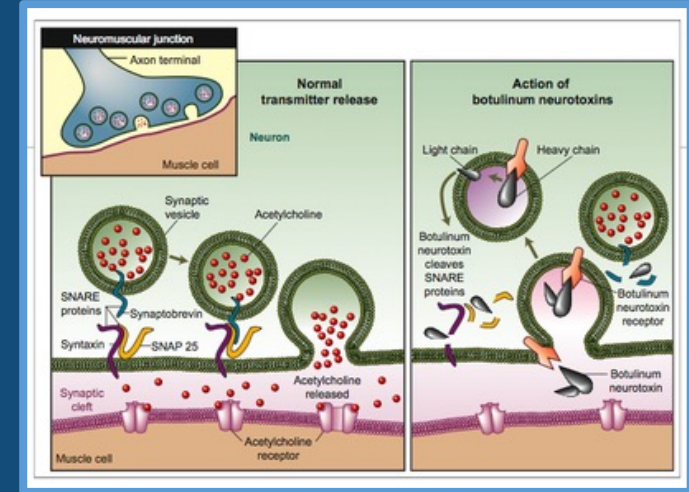
# Torticollis Treatment



- Frequency-Specific Microcurrent
  - Most often applied with a moistened towel or with skin patches
  - Microcurrent is an extremely mild electrical current (one millionth of an ampere)
  - Increases the production of the substance ATP in muscles – softens
- Evidence supports microcurrent for treatment of torticollis (Heidenreich 2018) (Kwon 2014)
- Case study 19 month old (Thompson 2019)
  - Grade 8 torticollis –with fibrotic nodules
  - Ten weeks of physical therapy provided stretching, strengthening, massage, and parent education.
  - Added FSM in weeks 3 to 10
  - “Partial Home Program adherence”
  - Results = Full range of motion, improved midline, no nodules.

# Torticollis Treatment

- Botulinum Toxin
  - Induces fibroblasts in mRNA & protein levels (Jiang B 2018)
    - Promising agent against SCM fibrosis
      - Regulates fibroblasts
      - Inhibits myofibroblast differentiation
  - Acts selectively on peripheral cholinergic nerve endings inhibiting acetylcholine release at the neuromuscular junction.
  - Interrupts the synaptic activity only temporarily – original synapses regenerate and then acetylcholine can be released normally





# Torticollis Treatment

## Surgery

### Indications (Sonmez)

- Patients who pathology does not resolve after 12 months
- Patients who develop facial asymmetry

### Inferior Z-plasty (Ekici 2014)

- Older children with CMT (10 years mean age)
  - Includes post operative protocol of collar, exercises
  - Good clinical and functional results

### Bipolar Release (Seyhan)

- Older children with CMT (>5 years of age)
  - Marked improvement in motion and head tilt



# Plagiocephaly vs Craniosynostosis

## A Case Study

An 8 month old comes to clinic with his parents for head shape evaluation. He was a 32 wk preemie but has been healthy. When asked why they are here, parents say “we know he has a preemie head but is there something else? My regular doctor was on maternity leave and the person covering sent us here. Does he need surgery?!”



# Head Shape Evaluations: THE CRUX OF THE CHALLENGE

## ABNORMAL HEAD SHAPE



### Deformational (plagiocephaly):

An extrinsic force is molding the skull or  
a Normal Variant



Physical Therapy  
+/- Helmet



### Craniosynostosis:

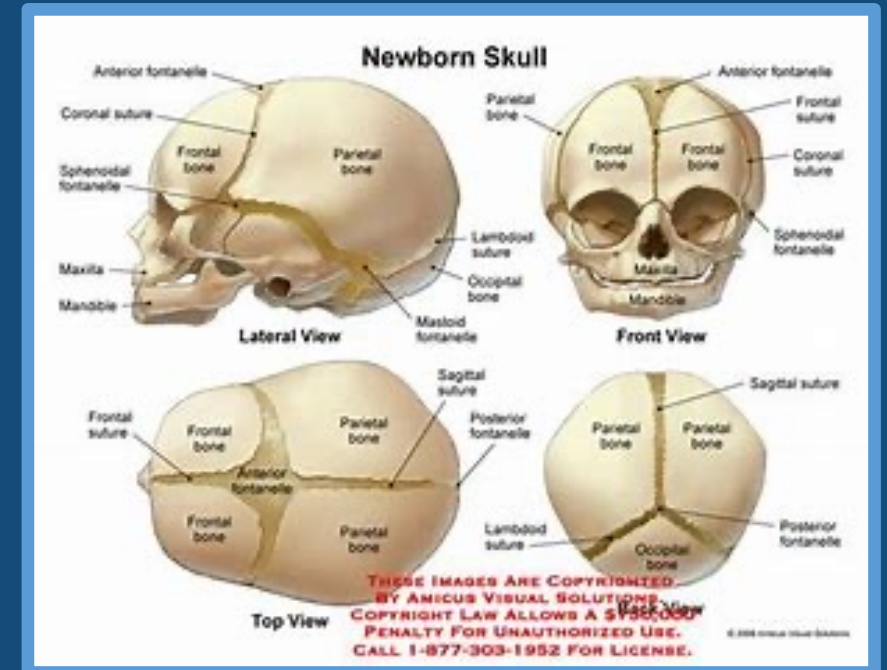
Premature closure of the growth plates with  
potential to cause increased cranial pressure



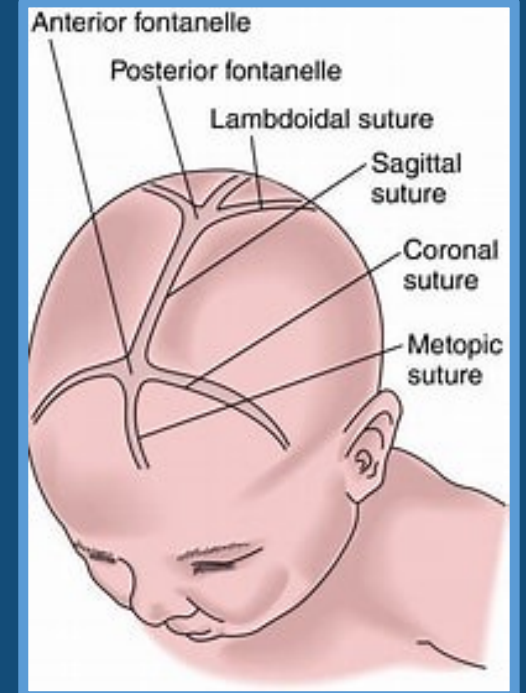
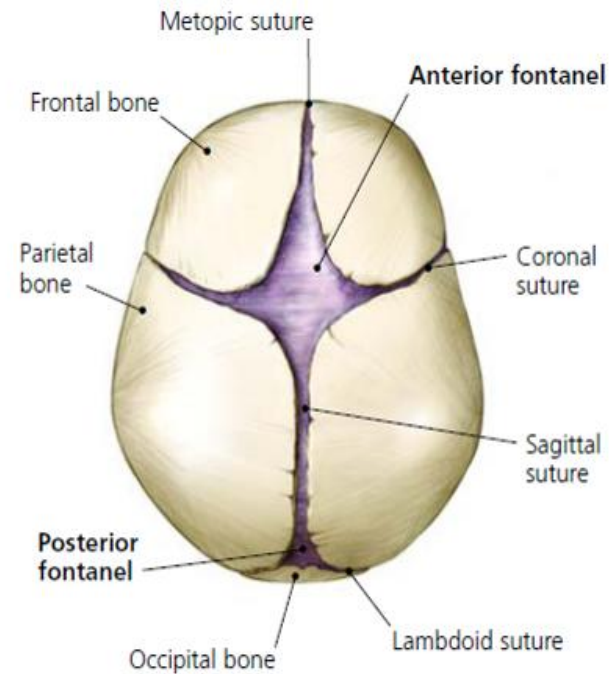
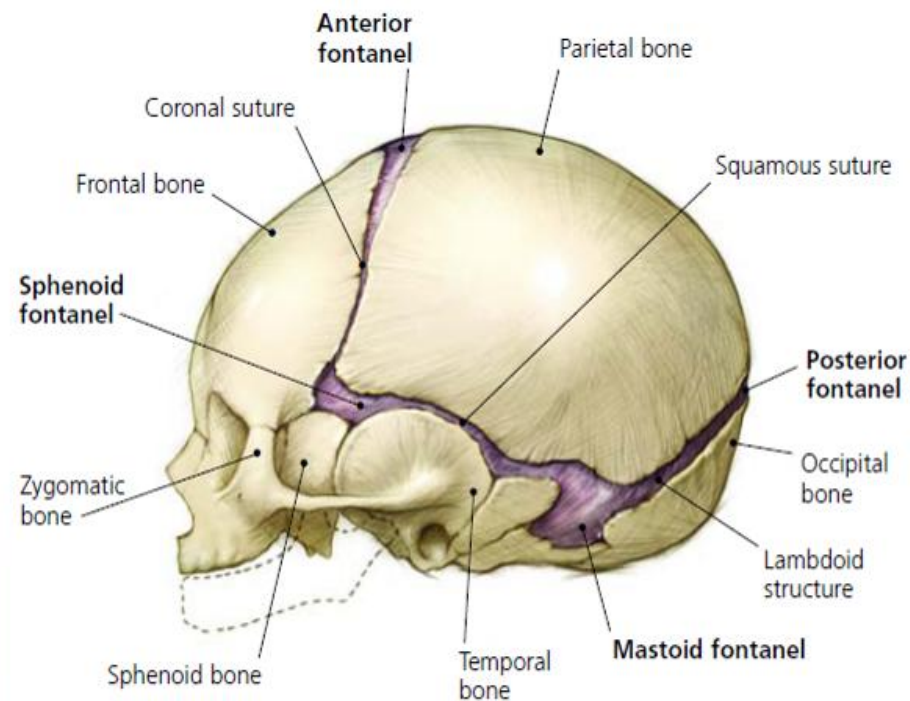
Referral to tertiary care center.  
Surgery

# Craniosynostosis

- Incidence 1:2500 liveborn
- 85% nonsyndromic (majority single suture synostosis)
- Sagittal > Coronal > Metopic > Lambdoid
- ~ 25% increased intracranial pressure
- 10-30% learning disability
- 6-10% familial



# Anatomy Review



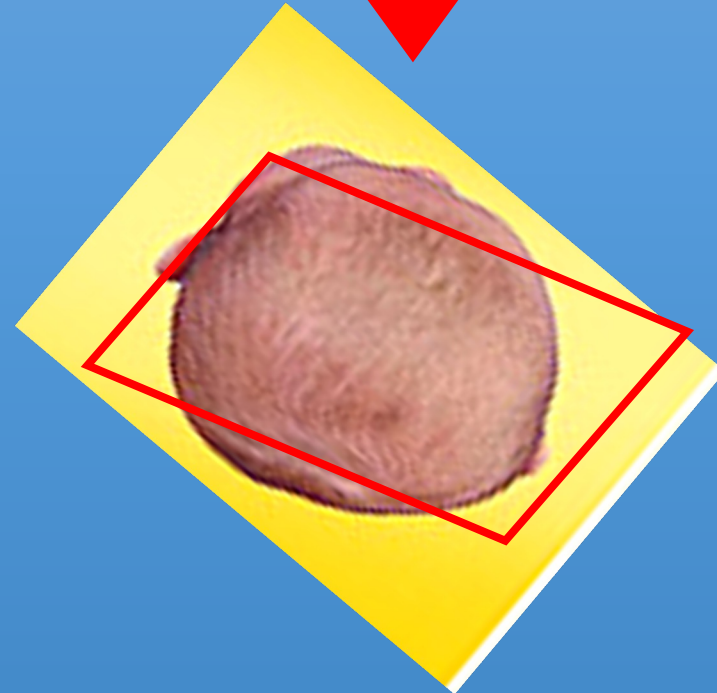
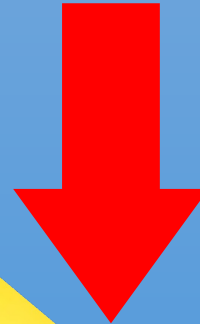


# “Back to Sleep”

Effect of gravity - Brachycephaly

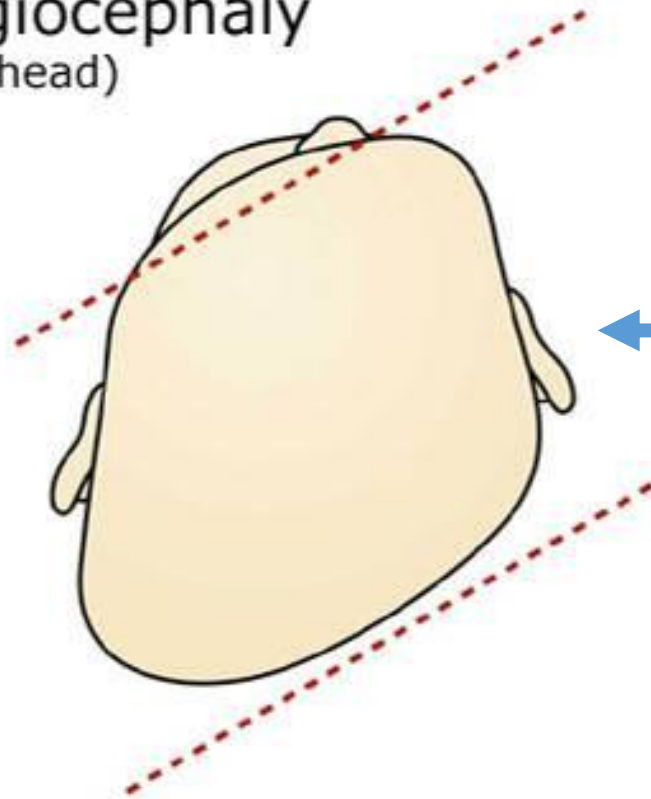
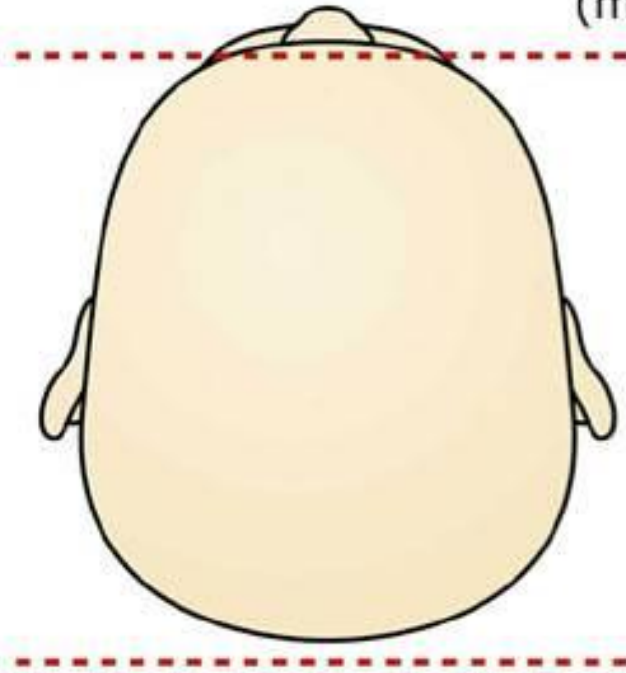


Effect of gravity (with torticollis)



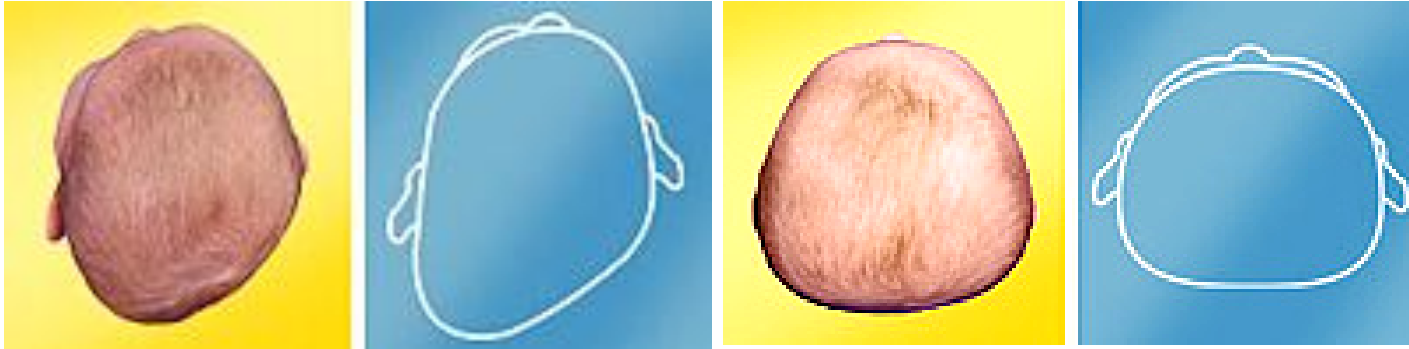


## Sample of Plagiocephaly (misshapen head)



This presentation would likely be left sternocleidomastoid involvement and would have left lateral tilt with right rotation

# Positional Plagiocephaly / Brachycephaly



Treatment of torticollis and positioning off back of head often improve head shape. Helmet therapy can be started at 6 months if desired.



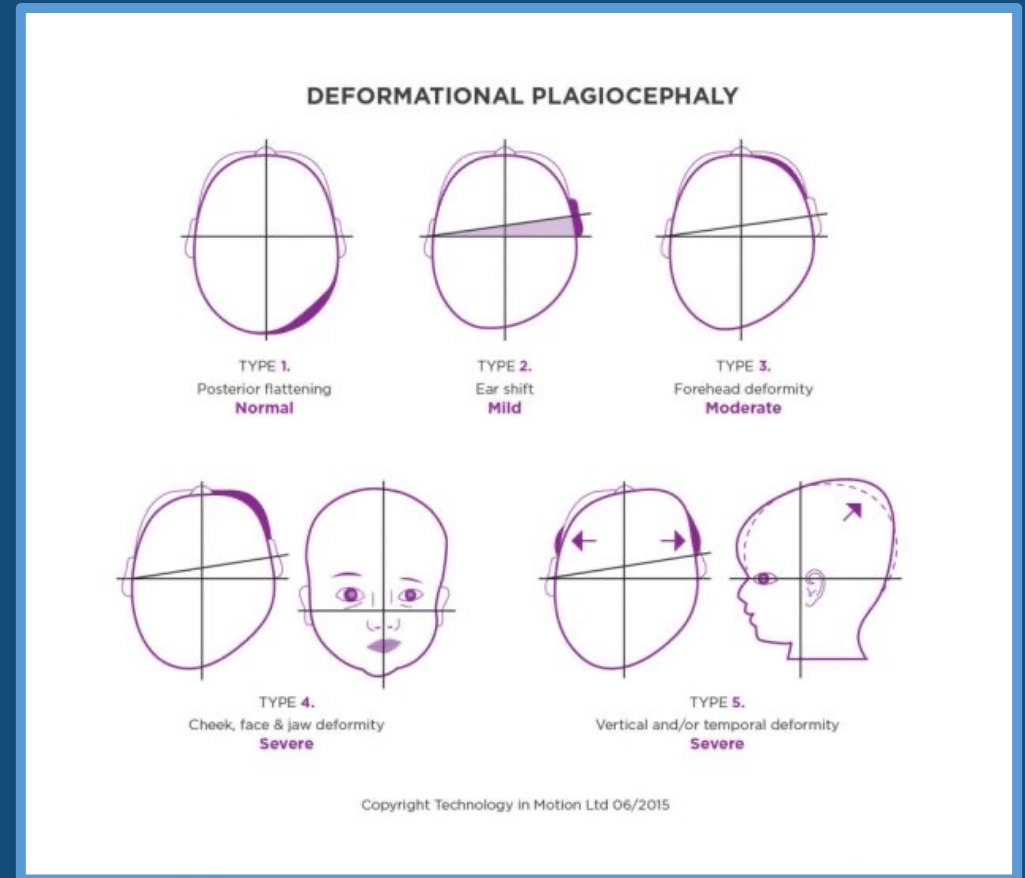
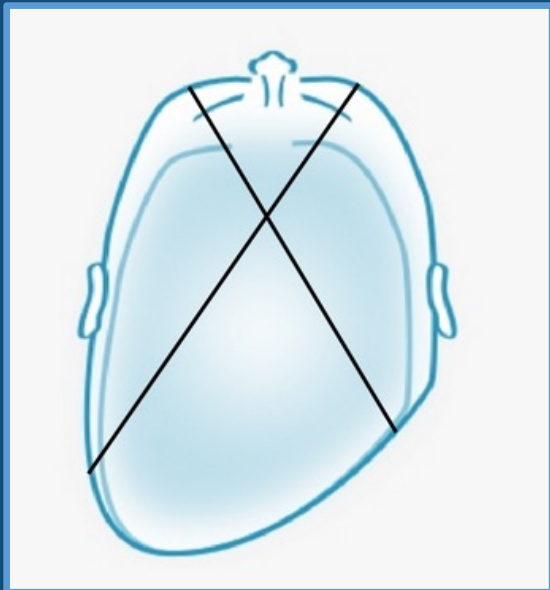
## Treatments

Physical Therapy  
Helmeting

# Measuring Plagiocephaly

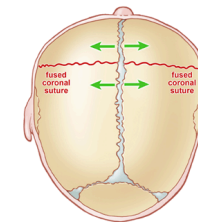
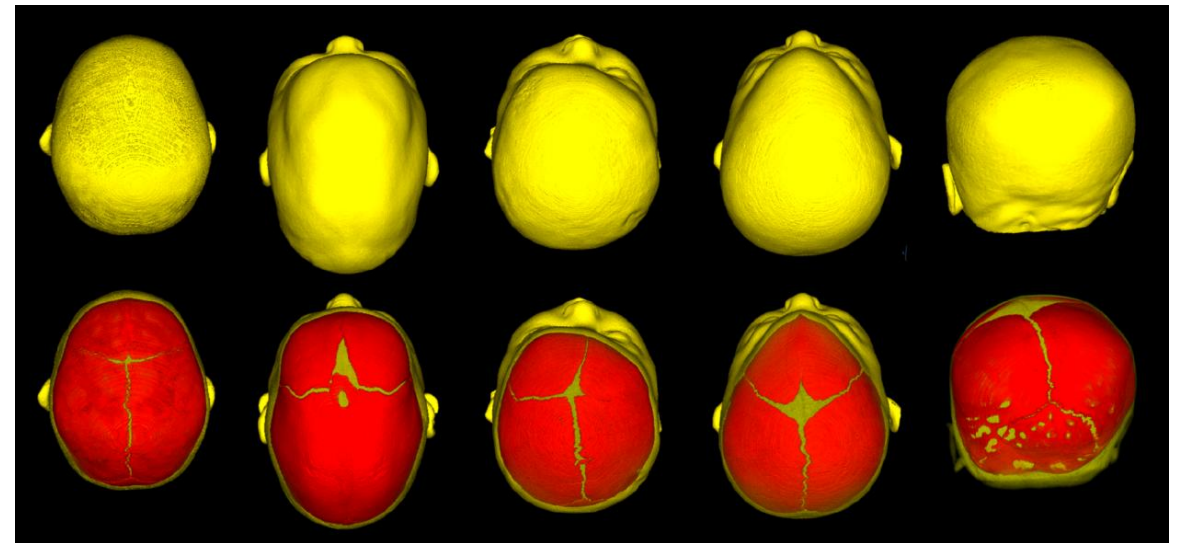
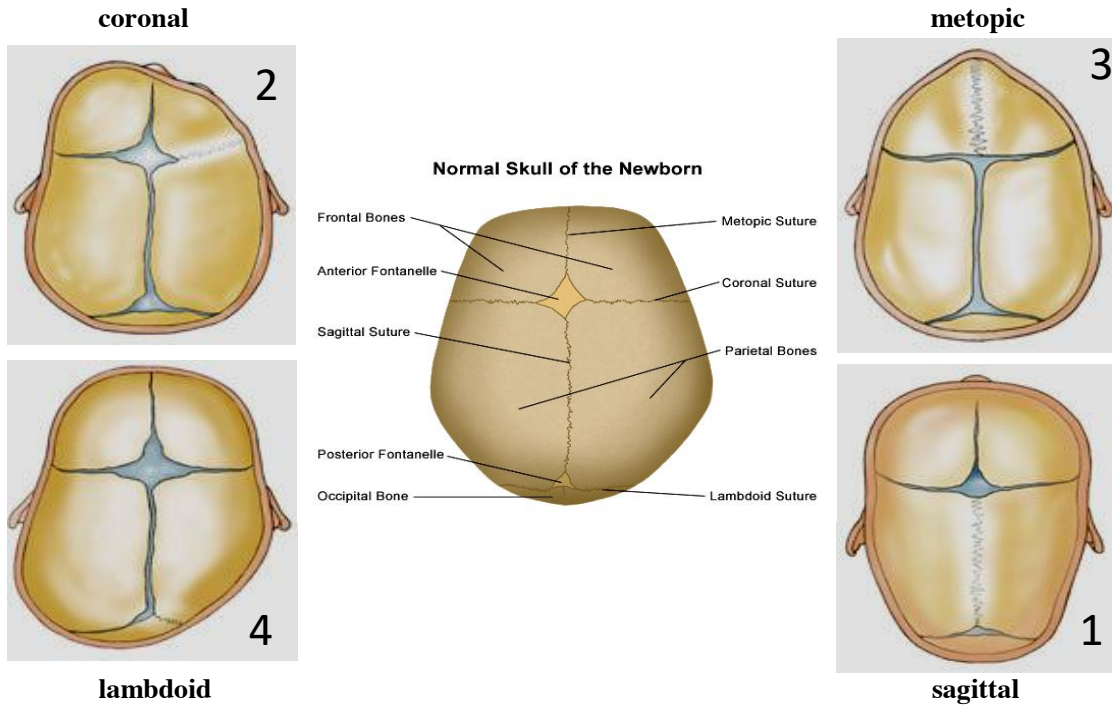
## Craniometer Used By Clinicians

- 0-6mm = Normal / Negligible. Mild Plagiocephaly
- 6 to 12mm = Moderate Plagiocephaly
- 12-18mm = Severe Plagiocephaly
- 18mm+ = Significant Plagiocephaly



# Craniosynostosis

Sagittal > Coronal > Metopic > Lambdoid



[http://www.ohsu.edu/xd/health/services/doernbecher/programs-services/images/brachycephaly\\_2.gif](http://www.ohsu.edu/xd/health/services/doernbecher/programs-services/images/brachycephaly_2.gif)



# Sagittal Craniosynostosis

## Clinical Characteristics

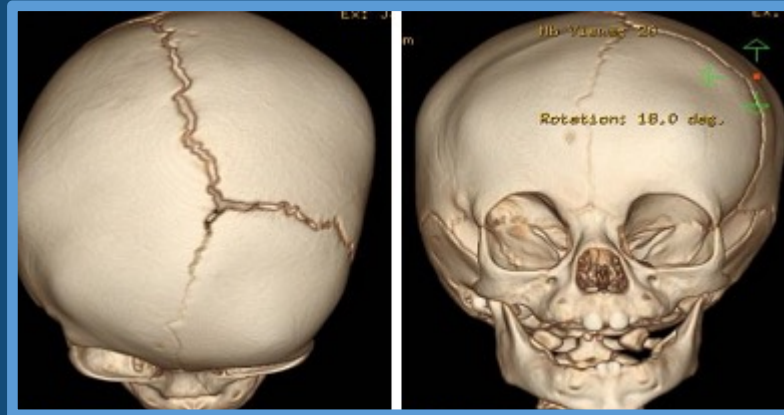
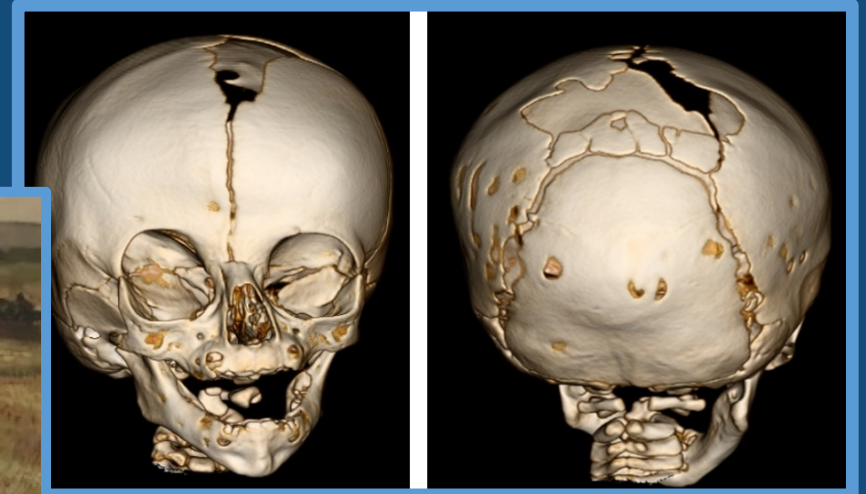
- Scaphocephaly
  - Long, narrow, “boat-like”
- Narrow occiput
- Prominent forehead
- Ridge over the sagittal suture



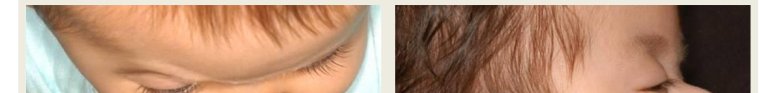
# Unilateral Coronal Craniosynostosis

## Clinical Characteristics

- Frontal Asymmetry
  - Flat forehead on affected side
  - Bulging forehead on contralateral side
- Harlequin eye deformity
- Nasal root deviation
- Facial “twist
- 1:10,000
- 1 Male: 2.5 Female
- Recurrence 5%



## Unilateral coronal craniosy



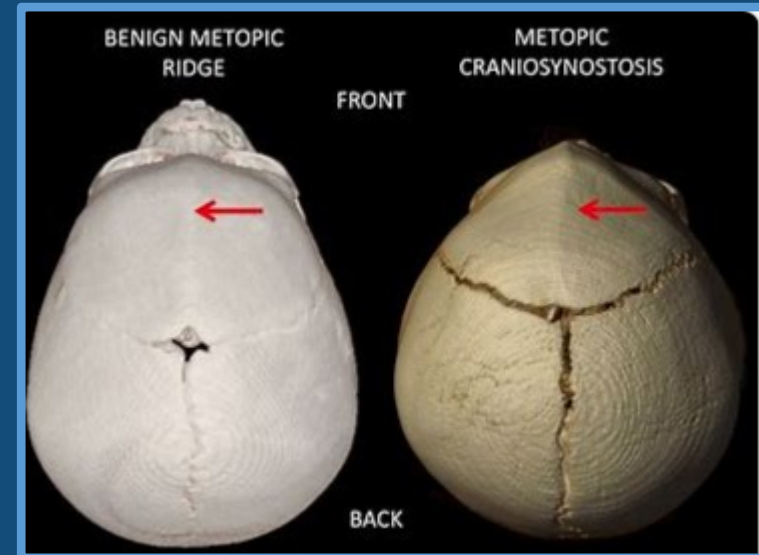
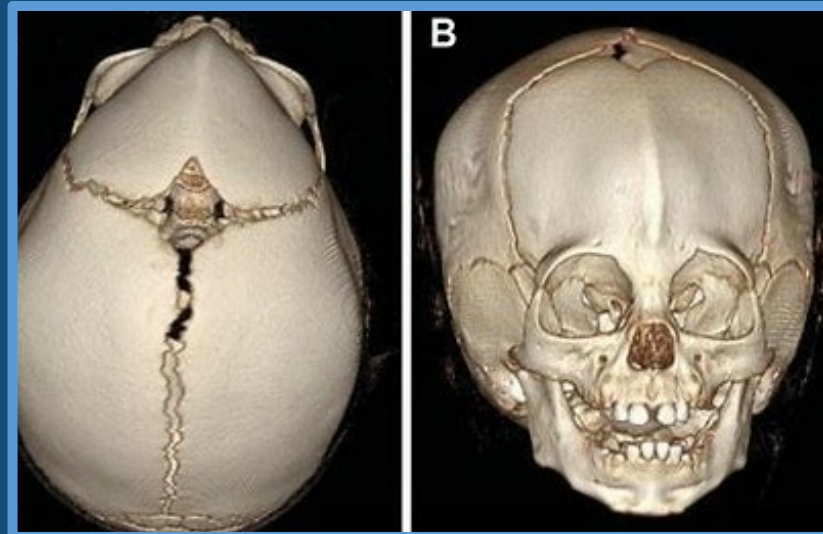
# Metopic Craniosynostosis

## Clinical Characteristics

- Trigonencephaly
- “Keel” appearance of forehead
- Pseudohypotelorism
- Biparietal widening
- Ridge over metopic suture

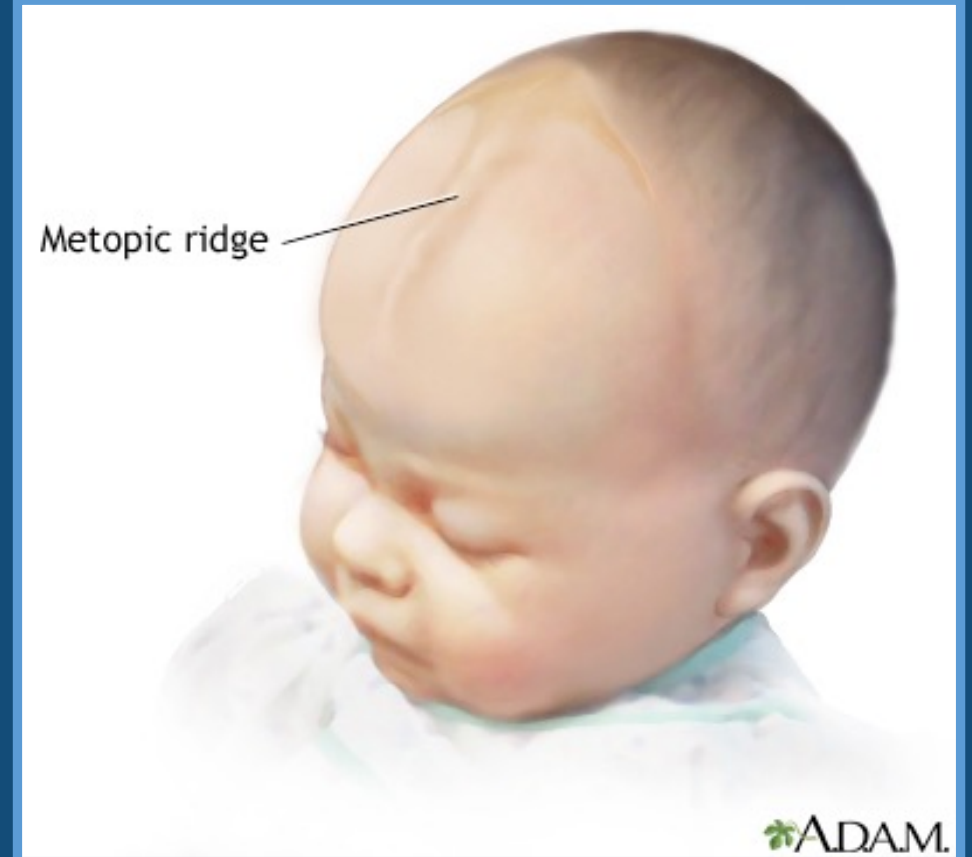
## Physiologic Closure

\* 2-24 months





# Metopic Ridge

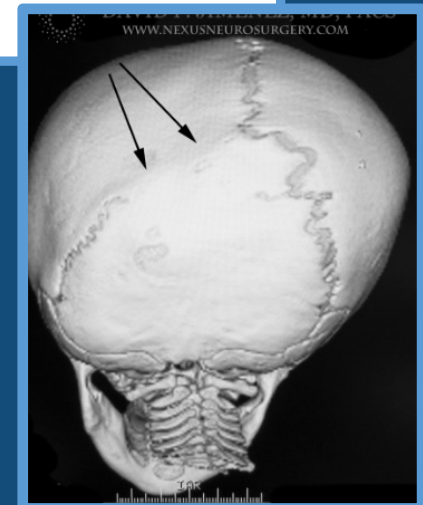
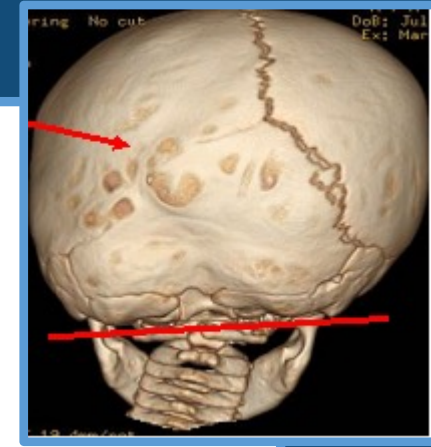
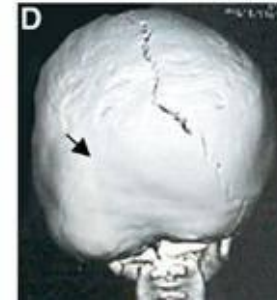




# Lambdoid Craniosynostosis

## Clinical Characteristics

- Posterior skull asymmetry
- NOT DEFORMATIONAL
- Trapezoid head shape
- Mastoid bulge
- Ear height asymmetry
- Skull base tilt
  - Can affect mandible.



# Key Points

- For torticollis or concern with head shape, refer early!  
(Physical therapy almost always indicated)
- Distinguishing Plagiocephaly vs Craniosynostosis
- Particularly important distinctions:
  - Plagiocephaly vs. Lamboid Craniosynostosis
  - Metopic Ridge vs. Metopic Craniosynostosis
  - “Preemie” Head Shape vs. Scaphycephaly
- Timing and process for referral for evaluation and treatment:  
Where and when

# Treatment / Referrals?

- Seattle Children's:
  - Craniofacial Clinic if concerned – 206-987-2208 (Darcy King, ARNP)
- Chiropractic Care
  - OMT – Dr. Abresch - 360-428-2500
  - Depends on practitioner
  - Developmental concerns / muscular asymmetries?
  - Assess vision (ocular) and other developmental parameters?
- Craniosacral
  - Depends on practitioner
  - Developmental concerns / muscular asymmetries (whole body)?
  - Assess vision (ocular) and other developmental parameters?

# Treatment / Referrals?

- Helmets
  - Cascade Orthotics & Prosthetics: 800-848-7332 (Larry Praise, CPO)
  - Will need to work with PT. Insurance coverage after “conservative management.”
  - Referral for first assessment at 4.5 mo. / second 6 mo.
- Physical Therapy
  - Need PT with additional training and education
  - Not all PT's are the same (even pediatric)
  - Valley Kids Therapy (Jenna): 360-336-3432
  - Children's Therapy: 360-814-2699





# Questions?

