



Orthopedic Anatomy

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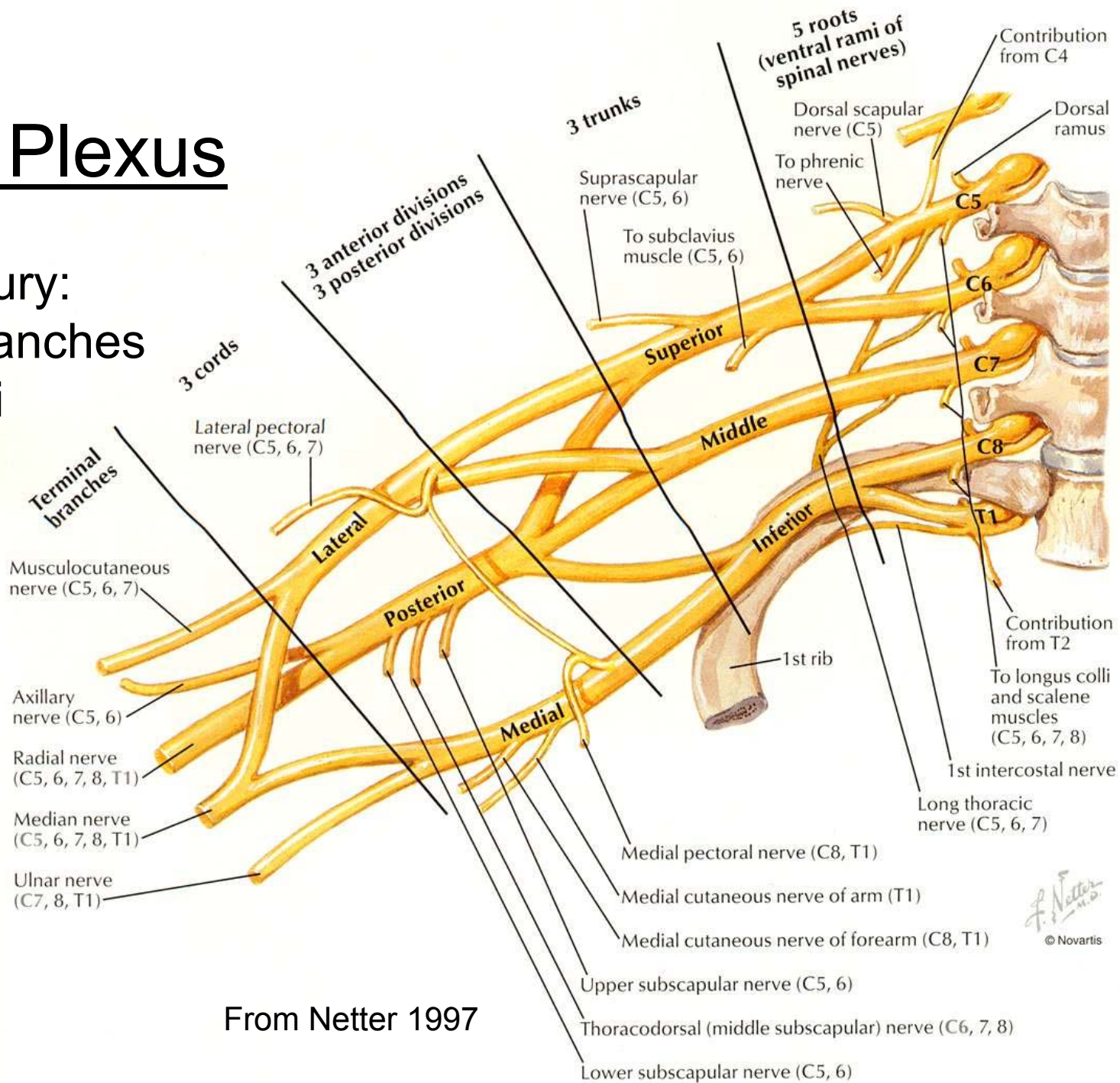


Brachial Plexus

Traumatic injury:

- Terminal branches
- Ventral rami

brachial plexus injuries



From Netter 1997

Upper Brachial Plexus Injuries

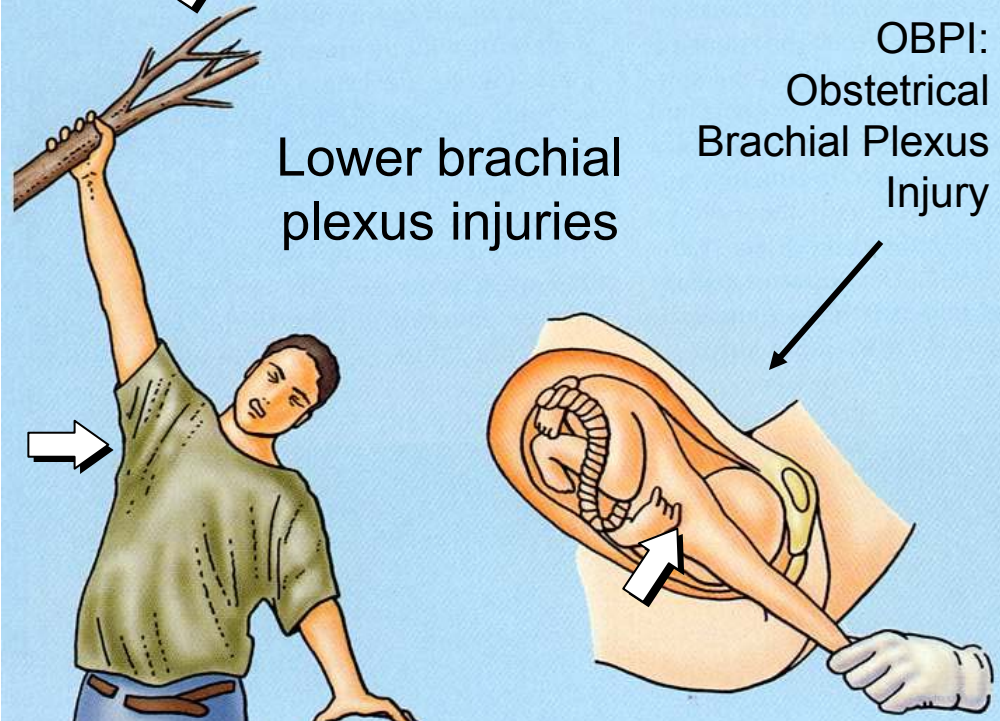
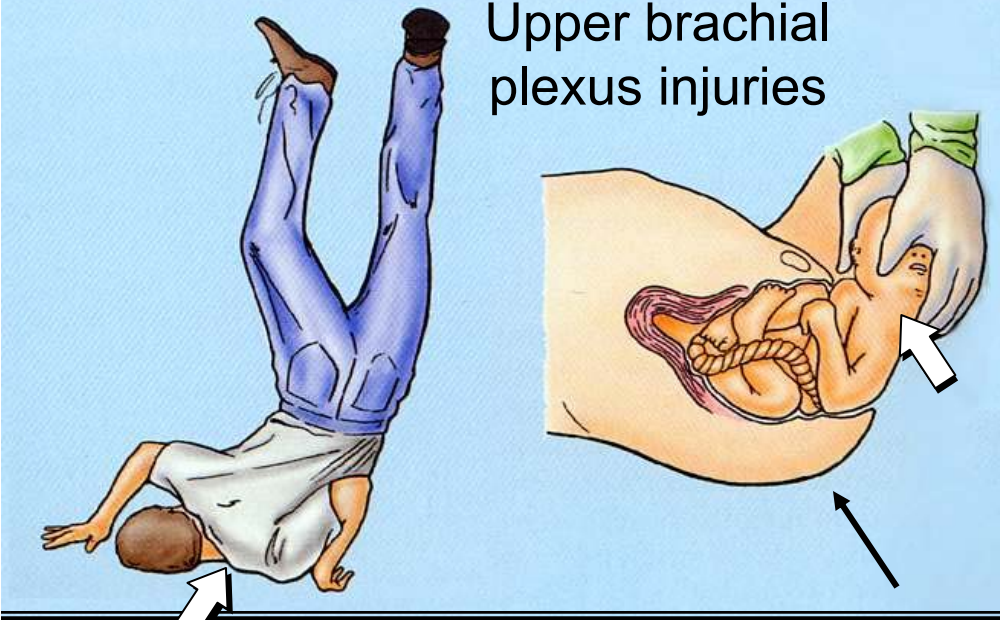
- Increase in angle between neck & shoulder
- Traction (stretching or avulsion) of upper ventral rami (e.g., C5,C6)
- Produces Erb's Palsy

Lower Brachial Plexus Injuries

- Excessive upward pull of limb
- Traction (stretching or avulsion) of lower ventral rami (e.g., C8, T1)
- Produces Klumpke's Palsy

"Obstetrical" or "Birth palsy"

- Becoming increasingly rare
- Categorized on basis of damage
 - Upper (C5,6), Erb's: 60-90%
 - All (C5-T1), both palsies: 10%
 - Lower (C8, T1), Klumpke's Palsy 1-5%



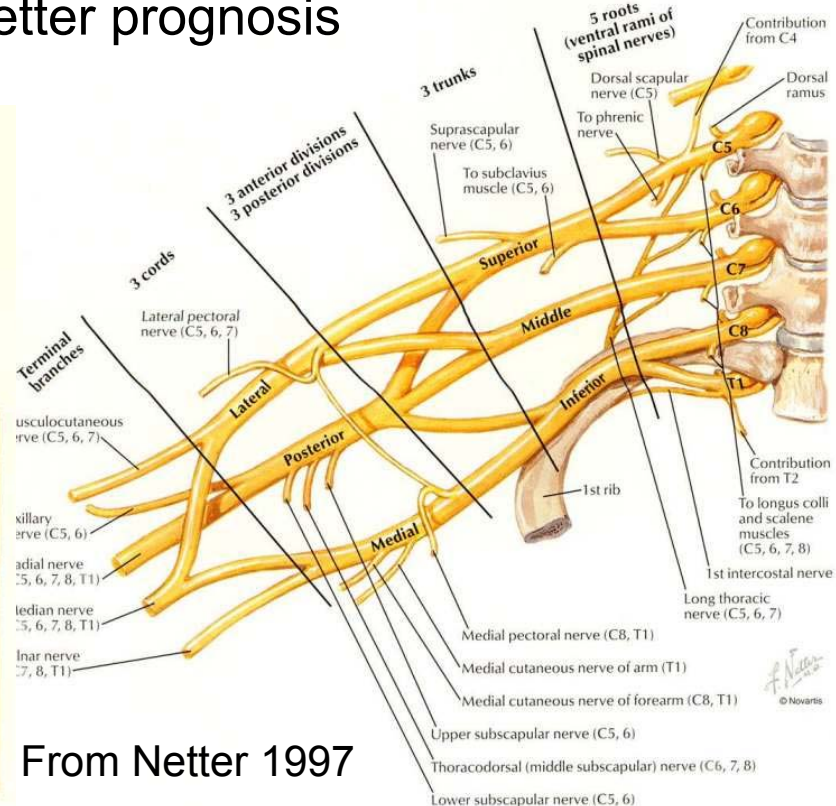
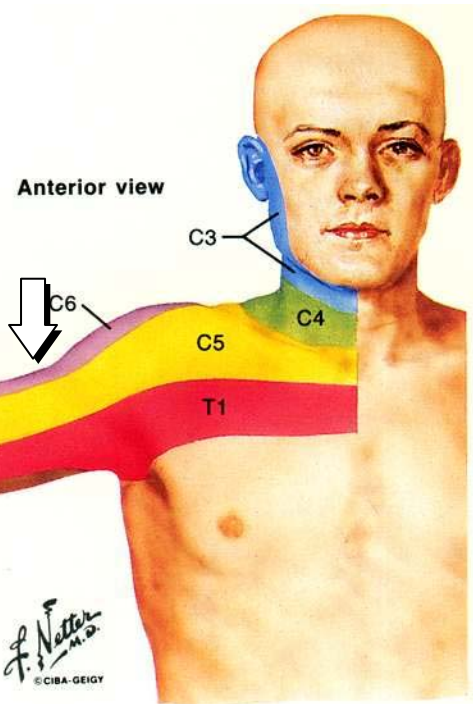
From Moore & Dalley (1999)

Upper Brachial Plexus Injury: Erb's Palsy



- Appearance: drooping, wasted shoulder; pronated and extended limb hangs limply (“waiter’s tip palsy”)
- Loss of innervation to abductors, flexors, & medial rotators of shoulder and flexors & supinators of elbow
- Loss of sensation to lateral aspect of upper extremity
- More common; better prognosis

From Bayne & Costas (1990)



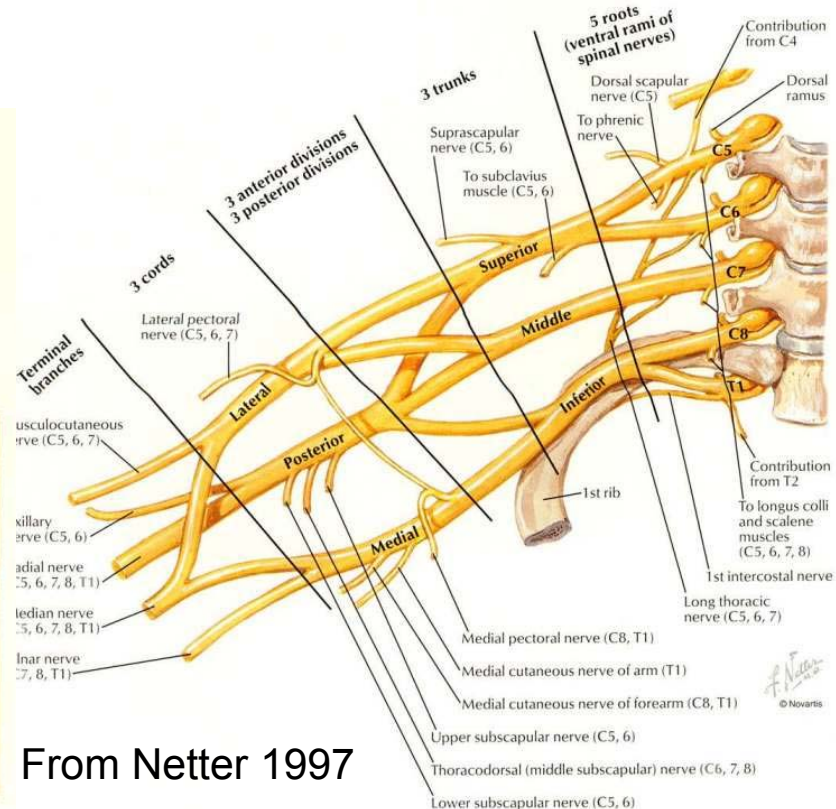
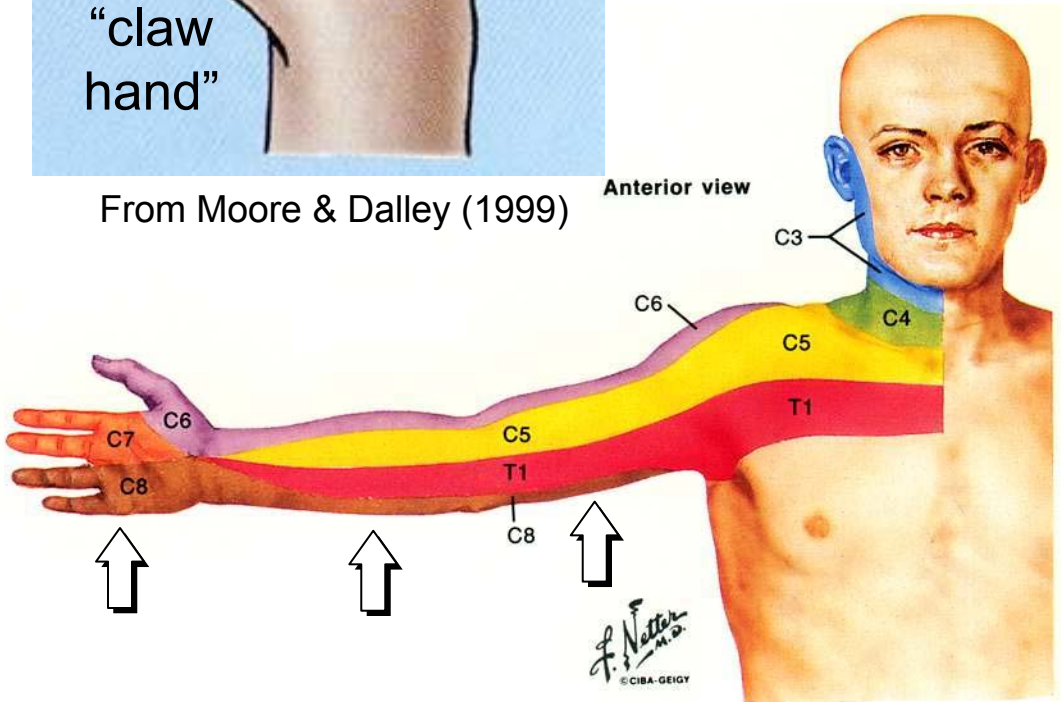
From Netter 1997

Lower Brachial Plexus Injury: Klumpke's Palsy

- Much rarer than UBPIs and Erb's Palsy
- Loss of C8 & T1 results in major motor deficits in the muscles working the hand: "claw hand"
- Loss of sensation to medial aspect of upper extremity
- Sometimes ptosis or full Horner's syndrome
- Much rarer (1%) but much poorer prognosis



From Moore & Dalley (1999)





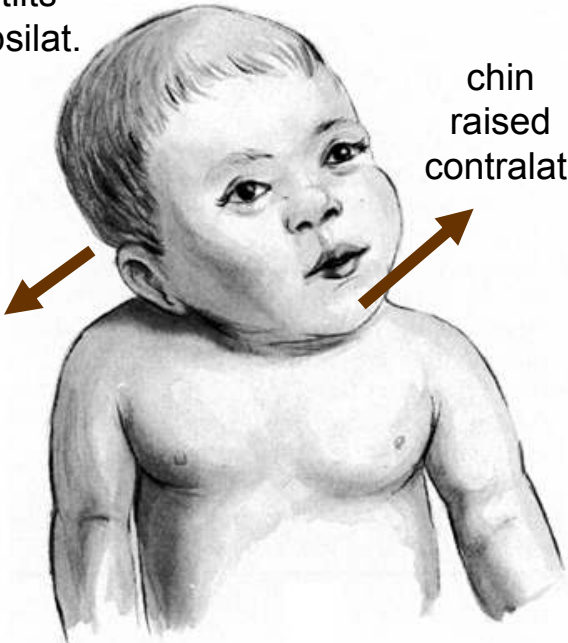
From Moore & Dalley (1999)

Case Presentation

A 5-year-old boy is brought to the pediatrician with the complaint that since early childhood the right side of his neck has been twisted and deformed. Childbirth apparently had been prolonged and difficult and was a breech delivery. Within a few weeks, there was a spindle-shaped swelling on the right side of the neck that was tender on touch and on passive movement of the head. Over the next few months, the swelling and tenderness subsided. By the time the boy was about 1-year-old, the muscle on the right side of the neck appeared cordlike. Gradually the neck became stiff and deformed, as shown at left. The face was also asymmetrical.

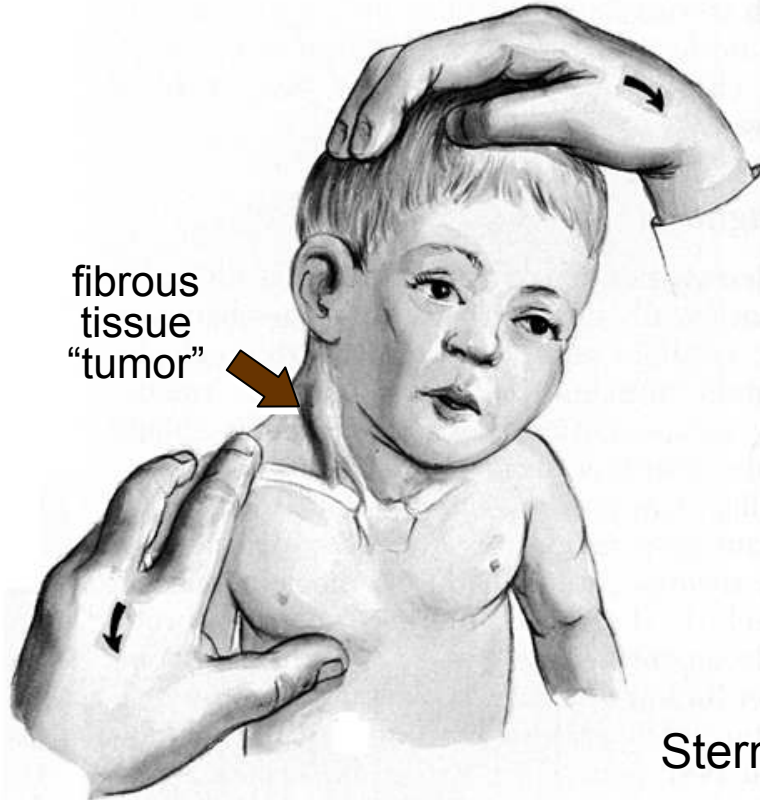
Congenital Muscular Torticollis

head
tilts
ipsilat.



chin
raised
contralat.

fibrous
tissue
"tumor"

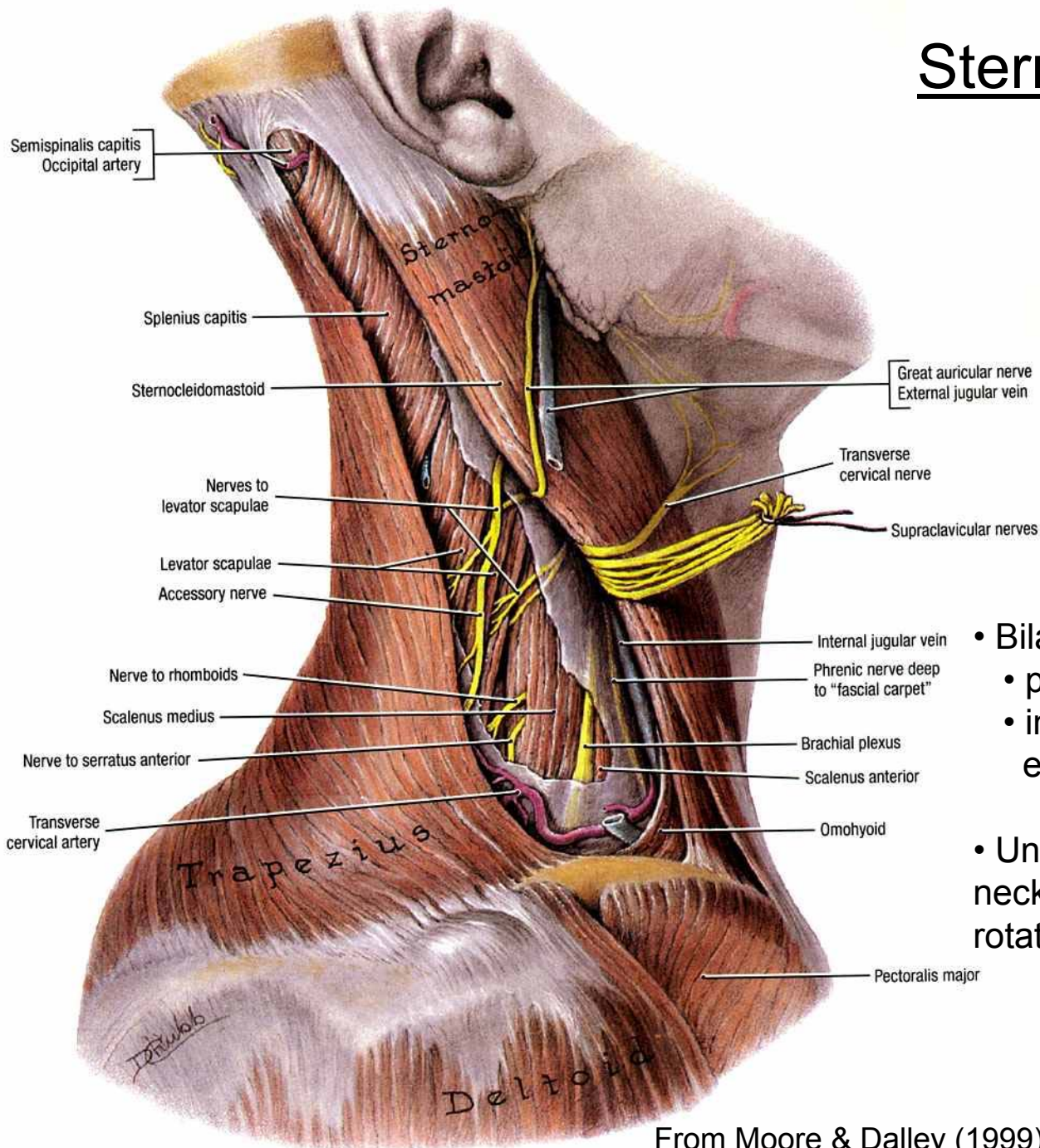


Sternocleidomastoid (SCM)

From Tachdjian (1990)

- Fibromatosis colli that develops in SCM probably prior to birth, although birth trauma (e.g., forceps) has also been implicated
- 75% of cases on right side
- SCM is transformed into a cordlike, nonfunctional muscle, distorting head and neck posture and altering growth of the face
- Etiology is unclear: Arterial or venous obstruction? Intrauterine malposition?

Sternocleidomastoid

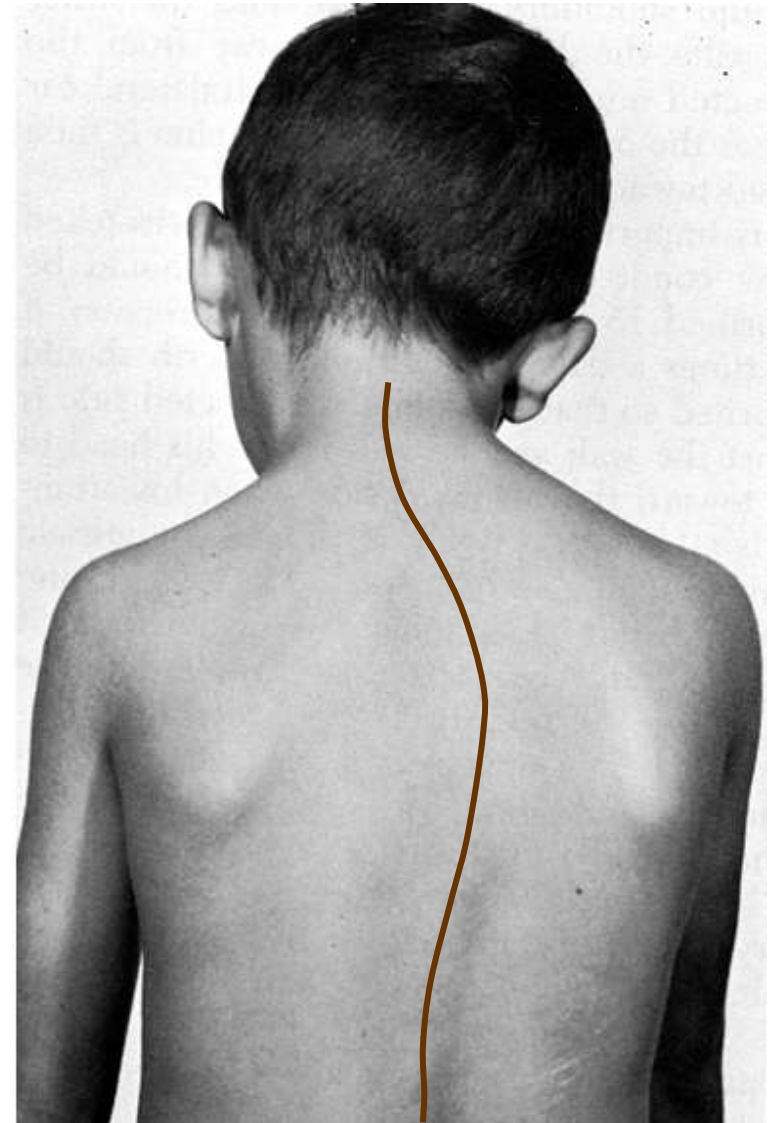
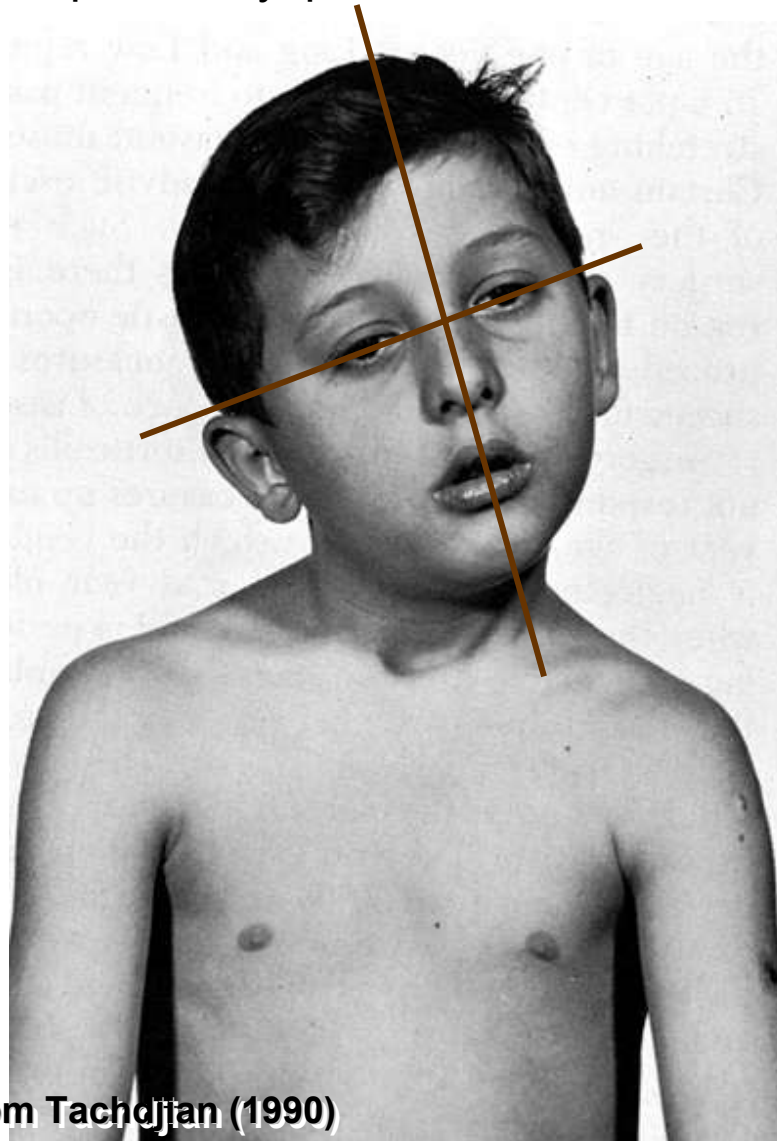


- Attachments: proximally, mastoid proc. & occ. bone; distally, sternum & clavicle
- Innervation: accessory n., C2,3
- Surgical concerns
 - nerves emerging from post. border (esp. accessory n.)
 - jugular veins
 - carotid A. & its branches
- Bilateral contraction: flex the neck
 - pull chin toward sternum
 - in conjunction with neck extension: protrusion of the chin
- Unilateral contraction: ipsilateral neck flexion and contralateral rotation of chin (as in torticollis)

From Moore & Dalley (1999)

Asymmetries Secondary to Congenital Muscular Torticollis

- Ipsilateral shortening and flattening of face; ipsilateral depression of eye & ear
- Contralateral convex scoliosis in lower cervical and upper thoracic regions; compensatory ipsilateral convex scoliosis in middle & lower thoracic regions



“Pulled (Nursemaid’s) Elbow”

- Very common in children under 4 (peak: ages 1–3)
- More in common in boys; more common on left side
- Sudden traction with elbow extended & forearm pronated



presentation

ouch



treatment

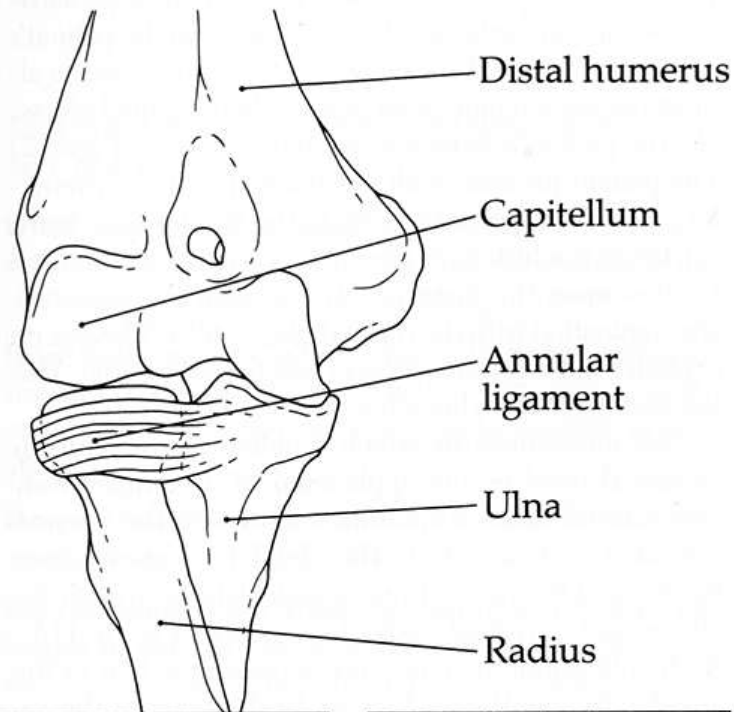


F. Netter
M.D.
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Subluxation of the Radial Head (“pulled elbow”)

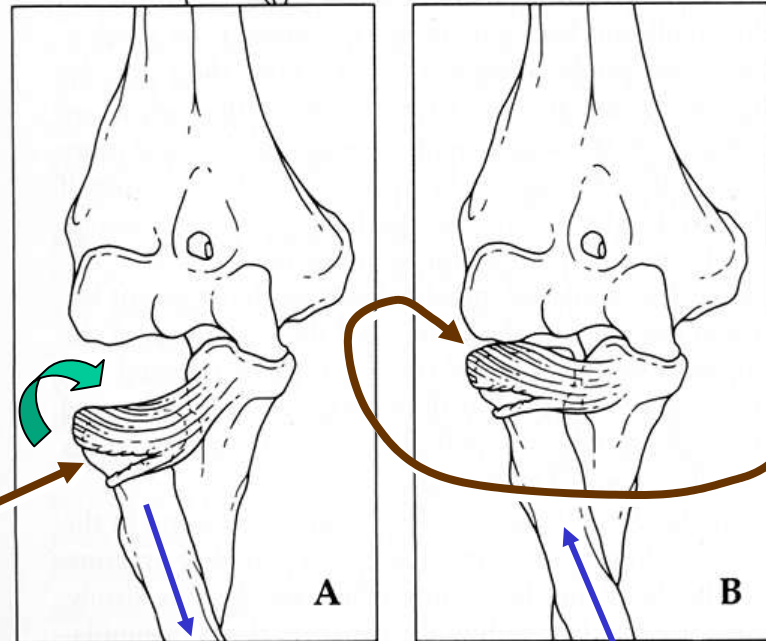
- Annular lig. joins radial head to ulna
- Traction on pronated forearm causes a distal tear in the annular ligament where it merges with the periosteum
- Radial head “escapes” anteriorly
- Annular ligament slides onto articular surface of radial head, between radial head & capitulum

- Above the age of five, tear does not occur because of thicker attachment of annular ligament to periosteum



ann. lig. slides proximally

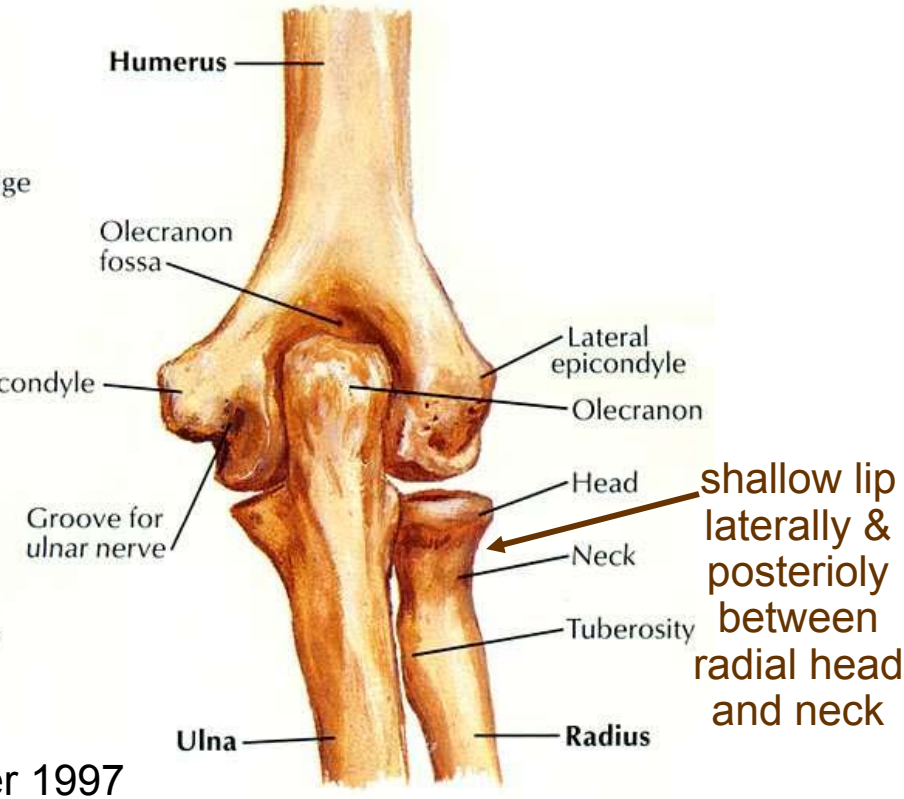
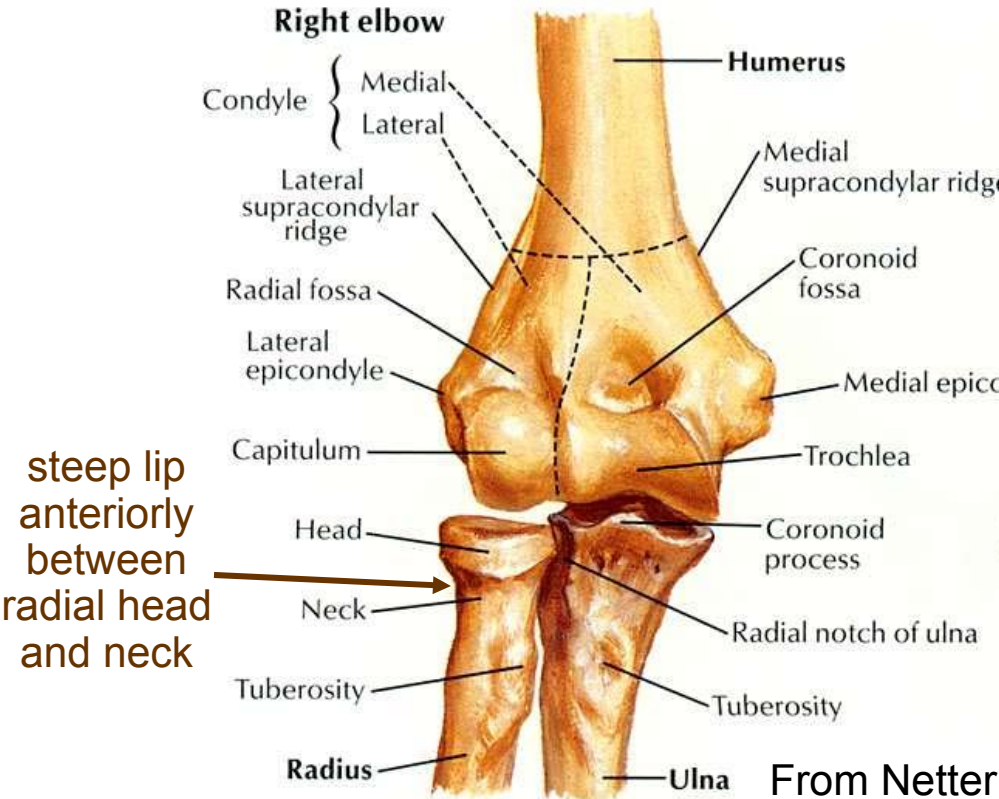
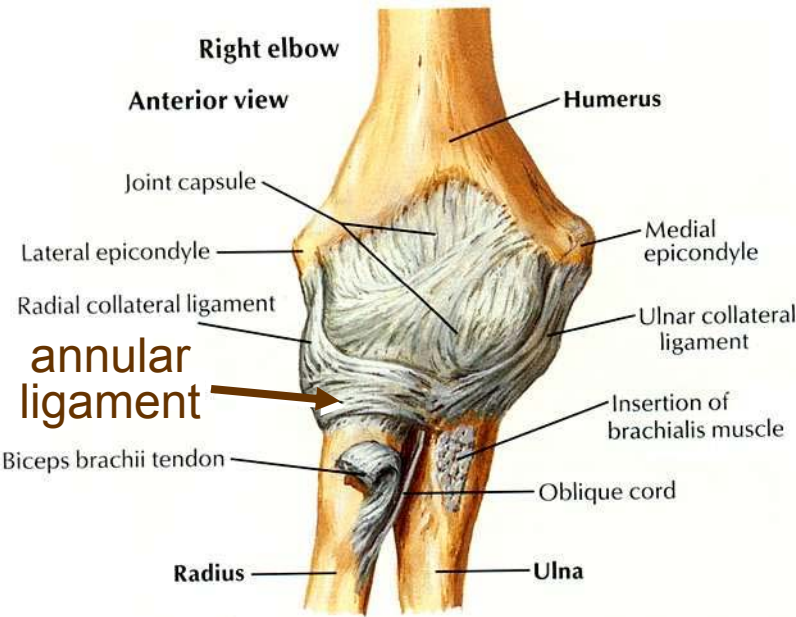
distal tear



entrapment of ann. lig. between capitulum & radial head

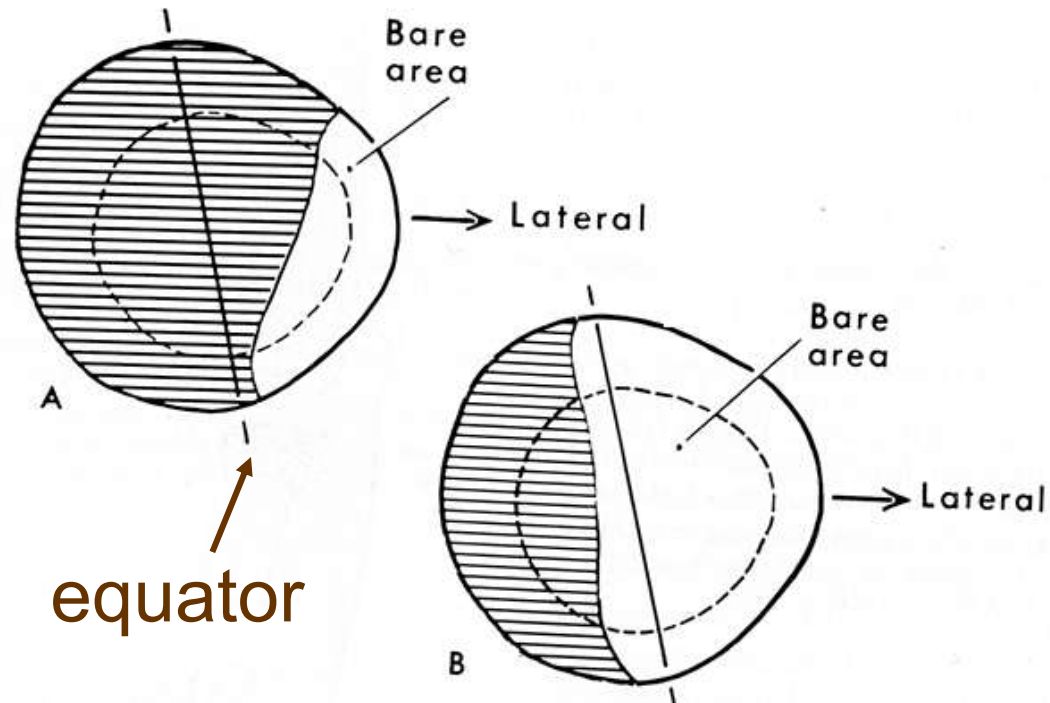
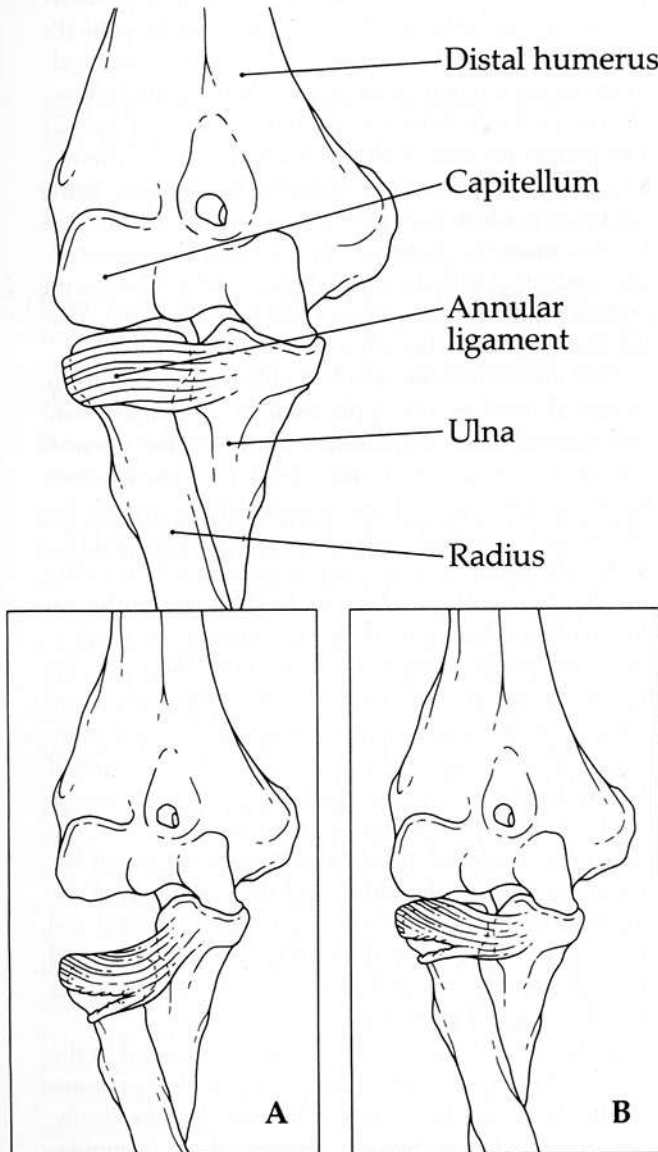
Why Subluxation in Pronation?

- Annular ligament restrains radial head, while allowing axial rotation of the radius
- Steep & sharp lip anteriorly between radial head & neck—in supination, annular ligament cannot slip proximally over lip
- Shallower lip laterally and posteriorly
- During pronation, rotation of radius brings this shallow lip anteriorly, allowing proximal slip of ann. lig. if there is a transverse tear



Interposition of the Annular Ligament

- Extent of interposition of the annular ligament within the joint determines course
- If ligament does *not* extend beyond “equator” of radial head (B below), subluxation can be reduced by closed manipulation (passive supination)
- If ligament extends beyond equator (A below), open (surgical) reduction may be required



From Slaby et al. 1994

From Salter & Zalta 1971

References

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Web

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- United Brachial Plexus Network: <http://www.ubpn.org/awareness/>
- Brachial Plexus Injuries in the Newborn: <http://www.neonatology.org/syllabus/bpp.html>
- Brachial Plexus Palsy Center of St. Louis: <http://brachialplexus.wustl.edu/>
- Nursemaid's Elbow / Radial Head Subluxation: <http://www.ortho-u.net/o2/183.htm>