

One Set Each: Protecting the Wrist and Ankle



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Outline

- ❧ Anatomy of the Ankle 
- ❧ Biomechanics
- ❧ Diagnosis/Injuries
- ❧ Rehab pearls
- ❧ Anatomy of the Wrist
- ❧ Relation to Elbow and shoulder health
- ❧ Diagnosis/Injuries
- ❧ Rehab Pearls

Did you know....Injury Summary

- ☞ Most common injuries misdiagnosed by PrimCare:
 - ☞ Shin pain = shin splints 
 - ☞ Really post tib tend
 - ☞ Knee pain = patellar tend/ jumpers knee
 - ☞ Really is osgoods, bipartite patella, chondromalacia, patellar malalign/subluxing/dislocating
 - ☞ Back pain = repetitive stress
 - ☞ Really is spondy, misdiag on false neg xray film
 - ☞ Elbow = insertional tricep tendinitis
 - ☞ Really is panners/OCD, you just see S&S of compensation
 - ☞ Wrist = jamming carpals
 - ☞ Really is TFCC

Breakout!



- ∞ Stand- flex your foot... how far does it go?
- ∞ Lunge- what does it look like?
- ∞ Next.....

Cont.



- ❧ NOW- correct your lunge
 - ❧ straight feet
 - ❧ Heels flat

- ❧ And... try to bend the back knee..?


- ❧ Next...why?

Cont..



- ❧ Straight feet pulls at the achilles and calf more
- ❧ Turned out hip (external rotation) and everted foot, places less total stress on the ankle, achilles calf muscles, plantar portion of the foot, and more
- ❧ IF you land short, in more motion than you have... beware...of the tear!

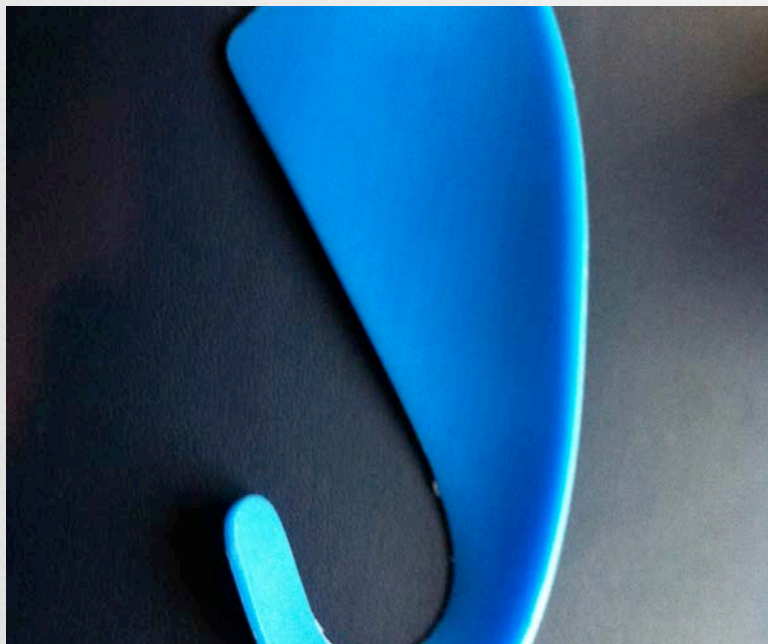
Prevention: Wrist

- ❧ Common gymnastics related injuries:
 - ❧ TFCC tear A diagram showing a horizontal line with three interlocking circles in the center, representing a tear in the triangular fibrocartilage complex (TFCC).
 - ❧ DRUJ injury
 - ❧ Hypermobility of the carpals
 - ❧ Forearm “splits” (ulna), pulling away of muscles from the longitudinal periosteal tissue of the ulna
- ❧ Prevention
 - ❧ Flexibility – elbow straight and elbow bent
 - ❧ Strength
 - ❧ Shoulder- protractors, shruggers, tricep elbow extension (prevention of elbow hyperextension in WB which causes stress to wrist, changes hand positioning, etc.)

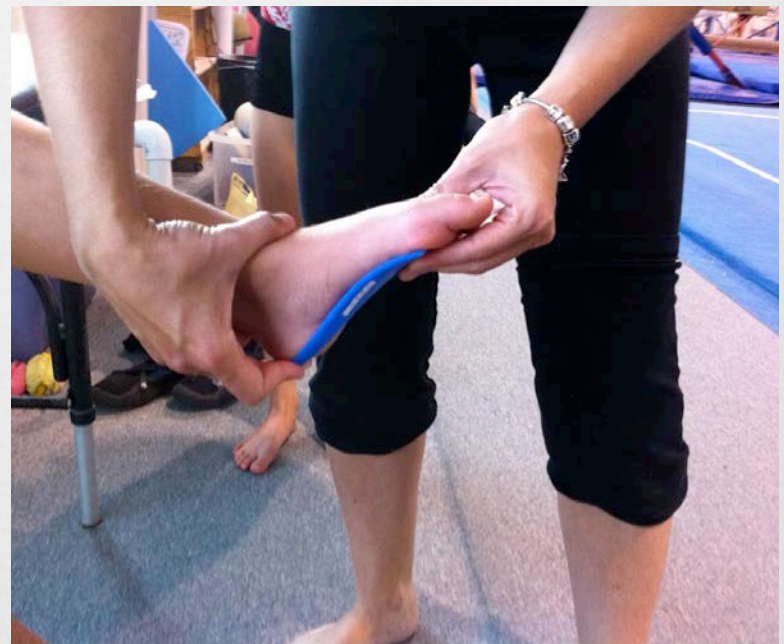
Barefoot Orthotic Pictures



Orthotic



Applying before tape



(Orthotics cont.)



Taping with CoFlex



Completed



Jump Progression

- ∞ Leg press partial weight bilateral
- ∞ Leg press full weight bilateral + ~~partial weight~~ partial weight unilateral
- ∞ Leg press over BW Bilat + full BW unilat + low BW jump bilat
- ∞ Leg press continues, and raise jump Bilat + add jump low weight unilat
- ∞ When reach FBW press Bilat, then progress to standing jump- eccentric and concentric- Double leg up to land bilat, single leg take off to 4" to land bilat
- ∞ Single leg Jump on Leg press FBW + eccentric off platform single to single
- ∞ Single plane double leg foot jumping, front-back, side-side
- ∞ NOW start jogging!
- ∞ Start agility (grapevine, jog forward, jog backward, ski jumps, cross front/back jumping jacks, etc.

Rehab Pearls



- ❧ If Lower body injury, even in straight leg brace, can still do strength of all EXCEPT knee
- ❧ If spine injury, abs are OK to do as well as spine in isometrics
 - ❧ Do not force psoas/iliacus work due to tug from anterior attachment T12 and down
- ❧ Return to sport after immobilization requires PT. Joints do not move properly, proprioception is 'off,' neural patterns need to be re-established, and bad habits prevented biomechanically

Prevention: Ankle

- ❧ Unstable surface training
- ❧ Closed eyes = gymnastics is often a blind landing sport
- ❧ Strengthening of the calves in BOTH straight knee and bent knee position
 - ❧ Back squat with heel raise, front lunge with front foot heel raise
- ❧ Flexibility- Closed Chain DorsiFlexion (CCDF)
 - ❧ Average human needs 25-30 degrees for proper stooping, stair descending, etc
 - ❧ Gymnast needs 45-50 past neutral!
- ❧ Shin (ant tib) as much as plantar flexors
- ❧ Rolling- suggest TP products (no affiliation!)

CV/Resume

- ❧ Former member, USA Gymnastics National Health Care Referral Network, Almost 10 yrs
- ❧ Owner/Manager- Accelerated Physical Therapy, Willowbrook/Darien- Through 2011
- ❧ Owner/President- MedGym, LLC.
- ❧ Writer/Medical Editor- *Inside Publications* (Inside Gymnastics, Inside Cheerleading, Inside Volleyball Magazines)
- ❧ Published- *Irish Dance and Culture Magazine, Technique Magazine, USECA*
- ❧ Medical Consultant- TumbTrak Products
- ❧ National and International Performing Arts Medicine Speaker and researcher

The Roller! The better the calf, the more flexibility. Pliability and flexibility vary... for Severs... ~~flexibility~~ pliability. No more stress to the heel attachment than needed



3. Flexibility



☞ Gastroc

Soleus

☞ Straight Knee

Bent Knee

☞ Heel flat for both, foot straight, very important

Shin Strength/Calf Flexibility

- ☞ Can be done as heel walking, or stationary
- ☞ Lift front part of foot off of ground, keeping heels in contact with the ground. Alternate feet.
- ☞ Do not allow compensation – do not flex hips and stick butt backwards



Trigger Point Massage Products

- ☞ Calf Roller
- ☞ 10 rolls from knee to ankle on calf
- ☞ 10 ankle circles in 5 places of your choice
- ☞ 10 rocks of the foot and calf side to side (windshield wipers) in 5 places
- ☞ 10-10-10-5 program



Foot Wheel



- ☞ Place pressure on the bottom of the foot
- ☞ Roll roller back and forth from heel to toes
- ☞ Pull toes up for deeper massage
- ☞ 3-5 minutes, 1-2x/day, before and after activity

THE WRIST!



Outline



- ❧ 1. Wrists- common injury trends
- ❧ 2. Anatomy
- ❧ 3. Biomechanics
- ❧ 4. Injury breakdown
- ❧ 5. Rehab
- ❧ 6. Prevention

Breakout...



- ❧ Hold your wrist in front of you, how far does it go up?
How far should it go?
- ❧ Try with fingers bent and then straight- is there a difference?
- ❧ Answers...

Cont.

- ☞ Yes! Actively, you should be able to extend your wrist to 90 degrees. This uses the muscles of the extensors, and stretches the flexors (which are overused in gymnastics due to handstand balancing, grip strength, etc, especially for men and performing artists (Cirque, LaReve, etc.)
- ☞ If you bend your fingers, you are alleviating stress on the finger flexors that go to the end of the fingers. A way to continue sport with push up position on parallettes and/or floor bar, Perfect Pushups?

1. Common Injury Trends



- ❧ Sprains
- ❧ Pain on top of wrist
- ❧ Pain on inside (medial) wrist
- ❧ Pain outside of wrist
- ❧ Forearm splints
- ❧ Carpal bone pain
- ❧ fractures

2. Anatomy



☞ Carpal bones

☞ Radius

☞ Ulna

☞ Metacarpals

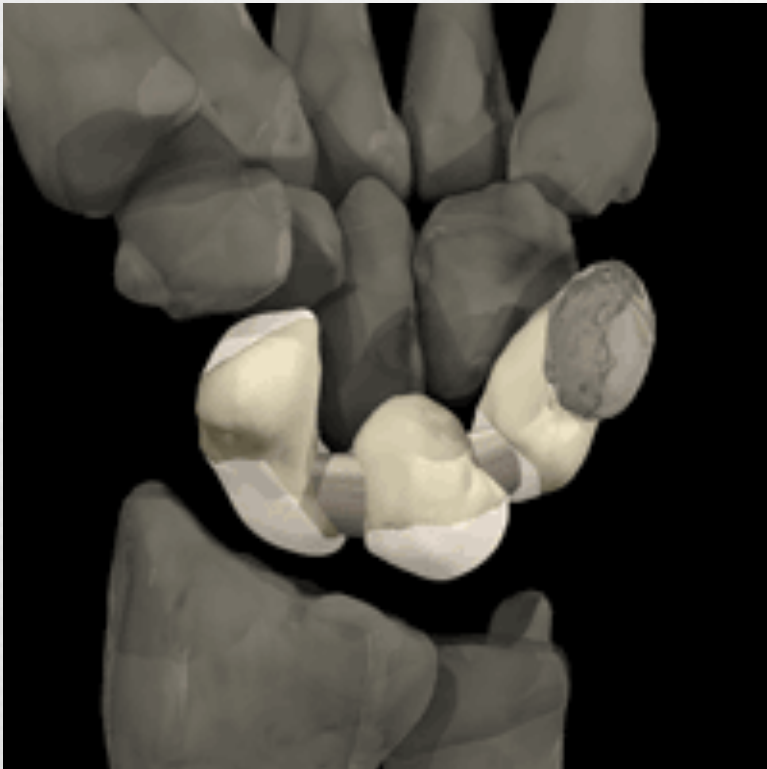
☞ Ligaments

☞ Meniscus

☞ Joints

☞ Nerves

☞ cartilage



3. Biomechanics



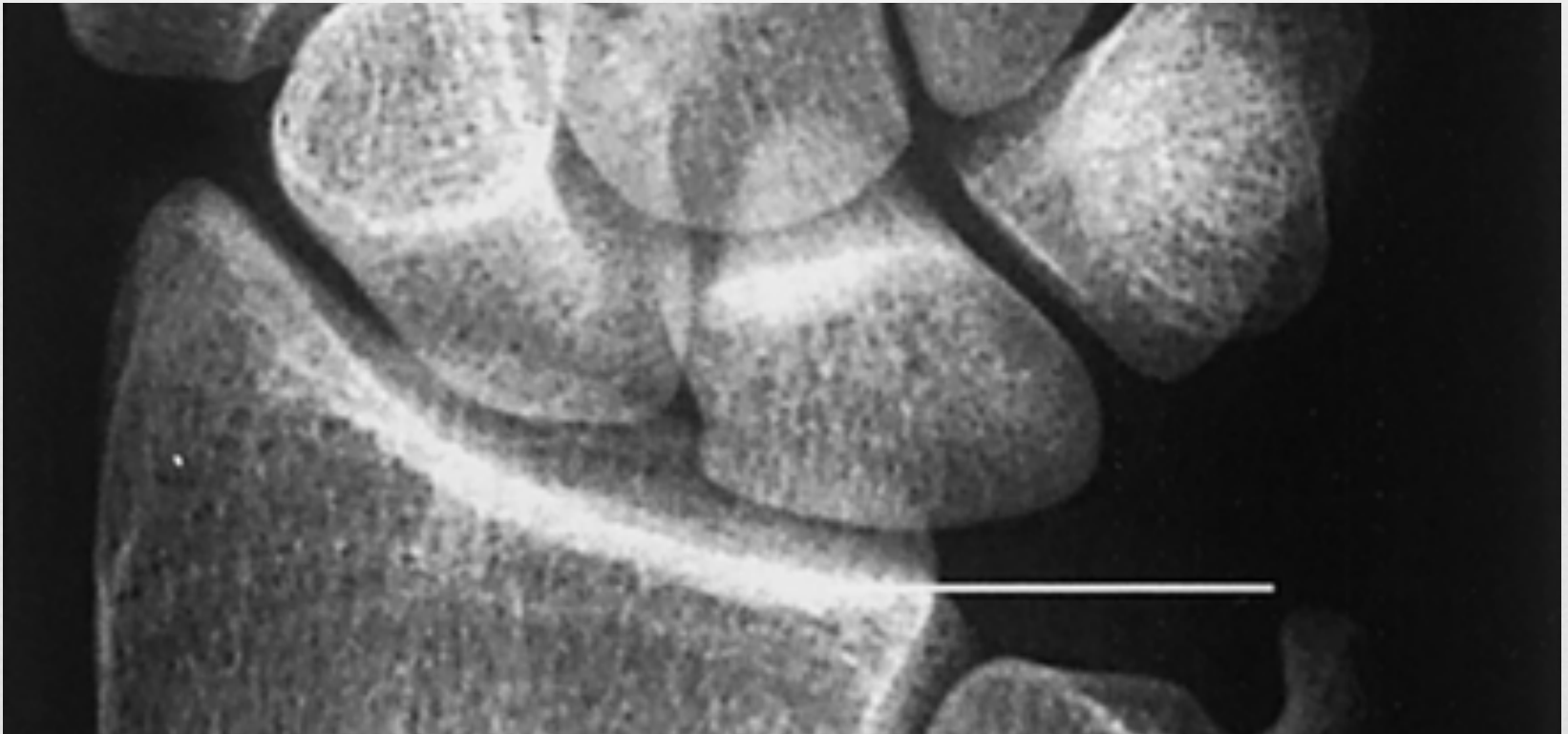
- ☞ Radius: 82% weight bearing
- ☞ Ulna- 18% weight bearing
- ☞ Joint itself- carpal motion with extension and flexion
- ☞ Growth plates
 - ☞ Reaction to growth plate stress- UV...

Ulnar Variance Close Up



- ☞ Radius should be longer than the ulna
- ☞ If the ulna is subjected to increased stress (upper extremity weight bearing in wrist extended position-90 degrees, gymnastics), then the bone “overstimulated growth” because of “perceived microtrauma”
- ☞ Increases TFCC injuries up to 80%
 - ☞ Predictability in filming bilateral wrists for UV???

Ulnar Variance Pic 1



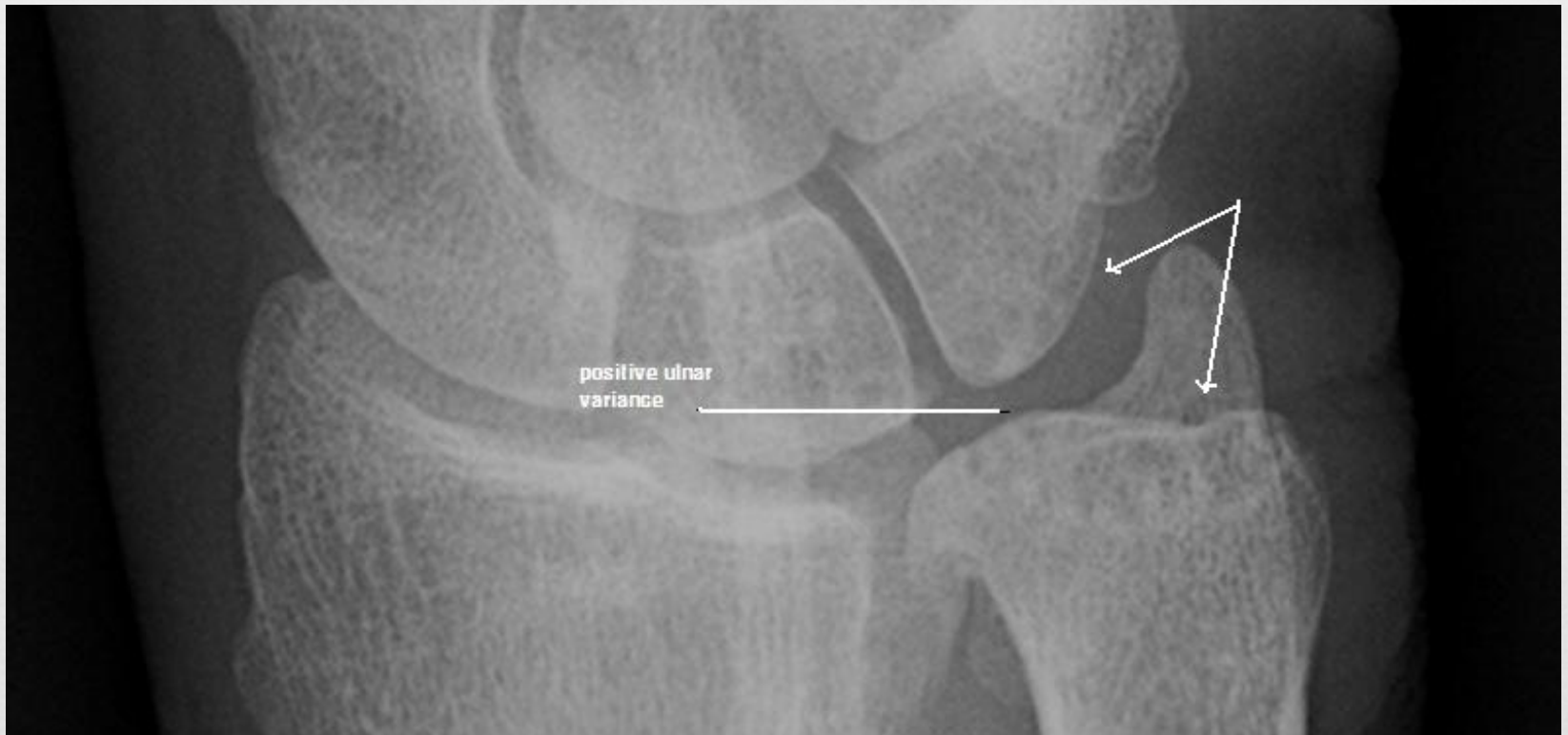
Ulnar Variance pic 2- case study- pain 10/10, level 10- non competing



Ulnar Variance pic 2- case study- pain 10/10, level 10- non-competing



Ulnar Impaction/Variance



4. Injury Breakdown



- ❧ A. Sprains
- ❧ B. Ligament injuries- categorical
 - ❧ Sapho-lunate
 - ❧ TFCC
 - ❧ Epicondylitis at the elbow- related
- ❧ C. Ganglion Cysts
- ❧ D. Fractures
- ❧ E. Carpal tunnel
- ❧ F. Forearm “splits”
- ❧ G. Nerve injuries

A. Sprains



- ❧ Sprain/strain to the tendon
- ❧ Muscles start off at the elbow, muscle belly in the forearm, extends to the wrist to insert below the joint to use/move the wrist
- ❧ Not enough room for bulk in the hand so only lig/tendons in most cases

B. Ligaments



- ❧ Palmar
- ❧ Dorsal
- ❧ Intercarpal
- ❧ Elbow

TFCC- a Closer Look

- ❧ Triangular Fibrocartilage Complex
- ❧ Disperses axial stress
- ❧ Consists of disc, meniscus, ulno-carpal ligament, radioulnar ligament (dorsal and volar), and ECU sheath
- ❧ 5mm thick ulnar, 2mm thick radial
- ❧ 15-20% blood supply (healing ramifications)
- ❧ Disc is avascular
- ❧ TFCC stabilizes the distal radio-ulnar joint (DRUJ)
- ❧ If Ulnar Variance (UV) is 2.5mm+, then load increases to between 40-44%
- ❧ If TFCC removed- radius gets 93-96%!!

Research



☞ The Gymnast's Wrist: Acquired Positive Ulnar Variance Following Chronic Epiphyseal Injury

☞ A. R. TOLAT, P. L. SANDERSON, L. DE SMET and J. K. STANLEY

☞ From The Hand Unit, Wrightington Hospital, Wigan, and Universitaire Ziekenhuizen Leuven, Pellenberg, Belgium

☞ Correspondence: John Stanley, Department of Hand Surgery, Wrightington Hospital, Appley Bridge, Nr Wigan, Lancs WA16 9EP.

☞ Five cases of symptomatic acquired positive ulnar variance are described. All cases occurred due to premature physeal closure of the growth plate in teenage girl gymnasts. All cases demonstrated ulno-carpal impingement, for which we describe a clinical test.

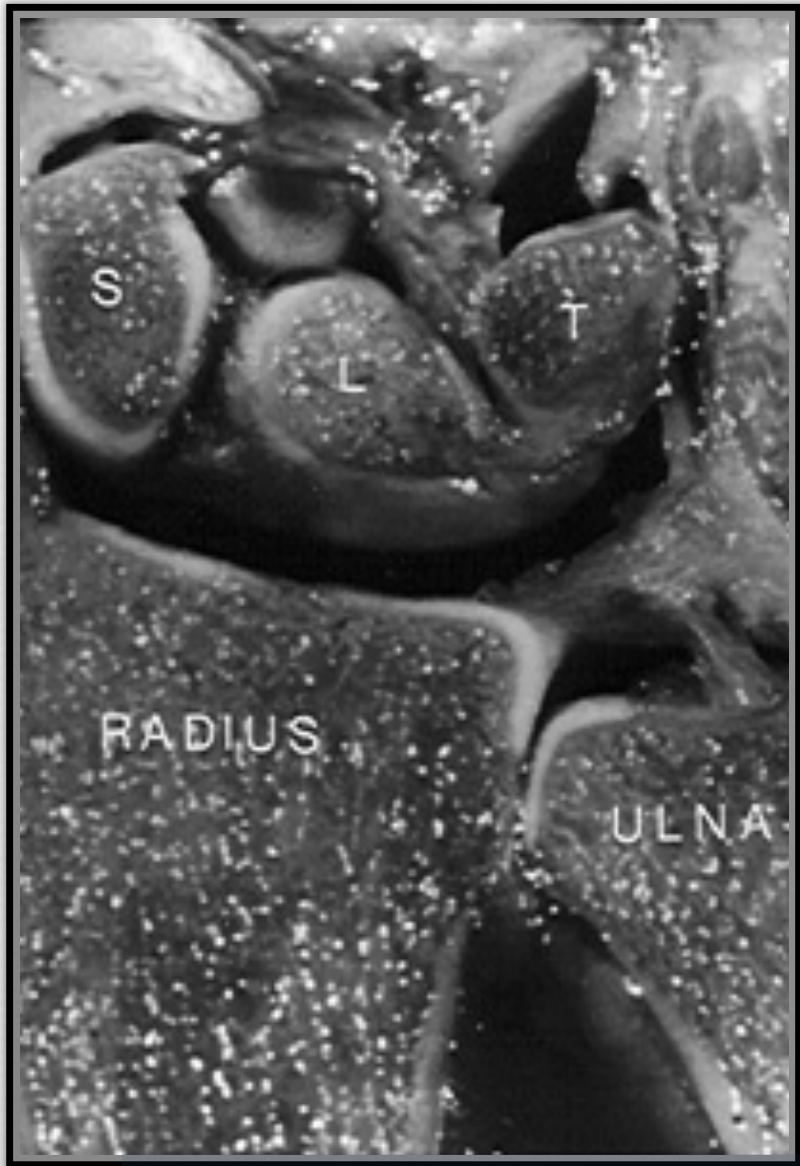
☞ Arthroscopic assessment of the wrist allowed us to assess the integrity of the TFCC (triangular fibrocartilaginous complex) and decide on the most appropriate surgery. Two patients needed distal ulna recession and one needed shaving for a TFCC perforation, with a good result.

☞ Journal of Hand Surgery (British and European Volume), Vol. 17, No. 6, 678-681 (1992)

☞ DOI: 10.1016/0266-7681(92)90200-L

TFCC- Picture





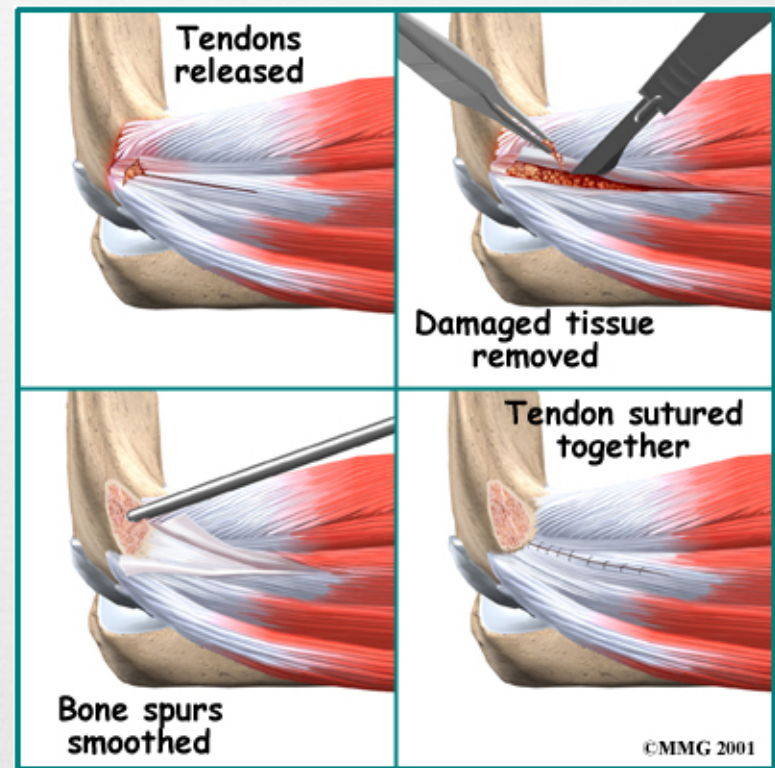
TFCC



TFCC xray

Elbow Epicondylitis

- ☞ Inside (medial)
- ☞ Outside (Lateral)
- ☞ Treatment- Needs to be deep, hands on
- ☞ ART/Graston
- ☞ Forearm and all compartments of the humerus/upper arm need to be addressed
- ☞ Especially address pronators and supinators of the forearm
- ☞ Surgery last option!



C. Cysts



- ❧ Aspirate
- ❧ Depending on location
- ❧ Does it stop extension?
- ❧ Can do Fluoroscopy- moving xray
 - ❧ Want to do bilateral to compare motion
- ❧ Surgical removal- last resort
 - ❧ Side effect: create scar tissue

D. Fractures



- ❧ Ulna
- ❧ Radius
 - ❧ Colles Fracture
- ❧ Carpal Bones
- ❧ Metacarpals
- ❧ Avulsion Fractures

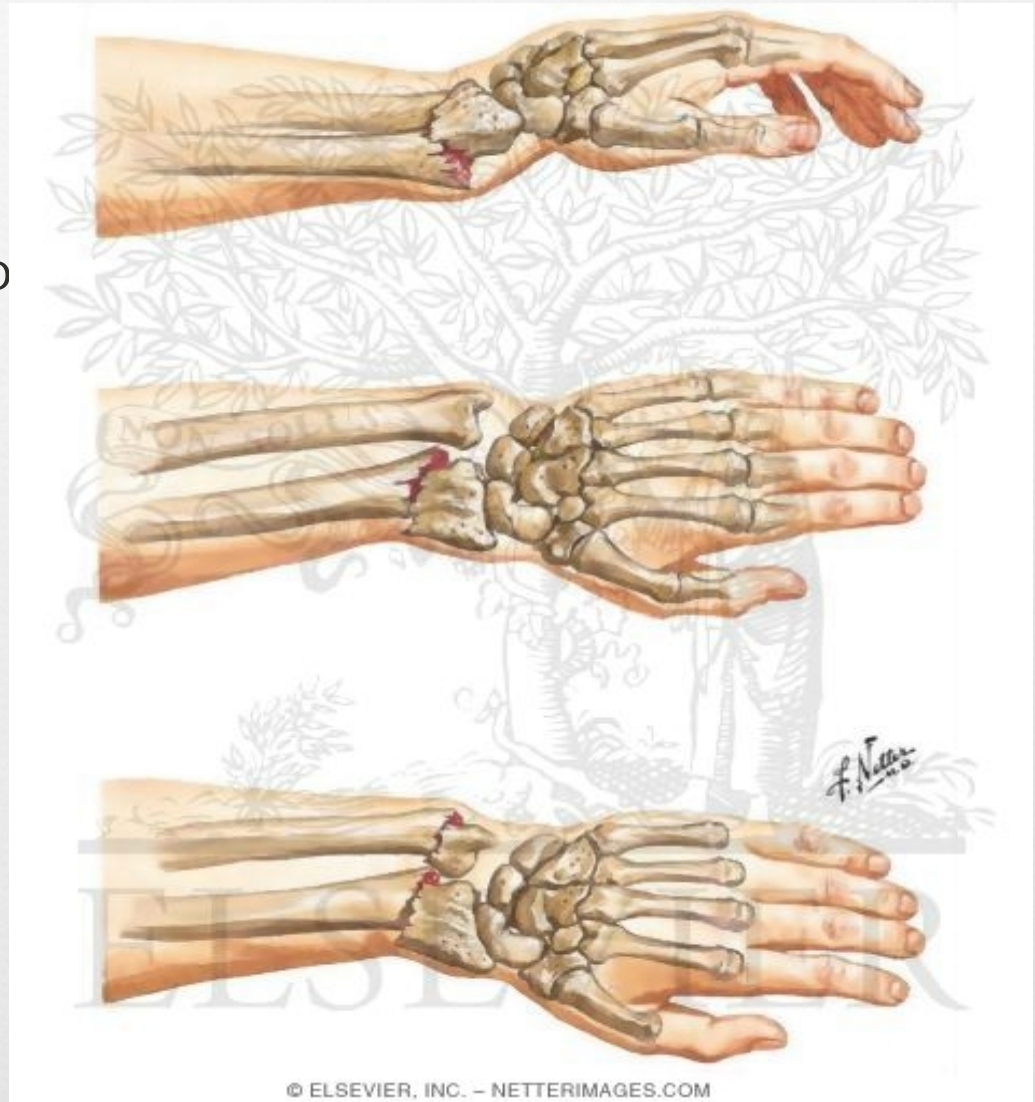
Ulna



☞ Fractures less common due to less weight bearing

Radius

- ☞ Colles Fracture
- ☞ 1814 named
- ☞ Distal radius
 - ☞ extension./compressio
- ☞ Usually 1" from end of bone
- ☞ More than 2 pieces= comminuted fracture
- ☞ Casting
- ☞ Surgical
- ☞ Re-film no less than 6 weeks- research shows not enough healing between
- ☞ 3-6 months before tumbling



Colles xray diagnostic



Radius shaft fracture



E. Carpal Tunnel

- ❧ At the wrist, no room, edema
- ❧ Nerve entrapment
- ❧ ART (Active Release Techniques) can help to release nerves if they are caught or if scar tissue exists that is disallowing the slide/glide of the compartment dorsal
- ❧ Need to release the tension in the soft tissue in the forearm at times- TP roller?

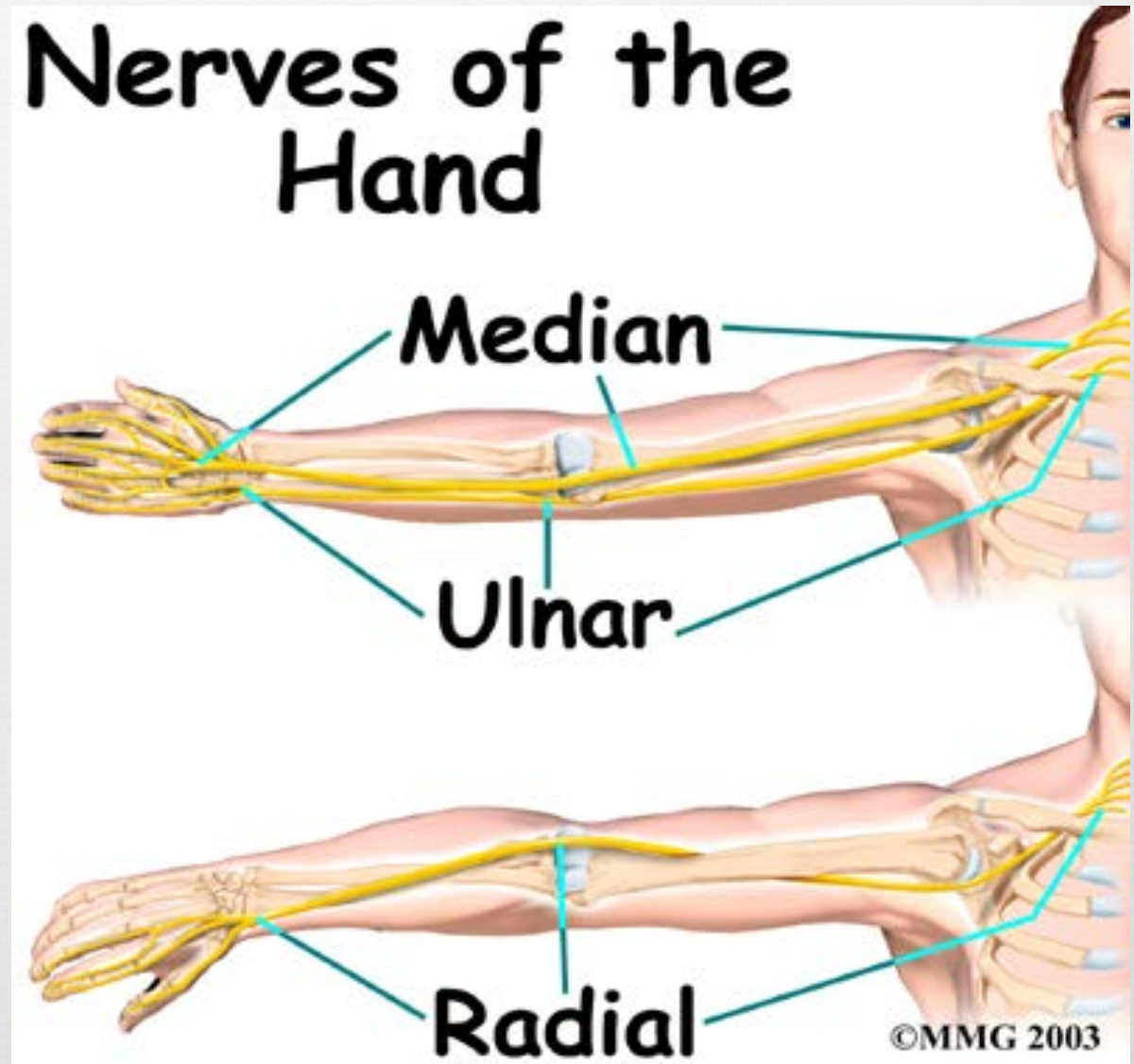
F. Forearm Splints




- ❧ Irritation of the periosteal tissue along the radius or ulna from repetitive stress
- ❧ Muscle essentially tightening and attempting to pull away from the bone due to high tone, low flexibility and repetitive overuse
- ❧ Rest, ART, flexibility and oppositional muscle strengthening
- ❧ Sometimes compartment release
- ❧ Condition- yes, without holding weights or bars, wrap "ankle weights" around wrist, use bands

G. Nerve Injuries

- ☞ Radial, Ulnar and Median
- ☞ Surgical- ulnar transposition



5. Rehabilitation

- ☞ Manual Therapy
 - ☞ ART- Active Release Techniques
 - ☞ Graston Technique (GT)
 - ☞ Joint mobilization 
 - ☞ Carpal bone mobilization
 - ☞ Trigger Point Dry Needling
- ☞ Flexibility
- ☞ Pliability- rolling
- ☞ Anti-inflammatory
 - ☞ Iontophoresis- take home patches
 - ☞ Oral meds
 - ☞ Topical Voltaren(prescript)
 - ☞ TPS cream (prescription combination)
 - ☞ Light therapy
- ☞ NO ultrasound in gymnasts- growth plate risk TOO high, adolescent development
- ☞ Strength of shoulders, triceps

Examples!



Why both?



☞ Straight: forearm, long two-joint muscles that cross elbow and wrist


☞ Bent:

- ☞ Because that is how we do a lot of gymnastics (non-elbow locked out!)
- ☞ And- Stretch focus is on distal wrist area


The more open your upper back, the more shoulder “flexion” you will have, the less stress on the elbow and wrist, the more vertical your impact is through bone!



6. Prevention

- ❧ Making sure that the extensor strength and flexor strength is balanced 
- ❧ Rope drills
- ❧ Flexibility
 - ❧ Measure 4x/year and track to see if in season/out of season trends for pounding on Ue decrease extension flexibility
- ❧ Tiger Paws
 - ❧ The debate....
- ❧ Elbow flexibility
 - ❧ Hyperextension prevention
 - ❧ Tricep strength

The Shoulder Relationship

- œ Shoulder Strength 
- œ Triceps – to prevent elbow bend
- œ Triceps for blocks
- œ Serratus anterior
 - œ Push up plus
 - œ Handstand shrugs
 - œ Shoulder taps in handstand
 - œ HS push ups
 - œ HS push up ½ holds
 - œ Block drills
 - œ Springboard bounces
 - œ Shoulder extension strength
- œ (Pics)

Arch...

☞ Notice how “bent” the wrists are, 120 degrees



☞ If the shoulders were more open (not even past neutral or even with the torso), they would be less “Stressed”

☞ Imagine this.... 100 times a day

☞ Pinches the proximal carpal bone



The handstand...

⌘ What is the degree measure of a handstand?

⌘ So... if you cannot get the wrist to 90 degrees easy, is there stress?

⌘ If you can get to 99, there are only 9 degrees extra... in a HS you are at 90% range capacity!



Hand position-

☞ Thumb over – demands less flexibility.



☞ Pull thumb back- need more!

☞ She needs more External Rotation (outward) of the shoulder to place less stress on the “fixed” wrist, and the elbow, that is in the middle, and always suffers!




Cont. 2



- ❧ Shoulder flexibility
 - ❧ Flexion- important
 - ❧ Back Handsprings, bars, rings
 - ❧ Blind changes, inverts, stalder hand positions, pirouettes

- ❧ Elbow flexibility
 - ❧ Supination/pronation
 - ❧ Especially important in pirouette skills on bars
 - ❧ Trend will be that level 7 starts to get tight, worsens summer between 9 and 10 again

Try this...

- ☞ Hold arm by your side, forearm resting on the table
- ☞ Try to turn your forearm,  palm up, so that the top of the hand touches the table
- ☞ How far can you go, and why does this matter?
- ☞ Part 2- raise your right arm over your head, rotate your arm clockwise (External rotation)- what position does this form on bars? Why does this matter?
- ☞ Answers....NEXT!

Answers!

☞ By holding arm bent at 90 degrees, you are checking ~~supination~~ and pronation ability. “Hand position” on bars comes from shoulder rotation, elbow motion availability, wrist motion. The more flexible the shoulder, the more the “brunt” of the total range is dispersed among the three joints. Less TFCC pain, less stress on elbow, and less impingement in the shoulder!

Sources

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- ❧ DOI: 10.1016/0266-7681(92)90200-L Stacie L. Grossfeld, Ann Van Heest Elizabeth Arendt and James House
- ❧ Pitcher's Periostitis Am J Sports Med March 1998 26:303-307

Summary

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