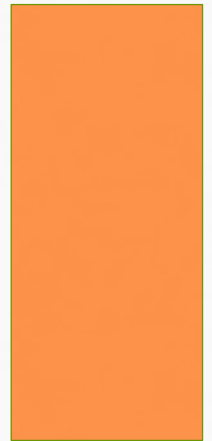


TREATING HAND STIFFNESS

NANCY HOCK, OTRL, CHT
MIOTA 2017



WHY DOES STIFFNESS OCCUR?

- Prolonged Immobilization
- Traumatic Injury/Multiple Injury
- Presence of Sympathetic Involvement
- Patient Characteristics
- Delay in Appropriate Treatment
- Insurance Limitations

PROLONGED IMMOBILIZATION

- Non-surgical treatment
- Cast Length
- Increased healing time

TRAUMATIC INJURY/MULTIPLE INJURY





SYMPATHETIC INVOLVEMENT



PATIENT CHARACTERISTICS

- Non-compliance
- Poor Tolerance
- Roles/Occupation
- Fear
- Motivation (secondary gain)
- Pain

DELAY IN APPROPRIATE TREATMENT

WHY????

INSURANCE ENVIRONMENT

- Limited visit authorization
- High co-pays
- Many services not authorized
- Splint/DME coverage

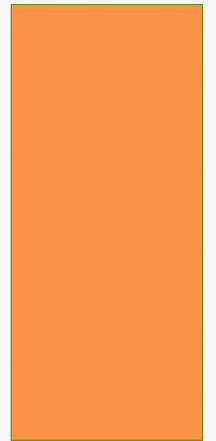
HOW TO AVOID STIFFNESS

- Control edema
 - What moves fluid?
- AROM/PROM as soon as possible
- The just right challenge (no pain/no gain?? – NO!)



EVALUATING STIFFNESS

WHAT IS THE SOURCE?





IS IT A JOINT PROBLEM?

- Compare AROM to PROM
 - If good passive and poor active – NO
 - If AROM and PROM are similar – Could be!

MOST DIFFICULT TO TREAT

- Wrist extension
- MCP flexion
- IP extension



JOINT STIFFNESS (SOFT TISSUE/JOINT)

- Ligament shortening
- Joint capsule tightness
- Bony block
- Evaluate end feel of joint
 - Soft – springy (could be edema)
 - Hard – abrupt end point

IS IT A STRENGTH PROBLEM?



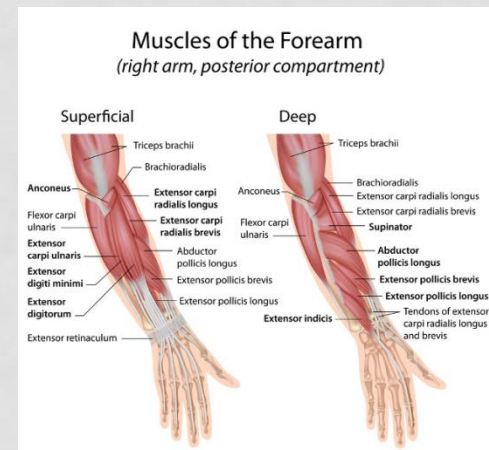
INTRINSIC/INTEROSSEOUS TIGHTNESS

- Decreased PIP passive flexion with MP passive extension
- Lumbrical tightness? Interosseous tightness?



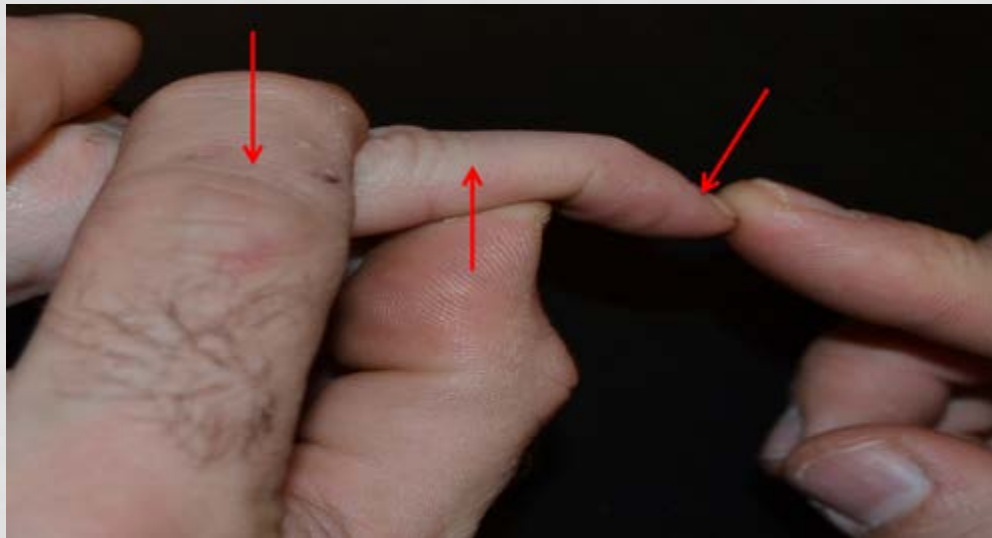
EXTRINSIC TIGHTNESS

- Significant difference between distal passive motion which is impacted by proximal passive joint motion.
- The position of the wrist impacts the performance of the digits



ORL TIGHTNESS (LANDSMEER'S LIGAMENT)

- Decreased passive DIP flexion with PIP passive extension.



SCAR

- Watch blanching/whiteness with ROM
- Scar adhesion may limit tendon glide
- Where it is white, it is tight!



LIMITED TENDON GLIDE

- Evaluate passive versus active ROM
 - If good passive and bad active – Yes
 - If AROM and PROM are similar – Could be!

NERVE FUNCTION ASSESSMENT

- Decreased nerve function may have resulted in joint contracture.
- May not be evident until joint contracture is improved.



OBSERVE PATTERNS OF MOVEMENT

- Does the MP extend before the wrist?
- Reverse pattern of fisting?

OTHER UNIDENTIFIED INJURIES

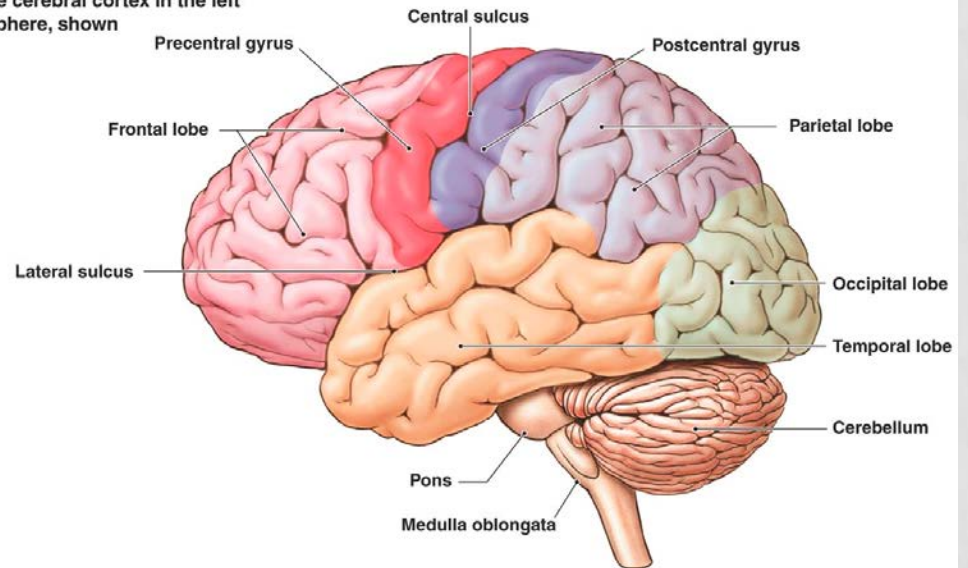
- Unidentified wrist injury may prevent improvements in digit motion.

CHANGE IN CORTICAL REPRESENTATION

- Motor areas that are not used lose cortical representation

A lateral view of the brain showing the lobes of the cerebral cortex in the left cerebral hemisphere

The lobes of the cerebral cortex in the left cerebral hemisphere, shown in lateral view



- Judith Colditz, ASHT Times, Volume 21, Issue 3

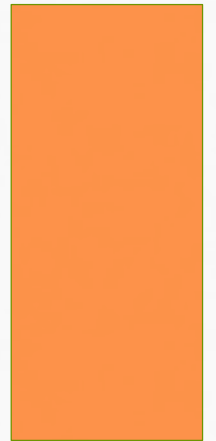
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WHAT DO YOU SEE?



TREATMENT OPTIONS

NOW WHAT DO I DO??



MANAGE EDEMA

- Increase tissue pressure (coban, isotoner glove, tubi-grip)
- Elevation
- Manual lymph drainage
- AROM

COBAN WRAP





ENCOURAGE APPROPRIATE PATTERNS OF MOVEMENT

- Wrist position in slight extension to encourage fist (encourage tenodesis)
- Lead with hook fist prior to MP flexion (avoid interosseous fisting)





ADDRESS TIGHTNESS

- Intrinsic
 - Extend MP and flex IP
- Extrinsic
 - Flex wrist and digits
 - Extend wrist and digits



IDENTIFY OPTIMAL POSITION TO OBTAIN TENDON GLIDE

- Joint motion distal to the adherence
- Proximal glide of extensors to gain digit extension
- Distal glide of extensors to gain digit flexion
- Proximal glide of flexors to gain digit flexion
- Distal glide of flexors to gain digit extension

RELATIVE MOTION ORTHOSIS

Block MP flexion to encourage flexion at the IP joints.



RELATIVE MOTION ORTHOSIS

Block MP extension to encourage extension at PIP.



HOW MUCH MOTION IS NEEDED?

- Digits
 - MP – 61 degrees
 - PIP – 60 degrees
 - DIP – 39 degrees
- Thumb
 - MP – 21 degrees
 - IP – 18 degrees

Means, K. R., Saunders, R. J., & Graham, T. J. (2011) Pathophysiology and surgical management of the still hand. In T. M. Skirvin, A. L. Osterman, J. M. Fedorczyk, & P. C. Amadio, (Eds), *Rehabilitation of the Hand and Upper Extremity*, (6th ed. P. 886). St. Louis, MO: Mosby.



PROVIDE APPROPRIATE PROM

- Too aggressive = Increased inflammatory response
- “Passive motion of the injured hand should be defined as the gentle encouragement of the tissue to reach a maximum available length” (Colditz, 2011).

MANAGE SCAR WHICH IS LIMITING
MOTION

ULTRASOUND - THERMAL



PARAMETERS

- Ultrasound: heat tissue .6C/Minute -
Need 4C temperature change to
increase collagen tissue
extensibility
- Ultrasound in conjunction with a
stretch
- 3mHz = 1-2 cm
- 1mHz = 3-5 cm

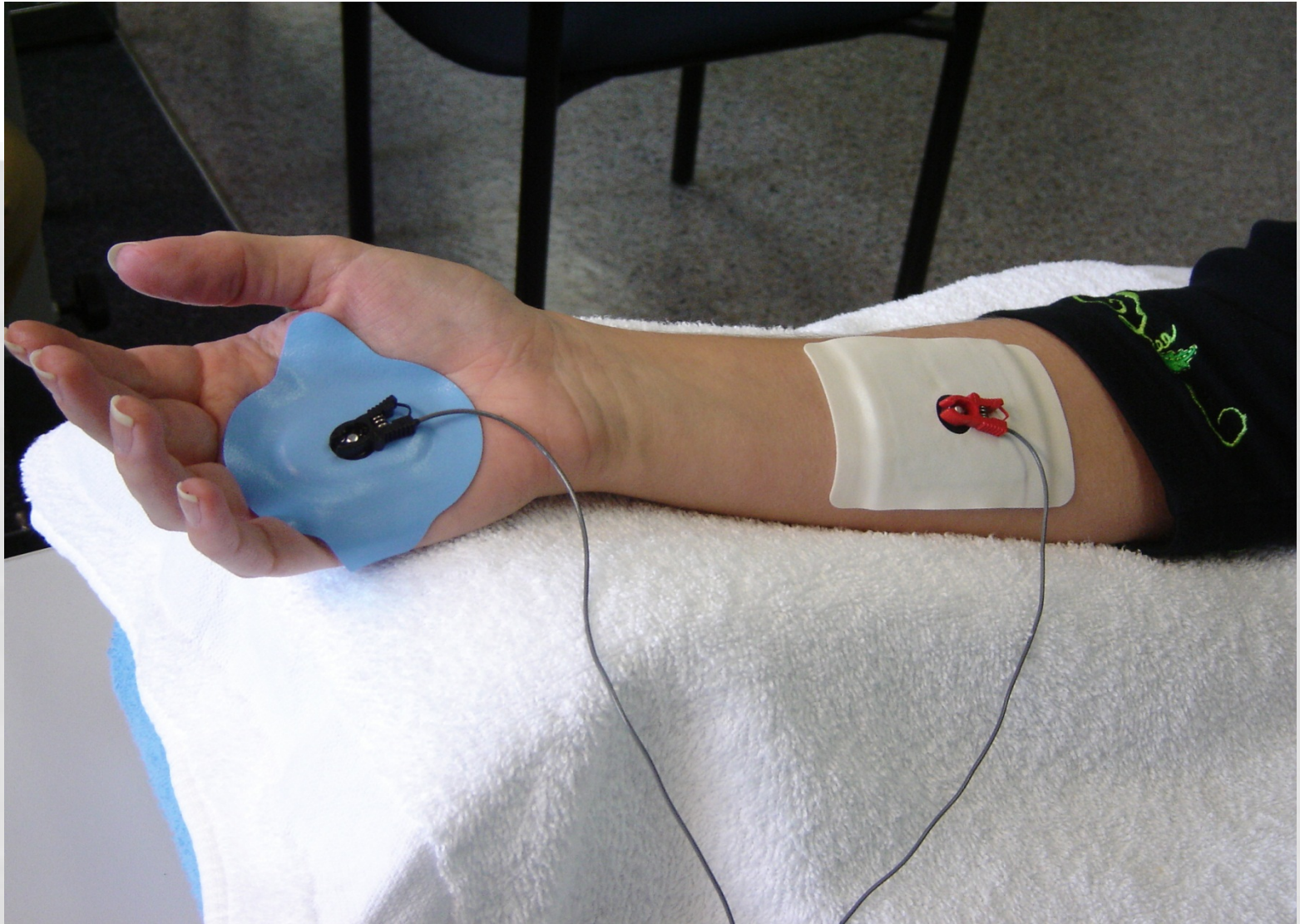
ULTRASOUND PARAMETERS

Intensity	1MHz freq	3 MHz freq
0.5	0.04 C/min	0.3C/min
1.0	0.2C/min	0.6C/min
1.5	0.3C/min	0.9C/min
2.0	0.4C/min	1.4C/min

ULTRASOUND CONSIDERATIONS

- Absorption rates:
 - Blood 3%
 - Fat 13%
 - Muscle 24%
 - Blood vessel 32%
 - Skin 39%
 - Tendon/ligament 59%
 - Cartilage 68%
 - Bone 96%

IONTOPHORESIS



SCAR MANAGEMENT

- Silicone gel sheeting
- Scar mobilization
- Elastomer scar mold



TISSUE RESPONSE

- Dr. Paul Brand - Journal of Hand Therapy 1995
- “It is better not to use the word stretch for what should be the long-term growth.”
 - Developed the Torque Angle Curve (TAC)
 - Interval goniometric measurements suggesting the more gentle the slope, the more compliant the tissue, the sharper the slope, the more stiffer the tissue.

TISSUE RESPONSE

- Paul LaStayo & Ken Flowers 1994, JHT
 - Suggested TERT
 - The time that a stiff joint is positioned at its available end range impacts the improvement in PROM

TISSUE RESPONSE

- Ken Flowers – Journal of Hand Therapy 2002
 - Modified Weeks Test for splinting decision hierarchy
 - First PROM measurement (cold reading)
 - Thermal modality (prefer fluidotherapy for 20 min w/exercise)
 - AROM with overpressure 10 min
 - Second PROM measurement ((preconditioned reading)
 - If gain in 20 degrees, no splint
 - If gain is 15 degrees consider static splint
 - If gain is 10 degrees, dynamic splint
 - If gain is 5 degrees, static progressive splint



KEY CONCEPTS – KEN FLOWERS

- Elastic recovery of ligamentous length follows stretch
- Trauma and immobilization result in adaptive shortening/stiffness
- Gentle prolonged stress promotes tissue lengthening
- Dosage of force application is determined with the splinting decision hierarchy
- Patient response is monitored to assess safety and effectiveness of splint program



SPLINTING

- Dynamic – soft end feel
- Serial Static – can help with edema reduction
- Static Progressive – used with greatest resistance or prolonged stiffness

INCREASE JOINT ROM / SOFT TISSUE LENGTH / TENDON GLIDE

- Splinting – TERT, low load force for prolonged period of time
 - Static progressive splinting vs dynamic
 - Serial static splinting
- Casting Motion to Mobilize Stiffness
 - Judith Colditz (Hand Lab)
- Coban wrap in end range for prolonged stretch

WHAT ABOUT THIS?



THIS?



THIS?



THIS?



THIS?



THIS?



THIS?



CASTING MOTION TO MOBILIZE STIFFNESS







SURGICAL OPTIONS

DIGIT WIDGET



DIGIT WIDGET



DIGIT WIDGET



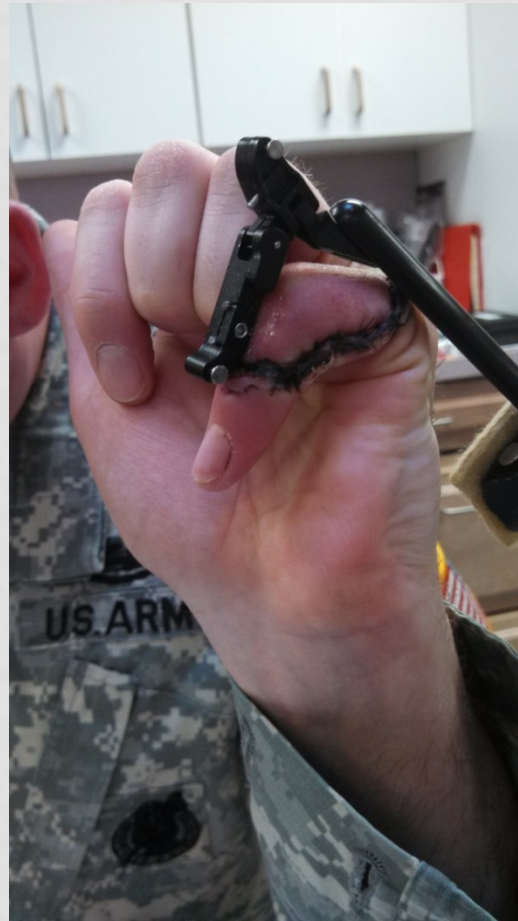
DIGIT WIDGET



DIGIT WIDGET – BLOCKING EXERCISES



DIGIT WIDGET



NOW WHAT WOULD YOU DO?

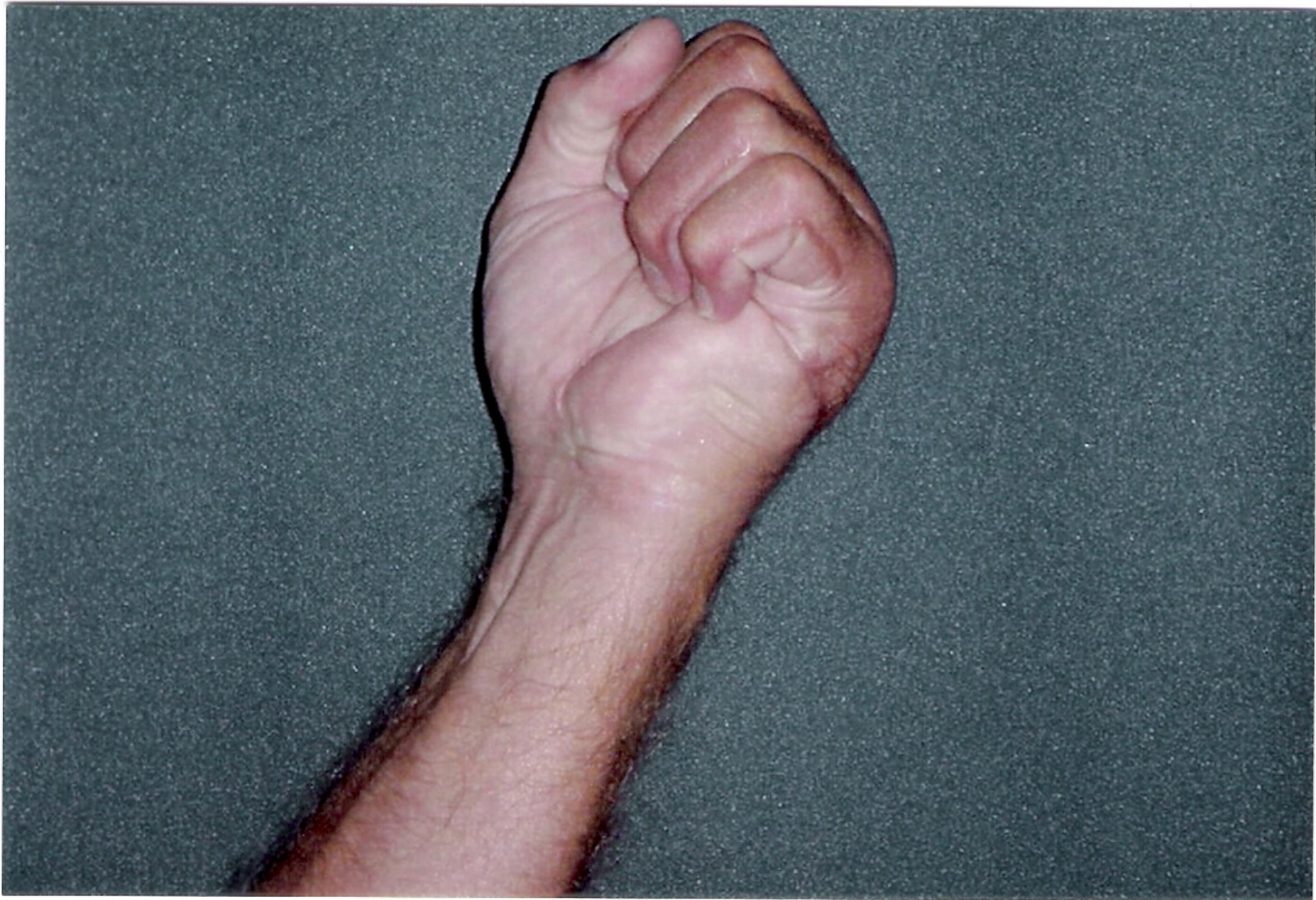


CASE STUDY

John

- Multiple injuries
- Delay in appropriate treatment
- Multiple surgical interventions
- Great patient characteristics
- Sympathetic symptoms not limiting treatment
- Insurance did not limit treatment







IF NO PROGRESS, CHANGE TREATMENT !!!!!!!

- Always ask yourself, *“What am I trying to accomplish?”*