

MUSCULOSKELETAL ULTRASOUND IN WORKERS COMP

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DIVISION OF IBJI

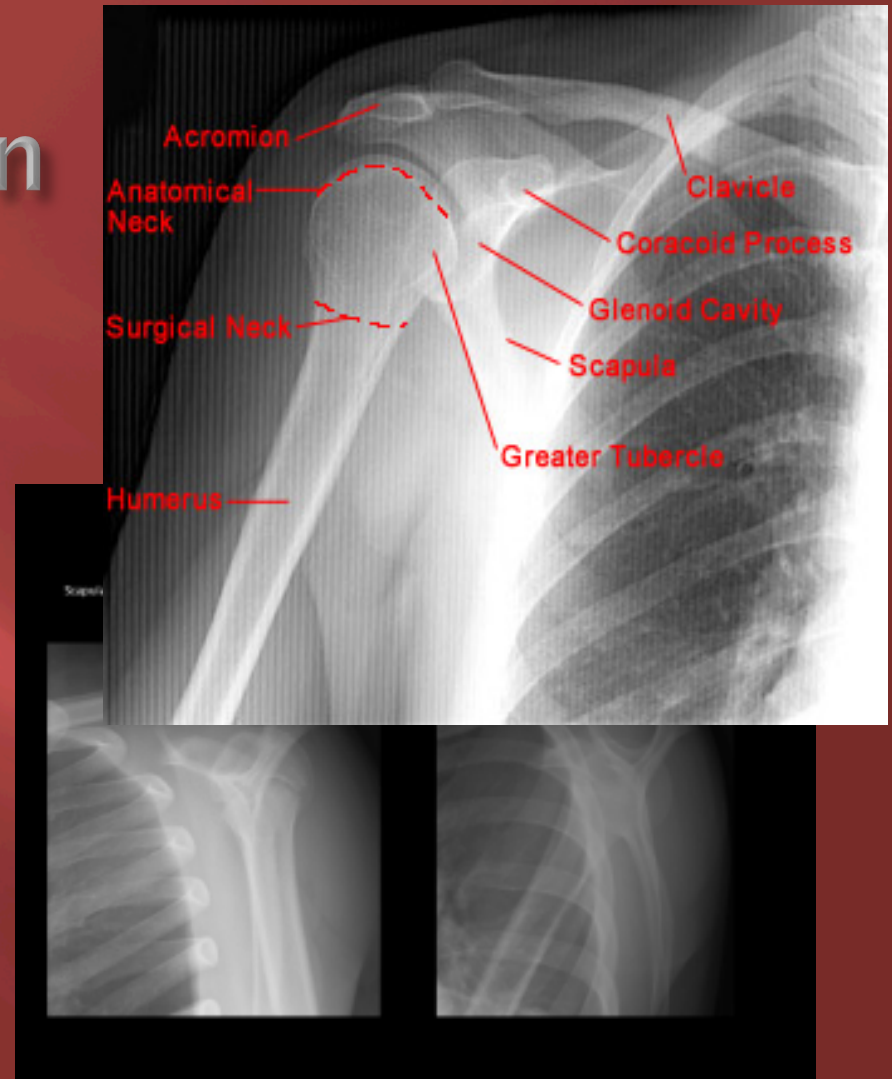
Why Should a PHYSIATRIST do msk us?

- ▣ We diagnose and treat muscle, tendon, joint, ligament, bone, (brain) injuries with rehabilitation and without surgery
- ▣ PM&R do many spine injections and EMGS so we are good with needles and imaging



Case presentation

- 35 . y.o.w.m. with a no history of shoulder pain. Works at City Municipality and was moving packages from truck to over head storage and felt a sharp pain in right shoulder and then fell on it 2 weeks ago . Pain is worse when he elevates the shoulder and there it radiates down to the biceps No significant medical or surgical history.
- Exam: loss of full active flexion/ abduction. Positive Neer/hawkins and no instability. Tender over anteriorly. Neg Speeds test.

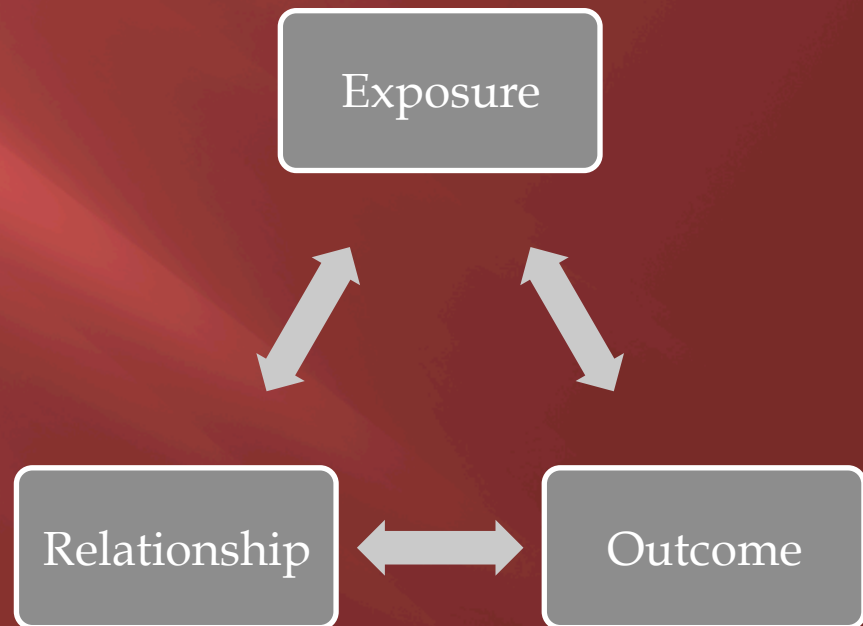


Shoulder conditions

- ▣ Industrial Injuries
 - Provider must give a clear description of the traumatic event
- ▣ Occupational Disease
 - ▣ Work related activities may cause or contribute to the development of condition caused by chronic exposure

Occupational Disease

- ▣ Conditions that support development of shoulder conditions
 - Carrying /lifting above the shoulder
 - Push/pull heavy loads
 - Working arms above shoulder > 15 minutes intervals



What's the next step?

- ▣ Start medication and order a MRI?
- ▣ Preform an US of the shoulder?
- ▣ Order therapy



US of the shoulder



Compared to other imaging

ADVANTAGES

- ▣ No x ray exposure
- ▣ Higher **resolution** than MRI
150 UM VS 469 UM (1.5t)
- ▣ Quicker than MRI
- ▣ Lower cost than MRI/CT
- ▣ 1/3 to 1/4 the cost
- ▣ **No CONTRAINDICATIONS**
with pacemaker or
prosthetics/ not degraded by
some implants (shoulder)
- ▣ Can use in real time for biopsy,
dynamic impingement and
injections
- ▣ Can image with hardware
- ▣ Better at differentiated solid
versus fluid

DISADVANTAGES

- ▣ Operator dependent
- ▣ Cant see thru bone well
- ▣ Gray scale only
- ▣ No scout films
- ▣ Poorer resolution at
greater depth

Cost savings

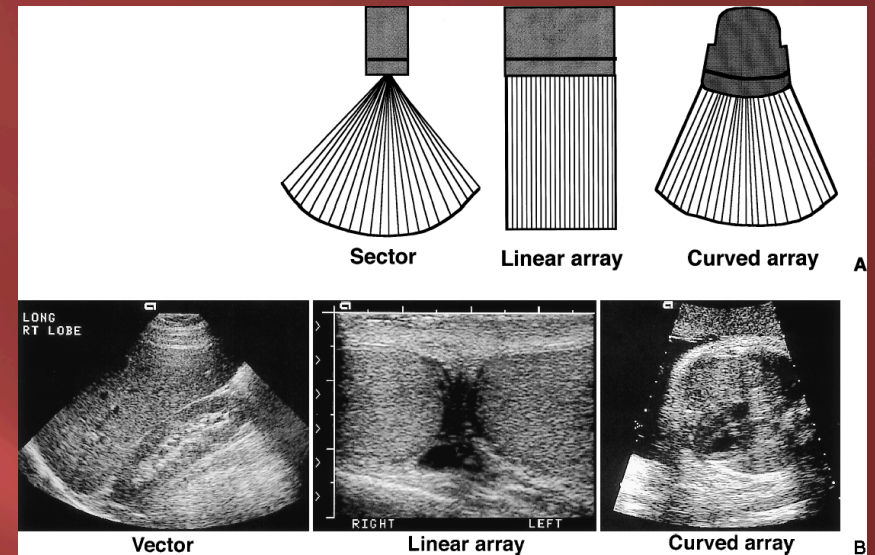
COMPARED TO MRI

WRIST, HAND, ELBOW, SHOULDER,
ANKLE, FOOT, LE, UE, HIP

- ▣ From 1996 to 2005 MRI costs increased 353%
- ▣ Projected MRI costs are 2.0 bill in 2020
- ▣ Using US would save 6.9 billion from 2006 to 2020



How does US work ??????????



- ❑ US waves are send out from transducer and reflected back and recorded
- ❑ When there is a density change in the tissue (bone versus tendon) the amount of reflection depends on the density difference
- ❑ Large density deltas reflect bright signal and smaller deltas reflect gray signal

Echogenicity\Echotexture from muscle, tendon, ligament, nerve



- Tendon: parallel collagen bundles are brightly echogenic and fibrillar echotexture pattern
- Nerve is similar to tendon
- But has a fascicular and honeycomb echotexture
- Muscle fibers are dark hypoechoic bundles with hyperechoic connective tissue between
- Bone is bright hyperechoic surface with posterior shadowing.



US basics

Hypoechoic: when fewer sound waves are reflected back to the transducer= high water content

Hyperechoic: brighter image when sound waves are strongly reflected back = lower water content tissue

Echogenicity

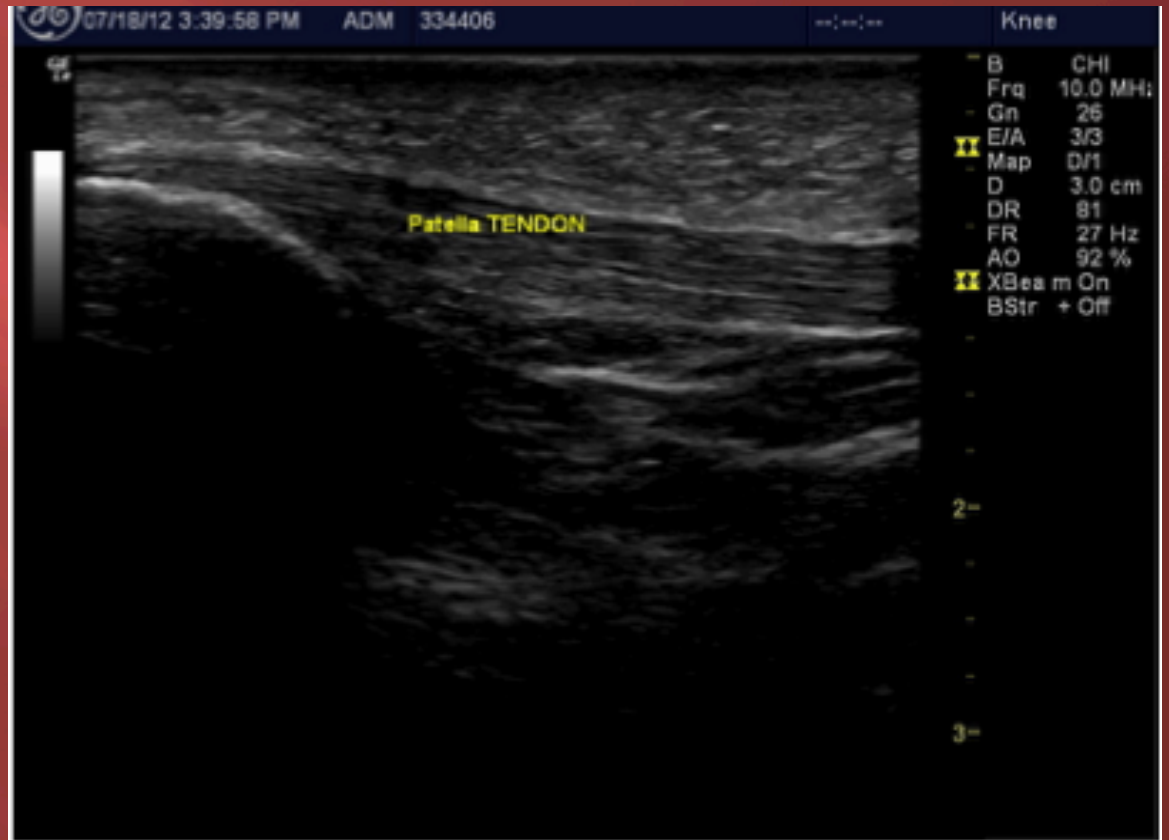


- ❑ Fluid is anechoic (black)
- ❑ Articular cartilage is anechoic thin layer above bright cortical bone



MSK Terminology

Long axis or
longitudinal
plane



US terminology

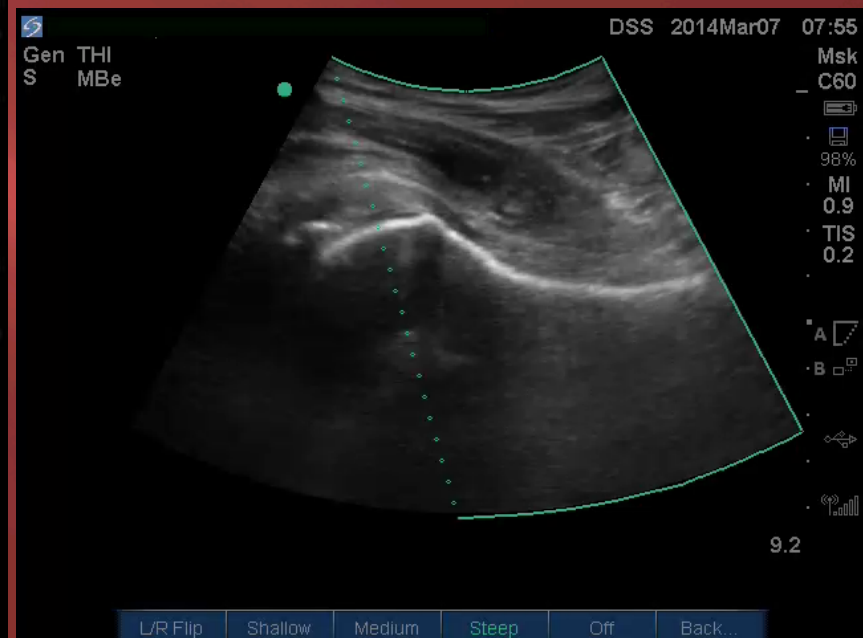
SHORT AXIS VIEW OR
TRANSVERSE PLANE



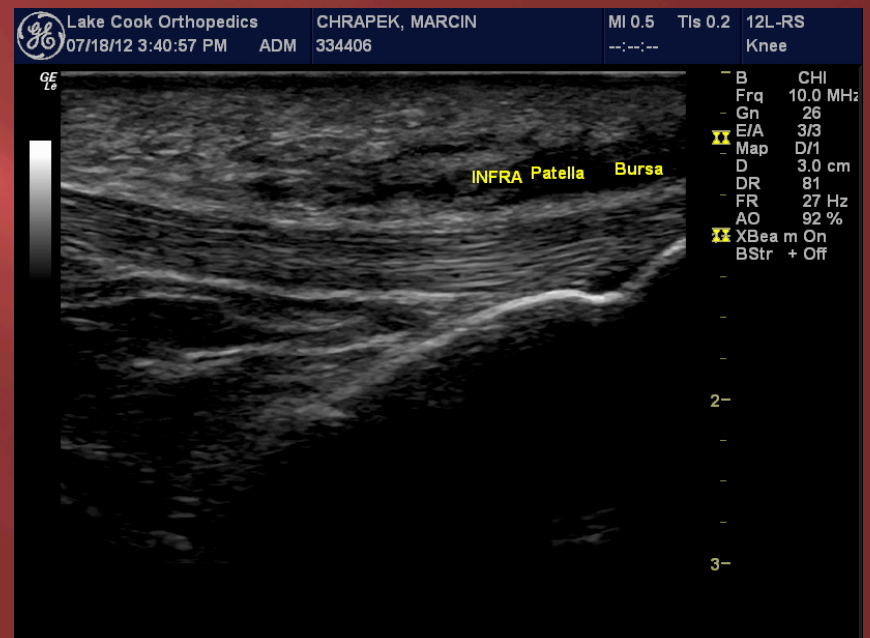
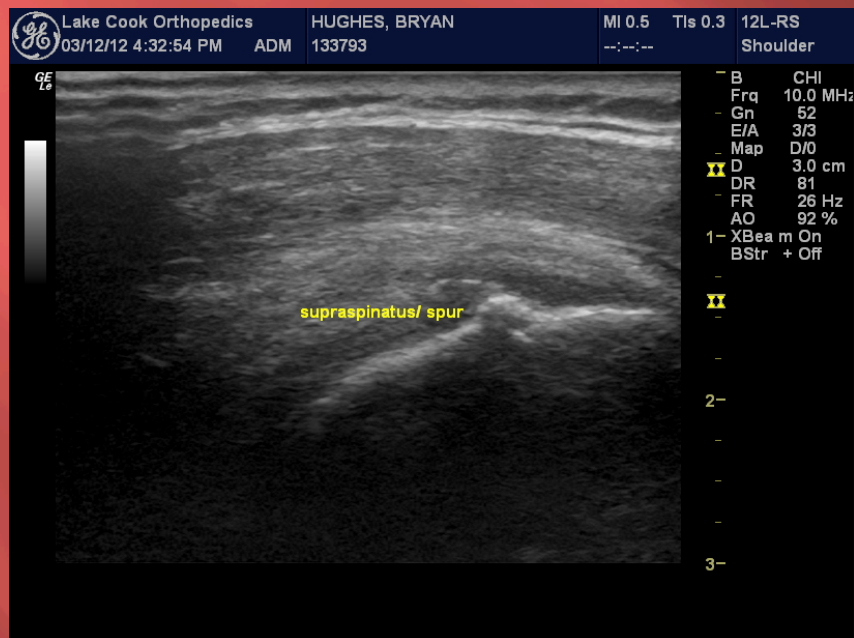
SHORT AXIS OR
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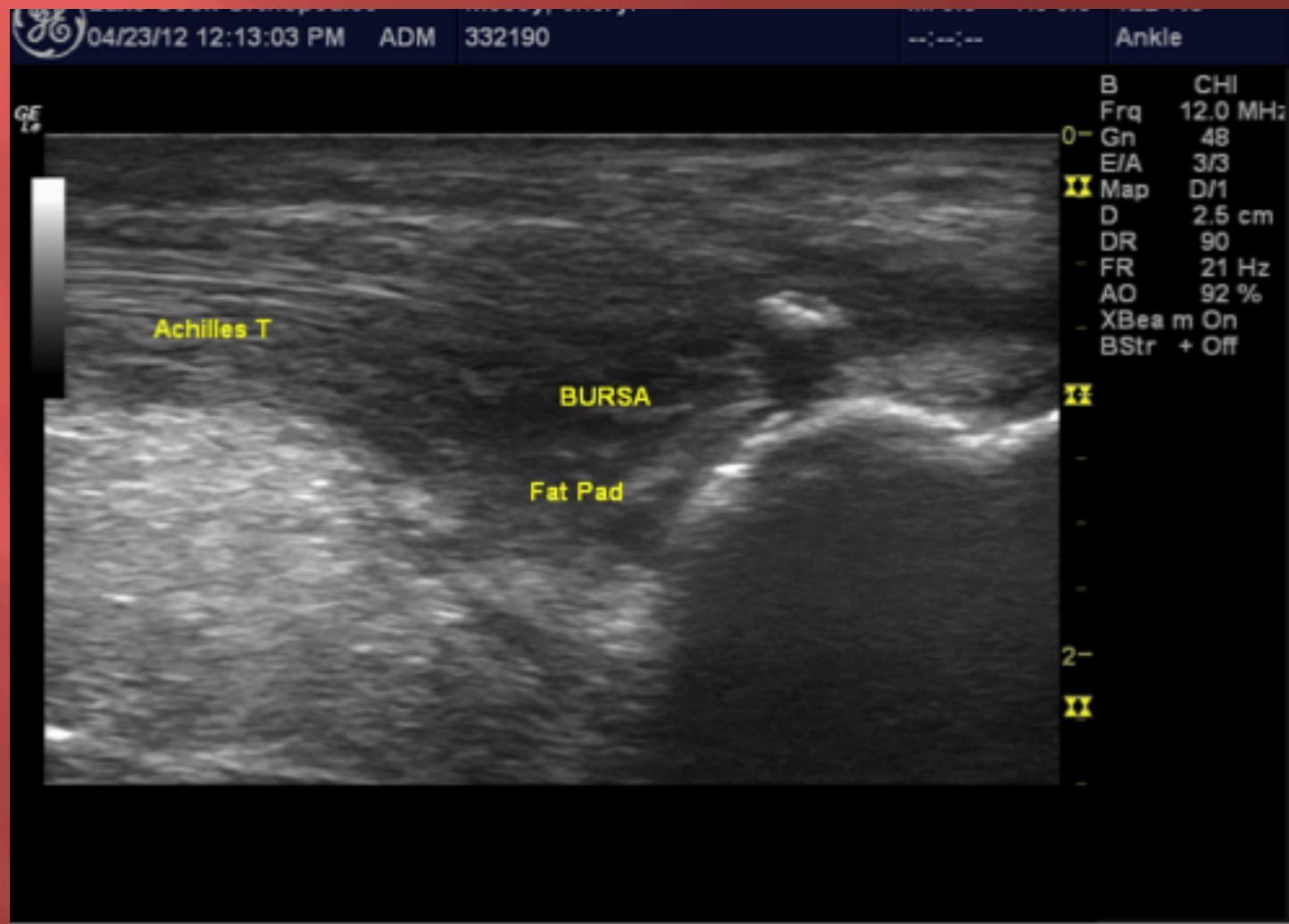
Diagnose and treatment with MSK US



Pathology



More pathology



Shoulder pathology

SUPRASPINATUS ARTICULAR SIDED TEAR

- ▣ More MSK studies written about the shoulder since early use of US for MSK problems due to the anatomy of the shoulder which makes US a great modality.



Shoulder injuries in WC

- ▣ 3rd most common injury in workers
- ▣ Cause of RTC impingement can be intrinsic or extrinsic
 - Intrinsic can be trauma or degeneration of the RTC with instability
 - Extrinsic can be boney changes or nerve root compression
- ▣ Loss of scapular motion or imbalance between the ST and GH muscular or arm elevation >90 degrees increase risk of RTC pathology

Shoulder conditions in WC

- ▣ RTC TEARS

- Full thickness/partial thickness

- ▣ AC dislocations

- ▣ Subacromial impingement with RTC tear

- ▣ GH dislocation

- ▣ Biceps tendon rupture or tendinopathy

MSK US Versus MRI of the Shoulder

Meta analysis by Braen, et al” Diagnostic accuracy of US, MRI and MRI arthrography” Br. Journal of Sports Med. 2015;49(20) 1316-28

Conclusion that US is as sensitive and specific as MRI to diagnose RTC tears.

However, still cant see bone or labral pathology

NERVE INJURY

45 Y.O. CARPENTER FOR 15 YEARS. COMPLAINS OF NUMBNESS AND PAIN IN THE PALM AND FIRST 2 1/2 DIGITS. CONSTANTLY GRIPPING AND HAMMERING 20 HOURS PER WEEK.

ALSO USES CORDLESS DRILL AND NAIL GUN THAT VIBRATES ANOTHER 10 HOURS PER WEEK. DENIES TRAUMA OR SIGNINIFICANT MEDICAL HISTORY BUT DOES SMOKE



EXAM

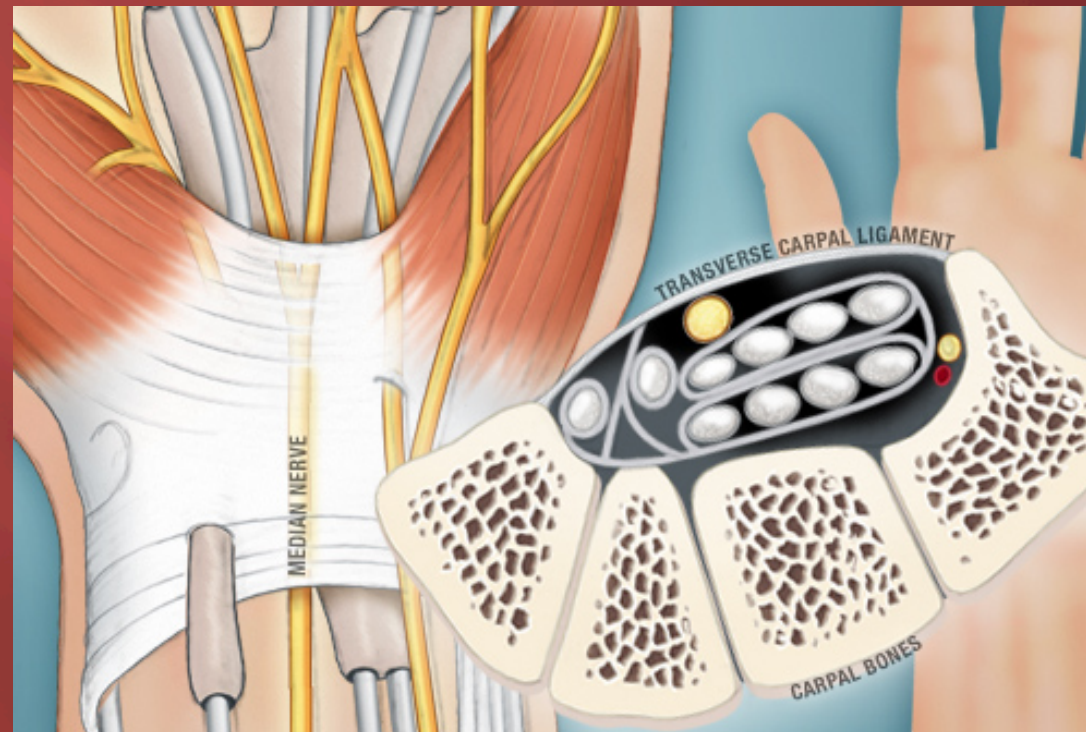
LOSS OF SENSATION IN THE
MEDIAN NERVE DISTRIBUTION
POSITIVE TINEL'S SIGN AT THE
WRIST

NEGATIVE PHALEN'S TEST

POSITIVE MEDIAN NERVE
COMPRESSION TEST

MMT IS 5/5 IN INTRINSIC HAND
MUSCLES

SPURLING IS NEGATIVE AND
DTR ARE NORMAL



CTS

MOST COMMON NERVE ENTRAPMENT SYNDROME
CTR IS TWICE AS COMMON AS RTC REPAIR
ESTABLISHING WORK RELATEDNESS

Exposure: workplace activities which cause or contribute to CTS: intense keyboard 12-20 hours/week, constant gripping, forceful /repetitive

Outcome: a diagnosis of CTS

Relationship: evidence which establishes 50% probability that workplace activities contributed to the development or worsening of the condition:

High -low : probability of work relatedness

Nerve pathology

ABNORMAL US FINDINGS

- ▣ Increase cross section area just proximal to site of entrapment
- ▣ Nerve flattening at the site of entrapment
- ▣ Change in nerve echotexture: hypoechoic, fascicle enlargement, increase vascularity, mobility

COMMON NERVE ENTRAPMENTS

- ▣ CTS: US is 85% sensitive and specific in several studies looking at CSA of the median nerve at the wrist or ratio proximal/distal
- ▣ Ulnar neuropathy at elbow: enlargement, hypermobility, ratio 1.4 maximal enlargement to unaffected site

Neuropathy:

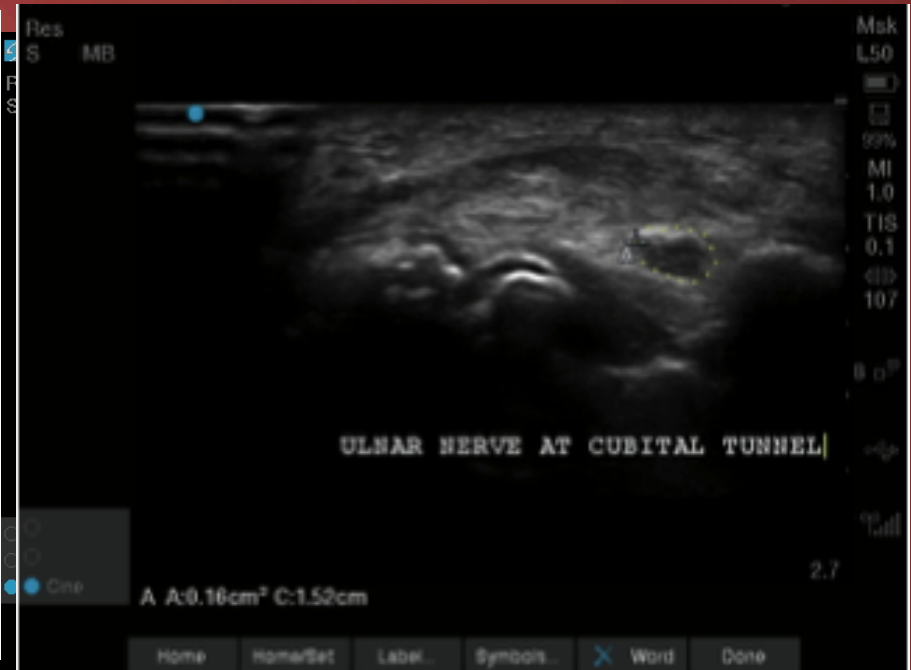
CARPAL TUNNEL SYNDROME

NERVE IS FLATTENED, ENLARGED,
CSA > .12 CM AND HYPOECHOIC

CSA JUST PROXIMAL TO CT IS 1.2 TIMES
LARGER

ULNAR NEUROPATHY AT ELBOW

NERVE IS ANECHOIC AND ENLARGED
AREA CSA > .10CM, FLAT, HYPOECHOIC
AND SUBLUXATION



Dynamic use of US

ULNAR NEUROPATHY WITHOUT SUBUXATION

EDX

- Sensitivity for ulnar neuropathy is between 50-75%
- Cant confirm subluxation like US

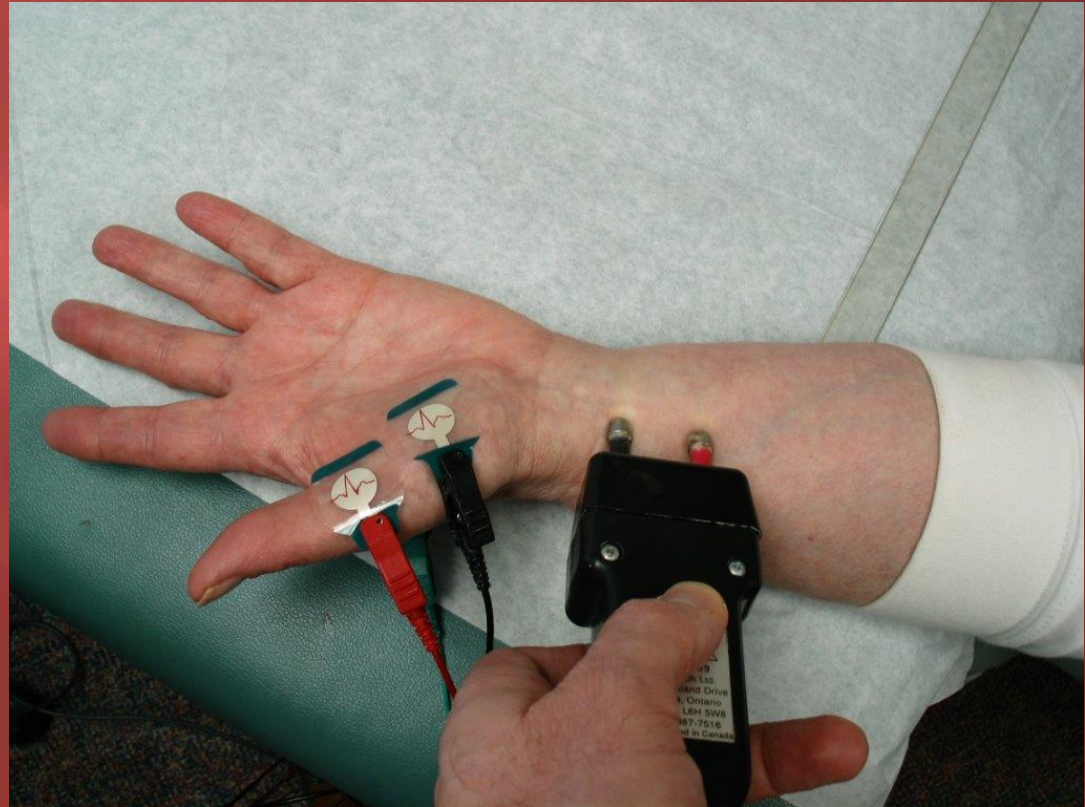


US / EDX use in CTS

US COMPARE TO
EMG/NCS IN CTS
QUICKER AND
CHEAPER THAN NCS/
EMG

SENSITIVITY AND
SPECIFICITY NOT AS
GOOD AS NCT/EMG
US IS NOT PAINFUL
LIKE EMG

But no measurements of
severity with US
currently



Nerve entrapment syndromes

Risk factors:

Vibration

Prolonged posture or awkward positioning that increases pressure of the carpal tunnel

- ▣ Treatment:
 - ▣ Modify work activities
 - ▣ Bracing
 - ▣ Steroid injection
 - ▣ Ulnar neuropathy
 - Open release
 - Open sub C or sub muscular transposition
 - ▣ CTR
 - Open
 - Endoscopic

Treatment of WC injuries with US guidance

- ▣ The advantage of using real time image guidance to improve accuracy and decrease the risk of injury
- ▣ All Joint injections but not great for the spine.
- ▣ Tendon sheath injections for steroid. Any tendon sheath can be visualized.
- ▣ Aspirations
- ▣ Nerve blocks

ACCURACY OF INJECTIONS

1. There is **no** study that shows that US decreases accuracy of injections

Accuracy

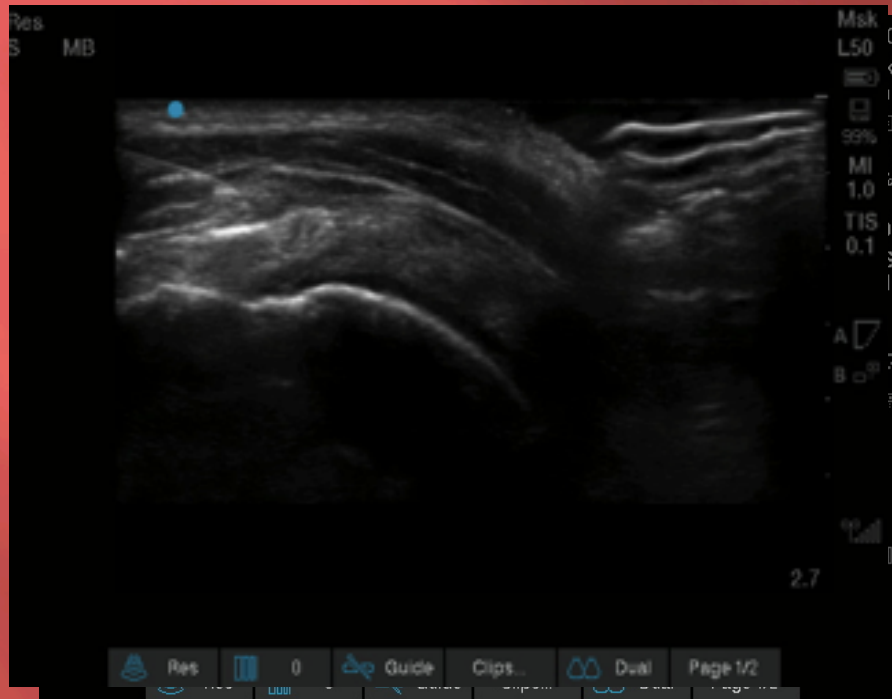
Joint	US guidance	Blind
Glenohumeral joint	95%	79%
Subdeltoid/ Subacromial	100%	63%
AC (1)	100%	45%
Knee (2)	99%	79%

- ▣ 1. Peck et al: *PMR* 2010; 2 :817-821
- ▣ 2. Curtis et al: *PMR* 2011; 6:

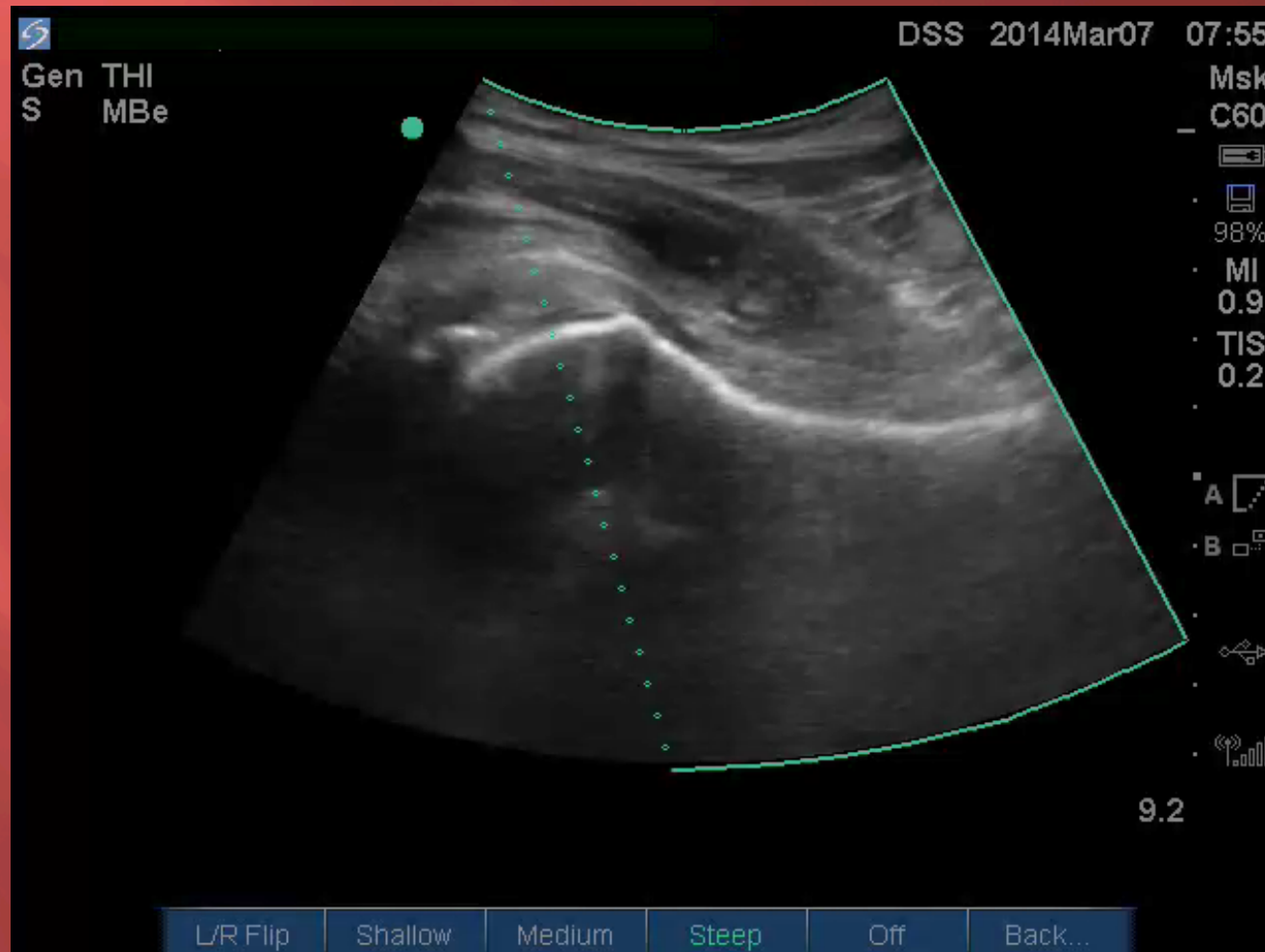
Accuracy

- ▣ However, the accuracy also depends on experience of years in practice and experience of using ultrasound : Curtis et al showed that the accuracy of injected the knee was from 55-100% depending on the experience of the physician
- ▣ SI joint 60-93%
- ▣ In addition when compared to “ blind “ surface localization, nerve stimulation, or emg, US guidance was superior in placement of needle for chemodenervation
- ▣ 1. Henzel et al PMR 2010
- ▣ 2. Jordan et al pain Physician, 2007
- ▣ 3.Mehmet et al US Med, 2003

Injection into SASD bursa



Hip Injection



Thank you
questions ???????????

