Ultrasound-Guided Injection Extremities

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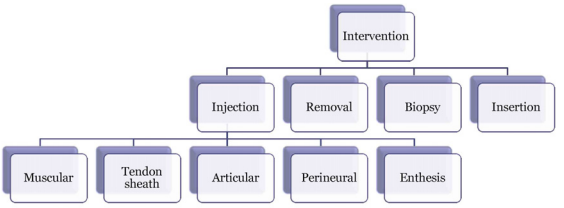
US-Guided Intervention



US-Guided Injection

- Intramuscular injection
  - *TPI*
  - *Torn muscle infiltration*
- Tendon sheath injection
  - *De Quervain disease*
- Intra-articular injection
  - *Steroid injection for arthritis*
- Perineural injection
  - *Peripheral nerve block*
- Enthesis
  - *Prolotherapy*

Commercial Local Anesthetics

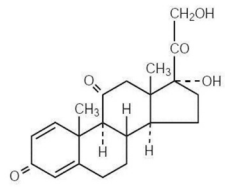
AL	pKa[b]	Water solubility of the neutral form (mM)[b]	Partition coefficient of neutral form	Potency[c]	Anesthesia time (h)[c]	Half-life (h)[c]
Procaine	9.2	16.3	84[b]	1	1	0.1
Mepivacaine	7.6	8.82	98[b]	2	1.5	1.5
Prilocaine	7.9	23.1	110[b]	3	1.5	1.5
Chlorprocaine	9.2	1.98	250[b]	4	0.75	0.1
Lidocaine	7.8	13.1	144[b]	4	1.5	1.5
Benzocaine	…	4.4	253[a]	n.d	n.d	n.d
Tetracaine	8.5	0.76	868[b]	16	8	2.5
Bupivacaine	8.1	0.58	798[b]	16	8	2.5
Etidocaine	7.7	0.16	1202[b]	16	8	3.0

Local Anesthetics

- Lidocaine
  - Sodium channel blocker
  - Commercially 1% or 2%
  - Block time 1 hour, but clinically effective than that.
  - 0.5~1% solution for usual injection

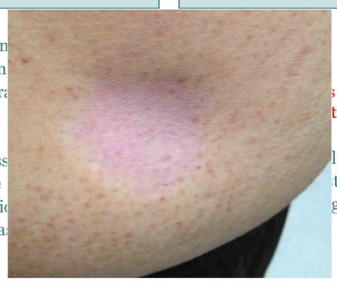
Steroid

- Anti-inflammation
- Variable action duration
  - Triamcinolone acetonide
  - Intra-articular
  - Intra-sheath
  - ***Never in the tendon body or nerve***

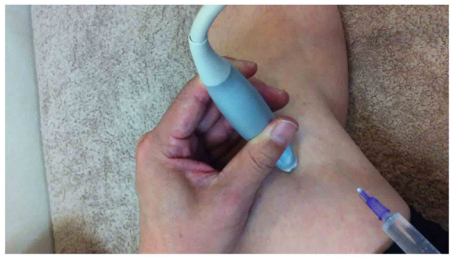


Side Effects of the Injection Materials

Lidocaine	Corticosteroid
• Local ▫ Hematon ▫ Infection ▫ Peripher • Systemic ▫ Dizziness ▫ Syncope ▫ Convulsi ▫ Cardiova	fat atrophy tion levation turbance g

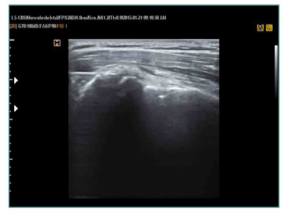


Technique of the US-Guided Injection

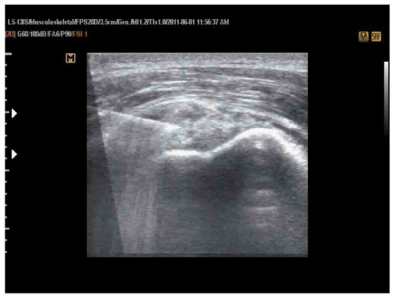


Aspiration and Lavage

Aspiration	Lavage
• Synovial fluid collection • Inflammatory exudate or pus • Hematoma • Ganglion	• Calcium deposit

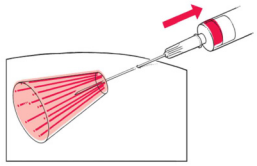


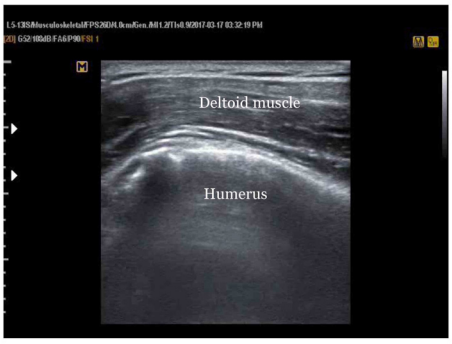
Unexpected diagnosis with Injection



Intramuscular Injection

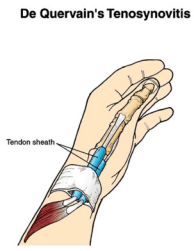
- Infiltration between muscle fibers
- With or without steroid
- Various methods





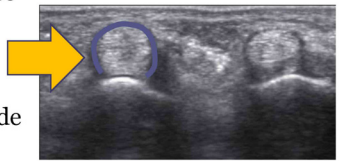
Tendon Sheath Injection

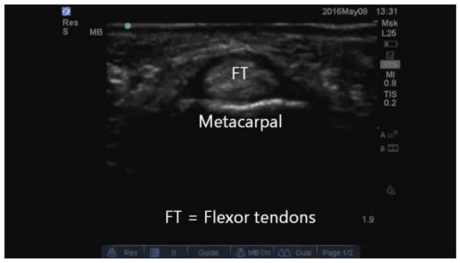
- Around tendons
- Lubrication and preventing excessive friction
- Tenosynovitis
- *Ultrasound guidance*



Tendon Sheath Injection

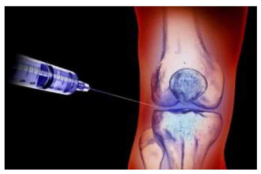
- De Quervain disease
- Trigger finger
- Mandatory US-guide





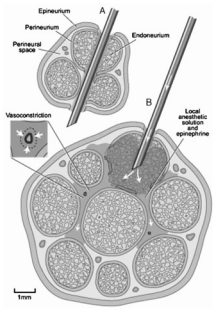
Intra-articular Injection

- Synovial inflammation
  - Osteoarthritis
  - Traumatic arthritis
  - Gout
  - Rheumatoid arthritis
- Mostly with steroid

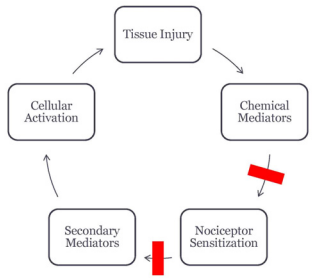


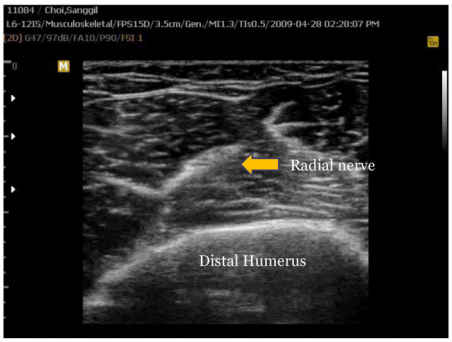
Perineural Injection

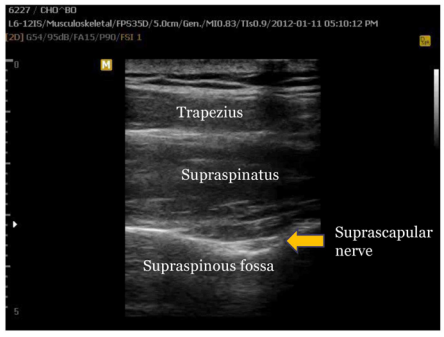
- Peripheral nerve block
  - Near or around the nerve
  - Not into the nerve
  - With or without steroid
- US-guidance for safety
  - With great care
  - Location of the needle tip

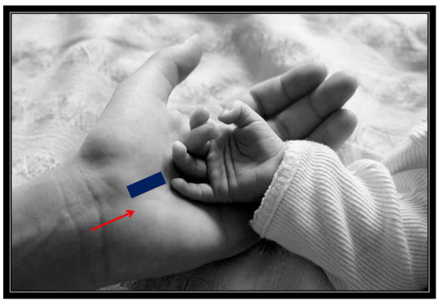


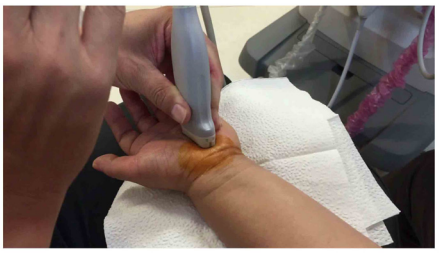
Role of Peripheral Nerve Block

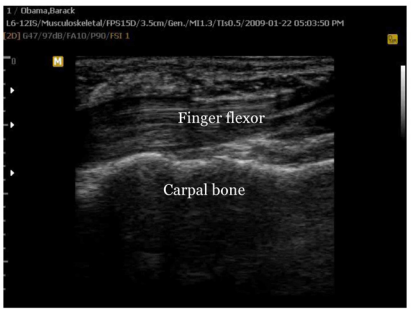






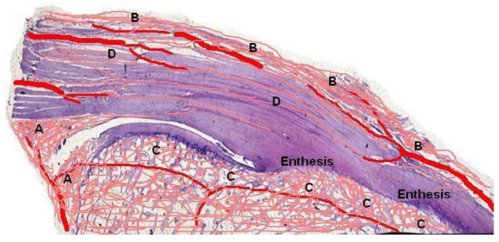






Enthesis Injection

- Tenoperiosteal junctions or ligament attachment sites

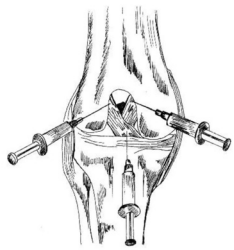


Enthesis Injection

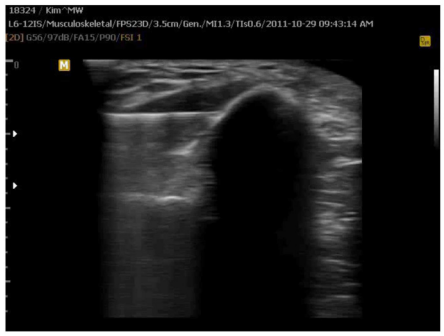
- Enthesopathy
  - Degenerative condition at the enthesis
    - Tennis elbow
    - Golf elbow
  - Pain aggravation after use
    - Poor healing process
    - Angiofibroblastic invasion
  - Progressive course
  - Conditions showing good results to prolotherapy

Enthesis Injection

- Prolotherapy : proliferation + therapy
- Induce regenerating and healing process
- Various proliferants including **glucose solution**
- With or without US guide



Prolotherapy of the Knee
Prolotherapy is effective for injuries to the knee ligaments, tendons, menisci, and cartilage.



Final Message

- *For the growth of the elderly population, the musculoskeletal disorders are increasing and they draw the intention of many physicians not only of the orthopedic surgeons.*
- *Many outpatients in the neurologic clinics are suffering from those ailments. They might visit you only for the relief of their pain.*

Final Message

- *Neurologist are going to have to know the musculoskeletal disorders as well as neurological diseases.*
- *For us the ultrasound are versatile in many ways and it can widen the horizon of our practice.*