

Nerve & Joint Blocks in Large Animals

Nerve & Joint Blocks

- Indications
 - Localize areas of lameness within a limb
 - Desensitize areas of a limb for surgical / noxious procedures

Neurophysiology Review

- How do local anesthetics work?
 - Nerves require Na^+ influx from extracellular to intracellular
 - Binds and blocks the Na^+ gated channels on the neuronal cell membrane
 - No influx of Na^+ from extracellular to intracellular
 - No depolarization
 - Can be coupled with epinephrine for vasoconstriction
 - Longer anesthetic
 - Less bleeding

Formulations

Drug	Onset	Duration
Lidocaine	Fast	1 – 2 hours
Mepivacaine (Carbocaine®)	Fast	2 – 3 hours
Bupivacaine	Intermediate	3 – 6 hours

Nerve & Joint Blocks

- Anatomical Considerations
 - What structures do the nerves innervate at varying levels of the limb?
 - Where do the nerves branch?
 - Are certain joints separate or do they communicate with other joints?
 - Are synovial structures in close proximity to nerves?

Nerve & Joint Blocks

- Lameness Exam Considerations
 - Is the lameness ‘blockable’?
 - Can you see it consistently
 - Is the horse amendable to nerve blocks?
 - No sedation allowed
 - Distal-to-Proximal nerve block sequence
 - Nerve blocks desensitize distal and deep to site of injection
 - Did the nerve block work?
 - Skin sensitivity

Nerve & Joint Blocks

- Preparation
 - Nerve blocks
 - Ensure skin is clean
 - 1 – 5 minutes of cleaning the skin with chlorhexidine/betadine + alcohol
 - Joint blocks
 - Entering the joint, so requires aseptic preparation of the skin
 - 10 minutes minimum
 - Sterile technique (gloves, needle, syringe)
 - New bottle of local anesthetic
 - Nerve blocks near a synovial structure warrant consideration for an aseptic preparation
 - ‘What if’ you inadvertently inject the synovial structure

Nerve & Joint Blocks

- Side effects
 - Cellulitis
 - Hematoma
 - Synovitis
 - Septic vs. Non-septic
 - Local Anesthetic Toxicity
- Outcome
 - Did the lameness improve or not?
 - False negative?
 - Mechanical, Deep pain, Learned behavior

Resource



- “Equine Joint Injection and Regional Anesthesia”
- Editors: William Moyer, Jim Schumacher, John Schumacher
- Publisher: Academic Veterinary Solutions, 2011
- Amazon Cost: \$100

NERVE BLOCKS

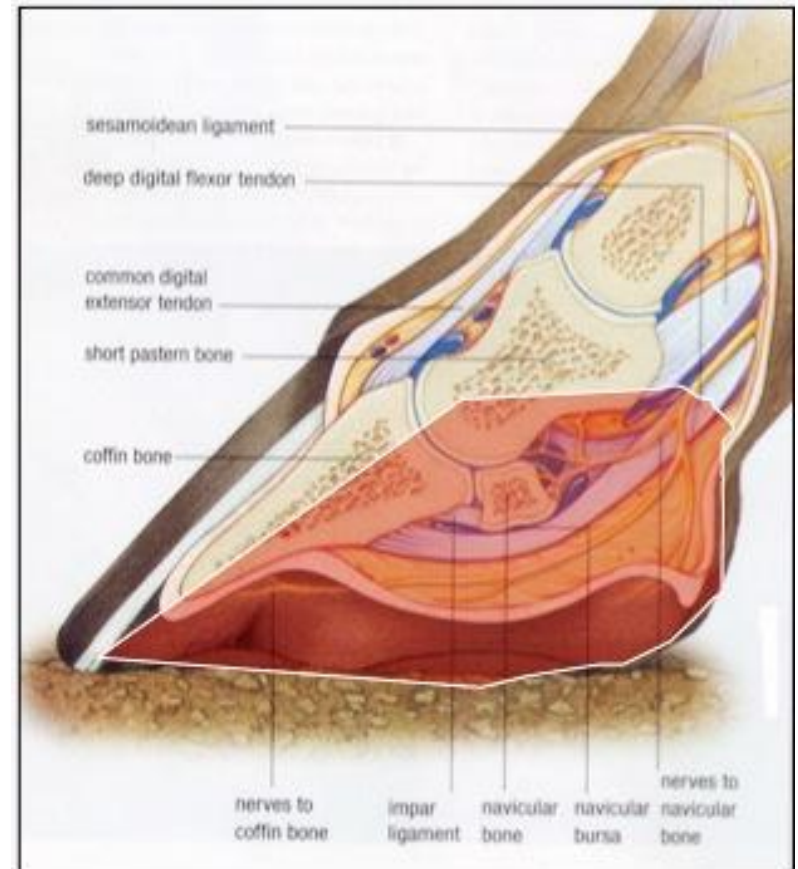
Palmar / Plantar Digital Nerve Block

- Volume:
 - 1 – 2 cc
- Needle:
 - 25 gauge, $\frac{3}{4}$ inch
- Technique:
 - Palpate the lateral and the medial palmar/plantar digital neurovascular bundle.
 - Place needle axial to the collateral cartilage, as low in the foot as possible.
 - Can perform with the limb held up or with the horse standing on the limb.



Palmar / Plantar Digital Nerve Block

- Blocks palmar/plantar third of foot & the sole
 - Navicular bone
 - Navicular bursa
 - Digital cushion
 - Distal aspect of DDFT
 - Wings of P3
 - Sole, bars, heels, frog
 - (occasionally) coffin joint



Abaxial Nerve Block

- Volume:
 - 1 – 2 cc
- Needle:
 - 25 gauge, $\frac{3}{4}$ inch
- Technique:
 - Palpate the lateral and medial palmar/plantar digital neurovascular bundle on the abaxial aspect of the sesamoid bones.
 - Insert needle along length of the nerve.
 - Nerve is at the palmar/plantar aspect of the bundle
 - cranial -> "V.A.N." -> caudal



Abaxial Nerve Block

- Blocks everything below the level of the fetlock
 - Foot
 - Coffin joint
 - Pastern Joint
 - P1/P2/P3
 - Distal DDFT
 - Distal Extensor Tendons
 - Distal Sesamoidean Ligaments



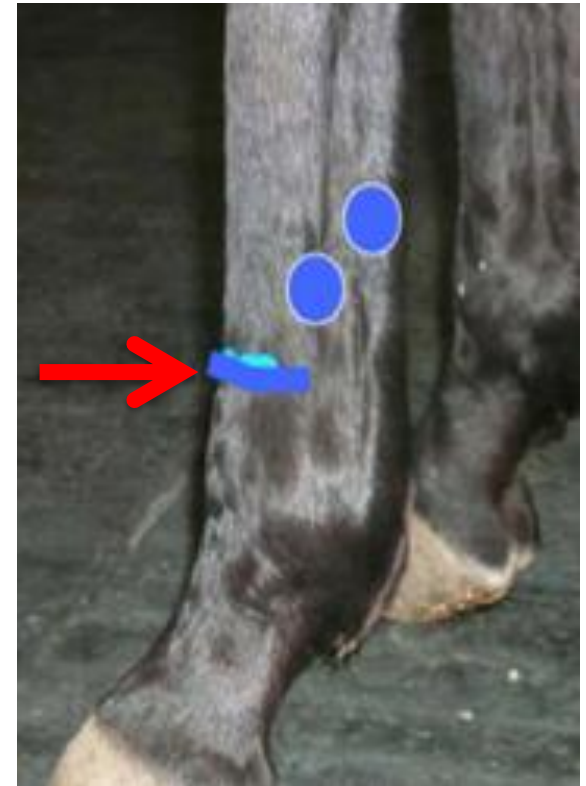
Low Four Point Nerve Block

- This block is specific for the forelimbs
- Volume & Needle:
 - 2 – 3cc
 - 1 inch, 22 gauge
- Technique:
 - Lateral & medial palmar nerves (2)
 - Lateral & medial palmar metacarpal nerves (2)
 - Lateral & medial palmar nerves
 - Between the DDFT and suspensory ligament, halfway up the length of the cannon bone
 - Avoid the flexor tendon sheath
 - Lateral & medial palmar metacarpal
 - Distal to the 'button' of the lateral & medial splint bone



Six-Point Nerve Block

- Volume & Needle:
 - 2 – 3cc
 - 1 inch, 22 gauge
- Technique:
 - Lateral & medial plantar nerves, and lateral & medial plantar metatarsal nerves are blocked identical to 4-point block in the forelimb
 - In the hindlimb, ‘dorsal metatarsal’ nerves innervate the dorsal surface
 - Therefore, *an additional* subcutaneous ring block is directed dorsally



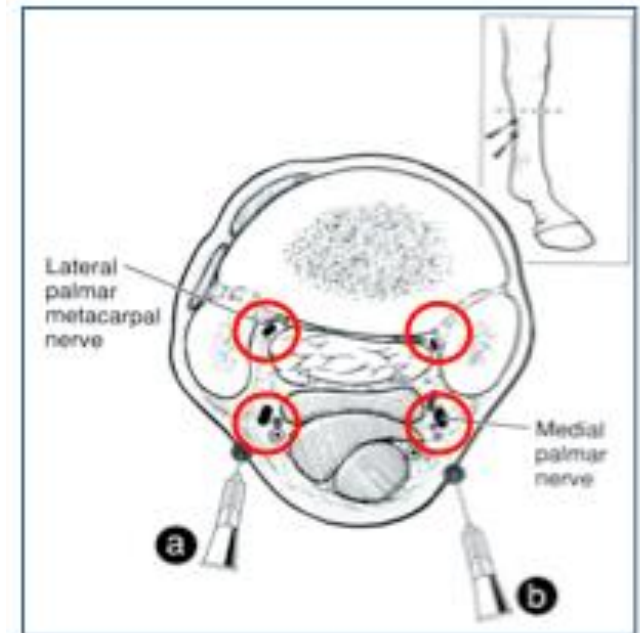
Low Four & Six Point Nerve Block

- Blocks fetlock joint and all structures below
 - DDFT/SDFT up to level of block
 - Insertion/branches of suspensory ligament



Proximal Metacarpal/tarsal

- Volume & Needle:
 - 2 – 3cc
 - 1.5 inch, 22 gauge
- Techniques:
 - *High 4-point*: block the palmar nerves between DDFT & suspensory ligament, and block palmar metacarpal nerves axial to the splint bone and abaxial to the suspensory ligament
 - *Local infiltration of suspensory ligament*: Directly infiltrate along axial aspect of splint bones, directly next to the suspensory ligament
 - *Lateral palmar*: Anesthetize the lateral palmar nerve as it courses along the medial aspect of the accessory carpal bone



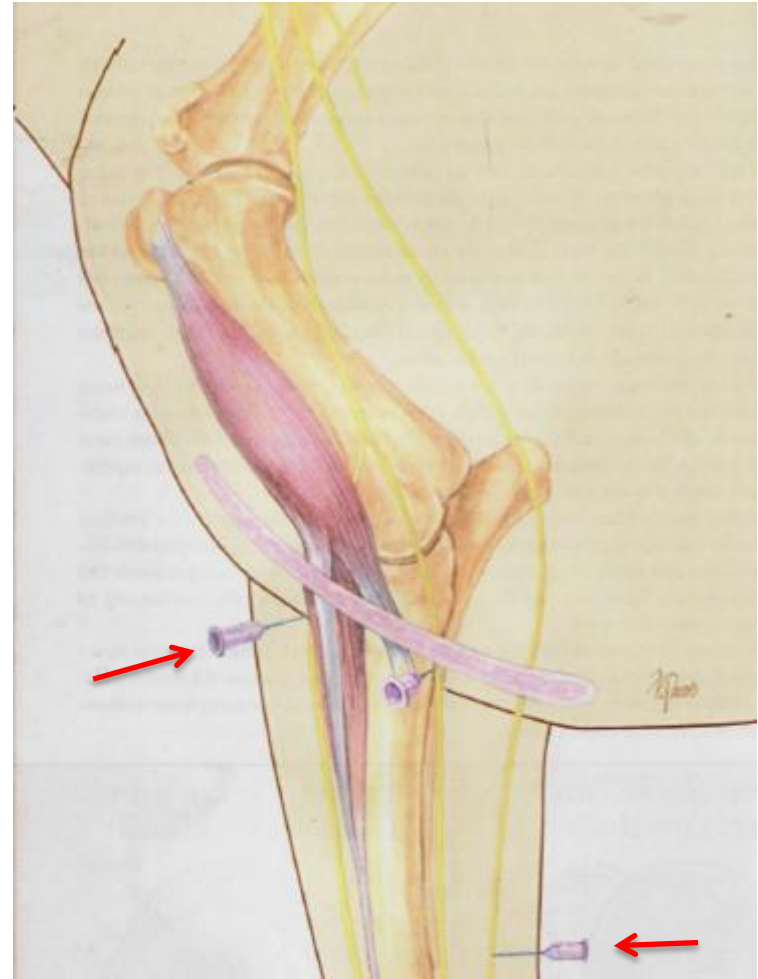
Proximal Metacarpal/tarsal

- Blocks all structures distal to the carpus, including the proximal suspensory ligament.



Median & Ulnar Nerve Block

- Volume & Needle
 - 10cc, 1.5inch 22 gauge
- Technique
 - Median nerve: inject 5cm distal to the elbow joint, on the medial aspect of the limb. The needle is walked off the caudal aspect of the radius.
 - Ulnar nerve: inject 10cm proximal to the accessory carpal bone, between the flexor carpi ulnaris muscle and ulnaris lateralis muscle.



Median & Ulnar Nerve Block

- Blocks entire limb from distal radius down, including the carpus.



Peroneal & Tibial Nerve Block

- Volume: 10 - 20cc
- Needle: 1.5 inch, 22 gauge
- Technique:
 - Deep and superficial peroneal nerve: is anesthetized on the lateral aspect of the limb, 10cm proximal to the point of the hock, in a groove created by the long and lateral digital extensor muscles.
 - Tibial nerve: is blocked 10cm proximal to the calcaneus, between the gastrocnemius tendon & superficial digital flexor tendon.
 - Nerve lies closer to medial aspect of the limb



Peroneal & Tibial Nerve Block

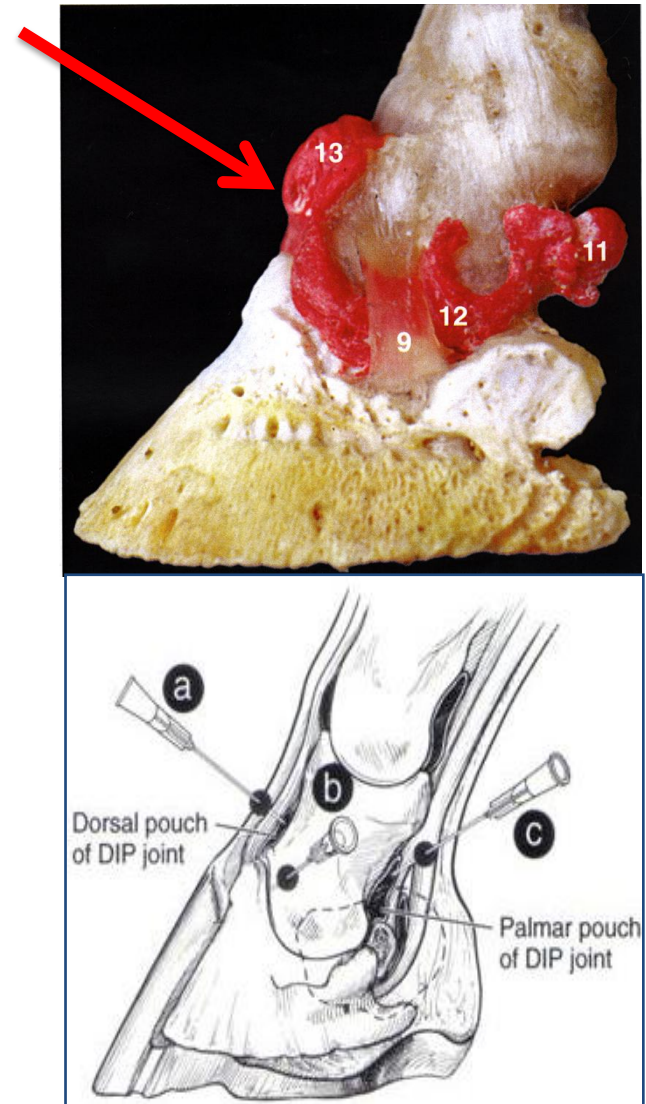
- Blocks entire limb from distal tibia down, including the tarsus.



JOINT BLOCKS

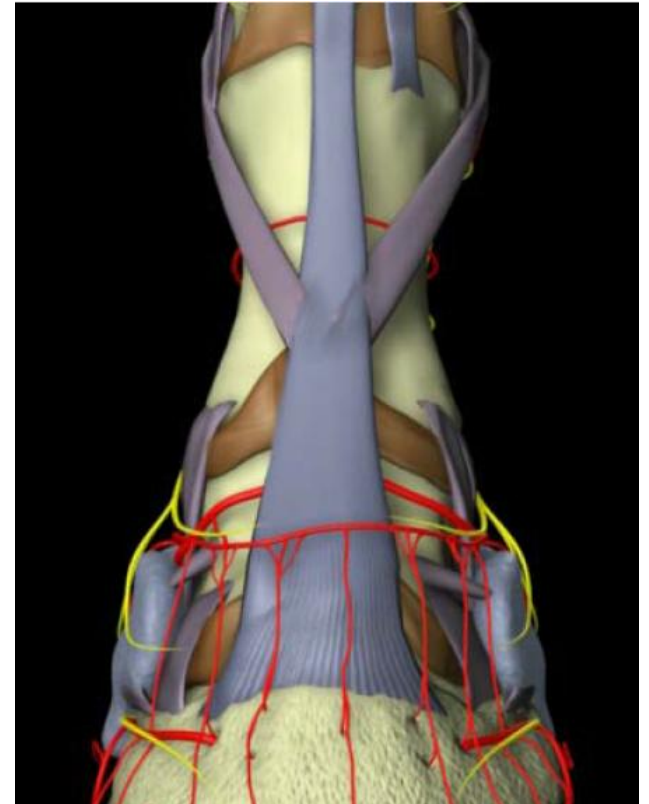
Coffin Joint Block

- Needle: 1.5 inch, 20 gauge
- Volume: 4 – 6 cc
- Technique:
 - Dorsal: Insert needle through dorsal surface of distal limb, 1-2cm proximal to the coronary band. Needle penetrates common digital extensor tendon. Needle aligned either perpendicular to skin surface or parallel to ground.
 - Lateral: Palpate the proximal edge of the collateral cartilage, halfway between dorsal and palmar/plantar aspect of P2. The needle is angled medial and down-wards.



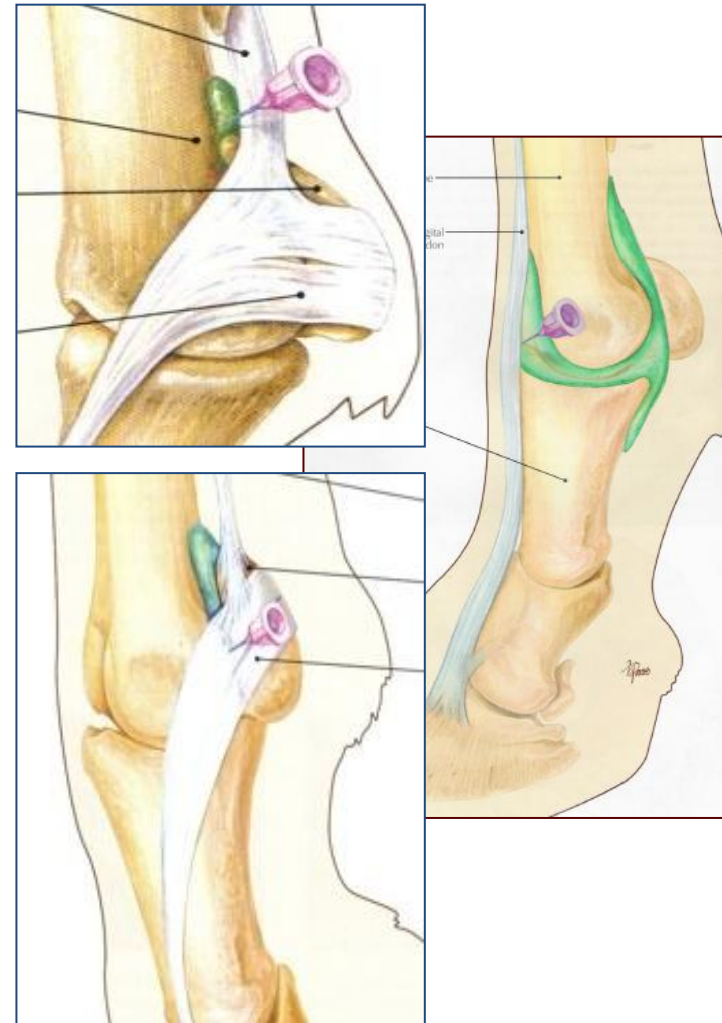
Coffin Joint Block

- Dorsal approach is both vascular and well innervated
 - Site will bleed
 - Stay in a safe position
- Bandage site after injection
- Structures blocked include the entire coffin joint, and navicular bursa by diffusion.



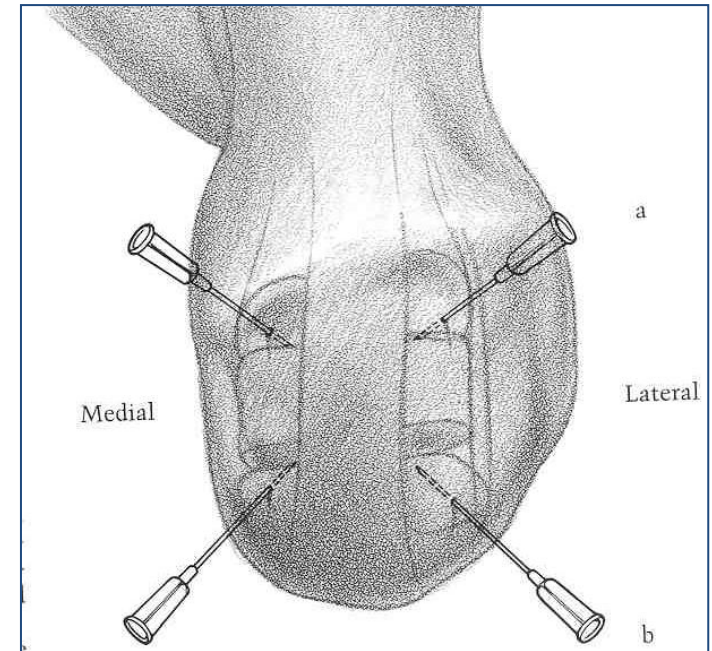
Fetlock Joint Block

- Volume & Needle: 8 – 12cc, 20 gauge, 1.5 inch
- Proximal palmar/plantar pouch: Palmar/plantar to the cannon bone, dorsal to the lateral branch of the suspensory ligament, and distal to the button of the lateral splint bone. Needle is inserted laterally and angled downward.
- Dorsal pouch: Dorsal aspect of the fetlock, needle inserted lateral and parallel to the frontal plane. Needle enters deep to the common/long digital extensor tendon.
- Distal palmar pouch: Palpate recess along distal dorsal side of lateral sesamoid bone, proximal to palmar/plantar process of P1. The needle is angled upward and dorsal-medial.
- Collateral Sesamoidean approach: Insert the needle between the palmar/plantar aspect of the cannon bone and dorsal articular surface of the sesamoid bone, penetrating through the lateral collateral sesamoidean ligament.



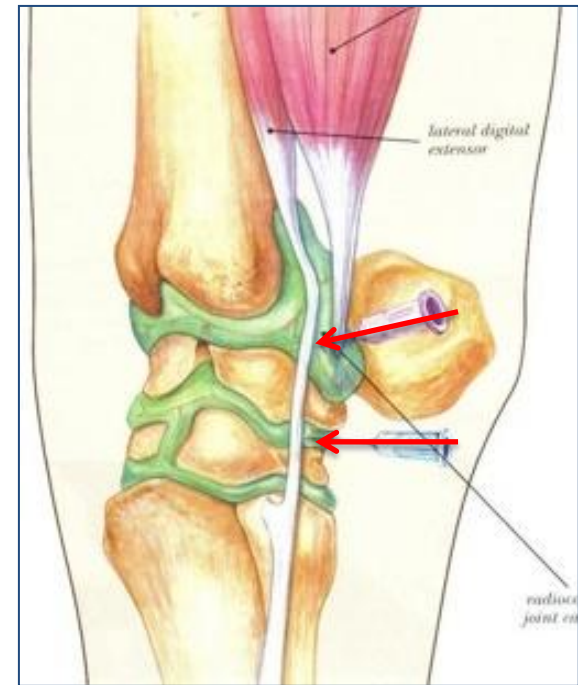
Carpus Joint Block

- Needle & Volume:
 - 20 gauge, 1.5 inch, 7-10 cc
- Radiocarpal joint: injected dorsally, with the carpus flexed. Palpated as indentation on medial or lateral side of extensor carpi radialis tendon. Proximal border is the dorsal-distal radius and distal border is dorsal-proximal radial/intermediate carpal bone. The needle is directed straight into the indentation.
- Intercarpal joint: Similar. Carpus flexed and indentation medial or lateral side of extensor carpi radialis tendon. Proximal border is dorsal-distal radial/intermediate carpal bone, and distal border is proximal border of third carpal bone. The needle is directed straight into the indentation.



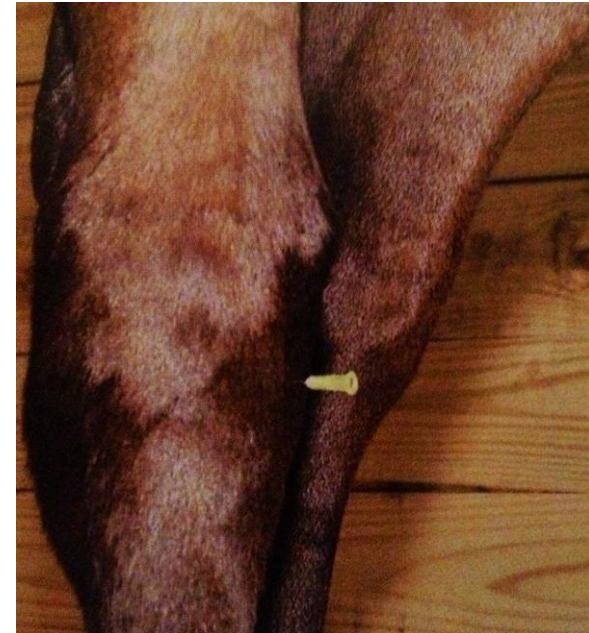
Carpus Joint Block

- Lateral approach:
 - Palpate notch created by the ulnaris lateralis tendon and lateral digital extensor tendon. Insert the needle into small depressions immediately distal to this notch.
 - The benefit of this approach is that it can be performed with the horse standing on the limb.
- The radiocarpal joint block is isolated only to that joint.
- Due to communication, the intercarpal joint block also blocks the carpal-metacarpal joint.



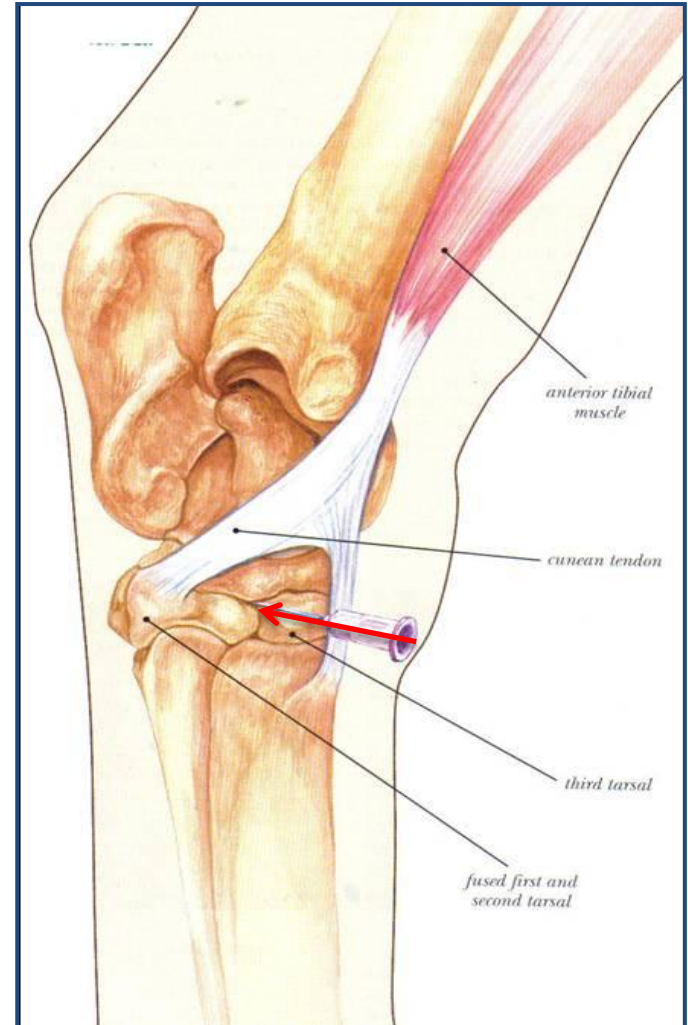
Tibial-Tarsal Joint Block

- Needle & Volume:
 - 1.5 inch, 20 gauge, 10 - 20 cc
- Tibial-tarsal joint is approached on the dorsal-medial aspect of the hock, where the joint pouch is easily palpated. The needle is inserted directly inwards.
- Important to be aware of the *saphenous vein* and avoid during needle insertion.
- Can inject the medial or lateral plantar pouch of tibia-tarsal joint
 - Easier when effusive
- Structures blocked:
 - Tibialtarsal itself is blocked, as well as the proximal inter-tarsal joint due to communication.



DIT & TMT Joint Block

- Needle: 1 inch, 22 gauge
- Volume: 3 – 5cc
- Distal intertarsal joint:
 - Injected on medial aspect
 - Limb situated forward
 - Needle inserted into a T-shaped gap formed by the junction of
 - Fused first & second tarsal bone,
 - Third tarsal bone
 - Central tarsal bone
 - T-shaped gap is immediately distal to the cuneal tendon.



DIT & TMT Joint Block

- Needle: 1.5 inch, 20 gauge
- Volume: 3 – 5 cc
- Tarsal-metatarsal joint:
 - Injected on the plantar-lateral aspect of the hock
 - Needle is inserted immediately above the head of the lateral splint bone
 - Needle is angled in a dorsal-medial and distal direction



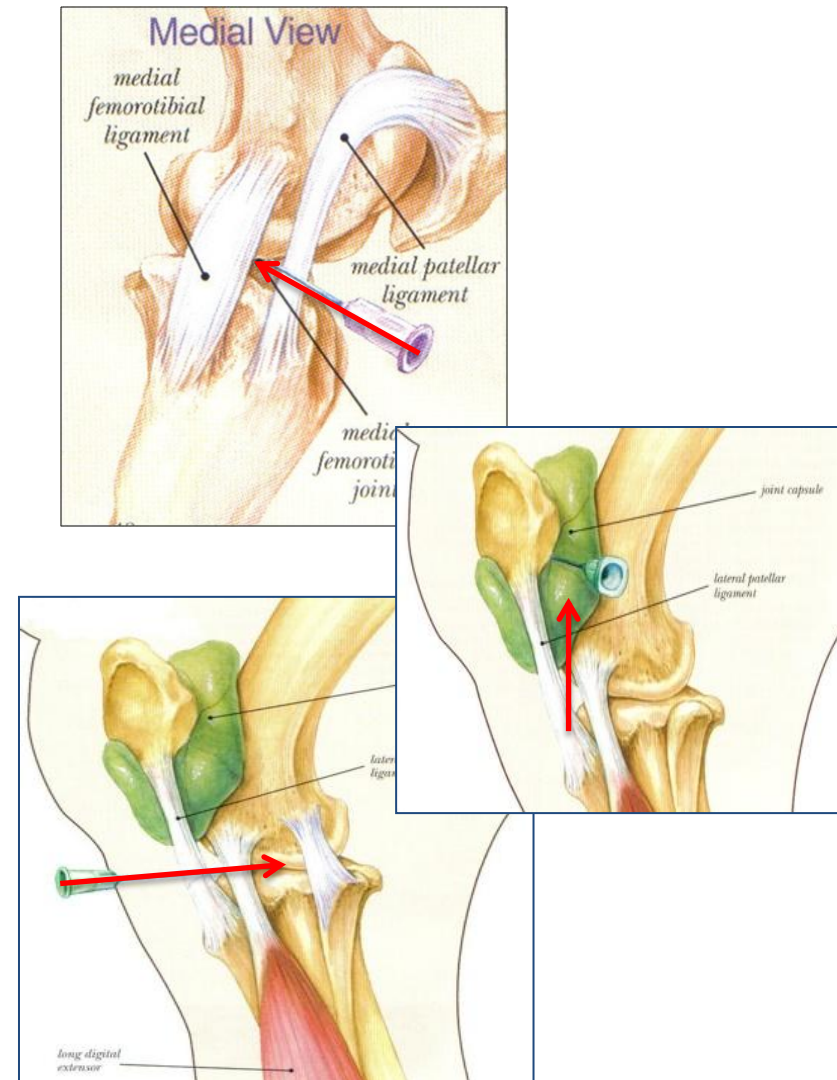
DIT & TMT Joint Block

- In approximately 25% of cases, the distal intertarsal and tarsal-metatarsal joints communicate
- In approximately 10% of cases, the distal intertarsal joint communicates higher up with the proximal intertarsal & tibiotarsal joint



Stifle Joint Block

- Needle: 18 gauge, 1.5 inch
- Volume: >20 cc
- Medial Femoral-Tibial:
 - Needle is inserted in between the medial patellar ligament and medial collateral ligament, proximal to the tibial tuberosity.
 - Watch for & avoid vessels
- Femoral-Patellar:
 - Needle is inserted in between the medial and middle patellar ligament, proximal to the tibial tuberosity. Needle is angled upwards, towards the suprapatellar recess.
- Lateral Femoral-Tibial:
 - Needle is inserted caudal to the lateral collateral ligament, proximal to the proximal-lateral edge of the tibia.



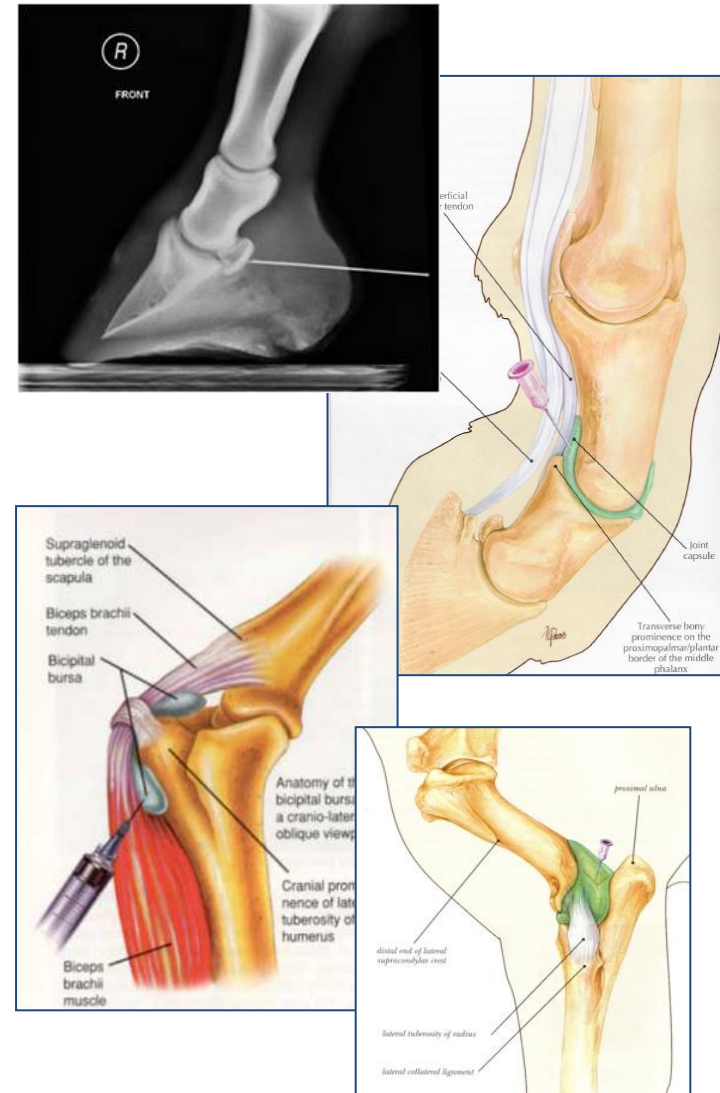
Stifle Joint Block

- Approximately 25% communication between femoral-patellar and medial femoral-tibial
- Approximately 15% communication between femoral patellar and lateral femoral-tibial
- Approximately 30% communication between medial femoral-tibial and lateral femoral-tibia.



Other Locations

- Any synovial structure can be amenable to intra-articular, intra-bursal, or intra-theal anesthesia if clinical examination creates suspicion.
- Review in reference textbook prior for less common anatomical sites prior to injection procedure
- Examples
 - Proximal Interphalangeal Joint, Tendon Sheath, Carpal Canal, Elbow Joint, Shoulder Joint, Hip Joint, Bicipital Bursa, Navicular Bursa, Tarsal Sheath, Sacroiliac Joint



Take Home Points

- **Knowledge of anatomy is essential in understanding diagnostic perineural and intra-synovial anesthesia.**
- Know the mechanism of action for local anesthetics
- Understand when to use blocks during your exam, how to prepare the injection site, how to determine if block worked, etc.
- Understand what structures are blocked with each nerve or joint block.
- You will not always remember where to perform each nerve or joint block until you perform the procedure a few times. Know where to find a description so you can review the technique prior to performing the nerve/joint block clinically.

QUESTIONS?