



Musculoskeletal

tal

Assessment & Diagnostic Studies

2022

Assessment- Health

• **History**

• **Chief Complaint**

• **History of present illness**

- Pain
- Joint Swelling
- ↓ strength
- Change in the size of an extremity or muscle
- Deformity
- Spasms
- Crepitation
- Change in sensation
- Stiffness
- Change in gait
- Change in functional abilities - ADL's



Health History

- **Past Medical History**

- Illnesses
- Immunizations
- Meds & Allergies
- Injuries, Hospitalizations, OR

- **Family History**

- Rheumatoid
- Degenerative arthritis
- Gout
- Scoliosis

Health History

- **Social History**

- Occupation
- Exercise – sedentary vs. heavy lifting/active
- Diet

- **Review of Systems**

- Describe problems with joint pain, muscle spasms, redness or swelling, ↓ movement, weakness
- Are ADL's affected?



Physical Assessment

- **Need to always compare bilaterally!**
 - Check the normal before the abnormal
- **Inspection**
 - Symmetry
 - Skin
 - Muscles
 - Deformity
 - Coordination, gait
 - Posture
 - Ability to perform ADL's

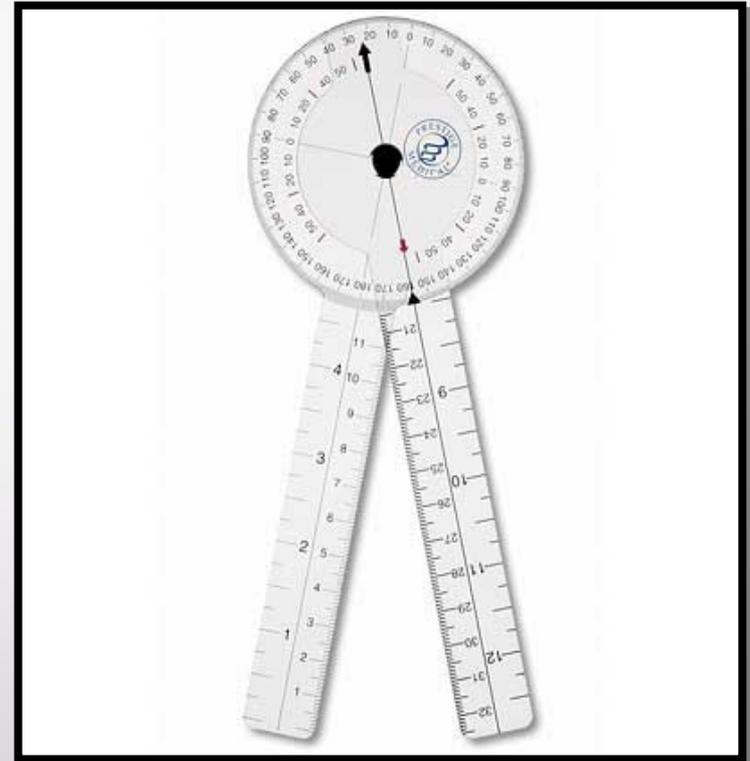
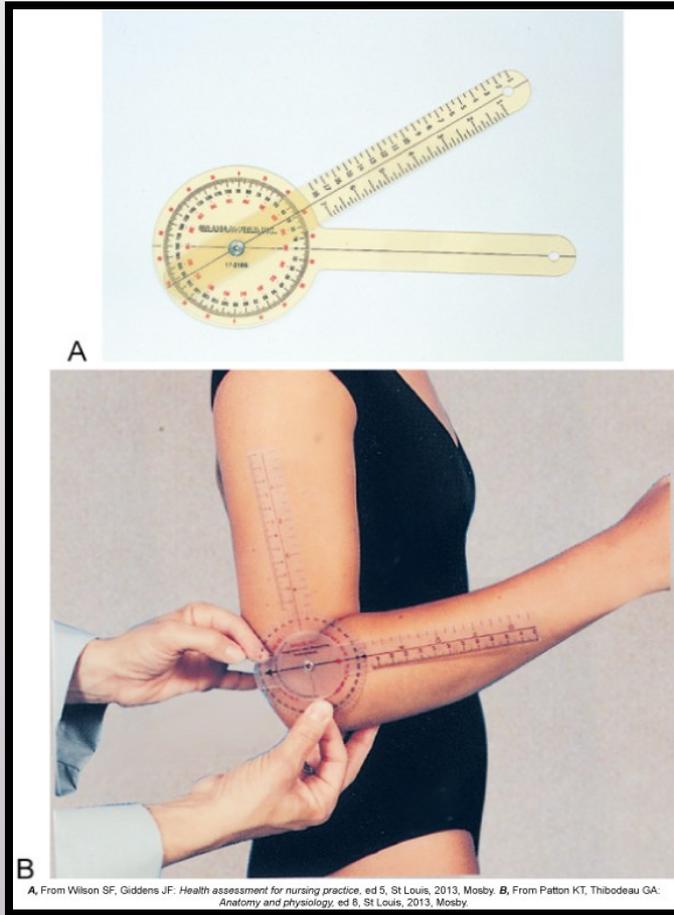


Physical Assessment

- **Palpation**

- *Gently* palpate muscles, bones, joints – note swelling, warmth, nodules, spasm, pain, crepitation
- Muscle Strength Testing
 - Grade it 0-5
 - 0 = no muscular contraction
 - 5 = active movement against full resistance without fatigue
- ROM – normal arc of joint movement
 - active before passive ROM
 - Goniometer – measure joint motion, ✓ angle of the joint

Goniometers



Physical Assessment

- **Normal MS Assessment**

- Full Rom of all joints
- No joint swelling, deformity, or crepitation
- Normal spinal curvatures, no tenderness on palpation of the spine
- No muscle atrophy or asymmetry

Muscle strength = grade 5

Neurovascular (NV) Assessment

- **Nervous and Circulatory systems need to be assessed**
 - Frequency of the assessment depends on the extent of the injury & acuteness
 - Document accurately and completely
 - 6P's -Pain, Pallor, Pulses, Paraesthesia, Paralysis, and Poikilothermia
 - To prevent complications associated with Orthopedic traumas, fractures, surgeries that can lead to permanent injury and death

Neurovascular (NV) Assessment

• Circulation

– **Color:** Pale / Pink / Cyanotic

- Pink-Normal
- Pale = ↓ arterial blood supply
- Cyanotic = venous stasis

– **Temperature:** Warm / Cool / Cold

- Warm-Normal
- Cool or Cold = ↓ arterial blood supply

– **Capillary Refill:**

- Rapid = < 3 sec (WNL)
- Slow or Sluggish = ↓ arterial blood supply

-**Edema:** Present? = Poor venous return. Is it pitting
or non-pitting?

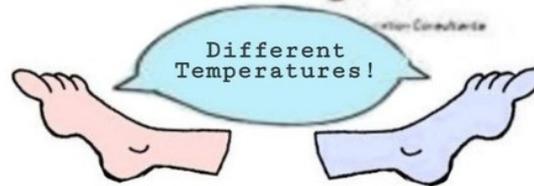
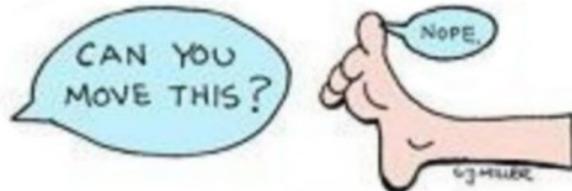
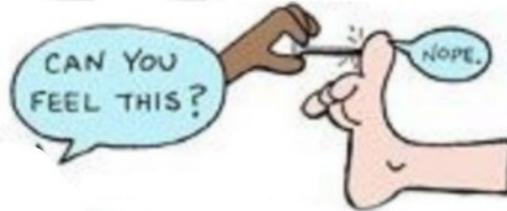
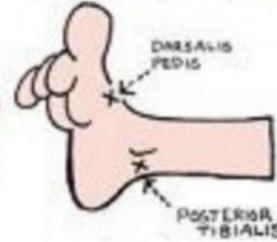
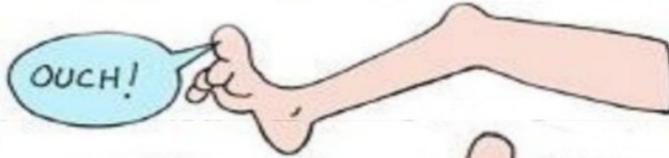
-**Pulse:** Absent or Present

- Note the rate and strength

Neurovascular (NV) Assessment

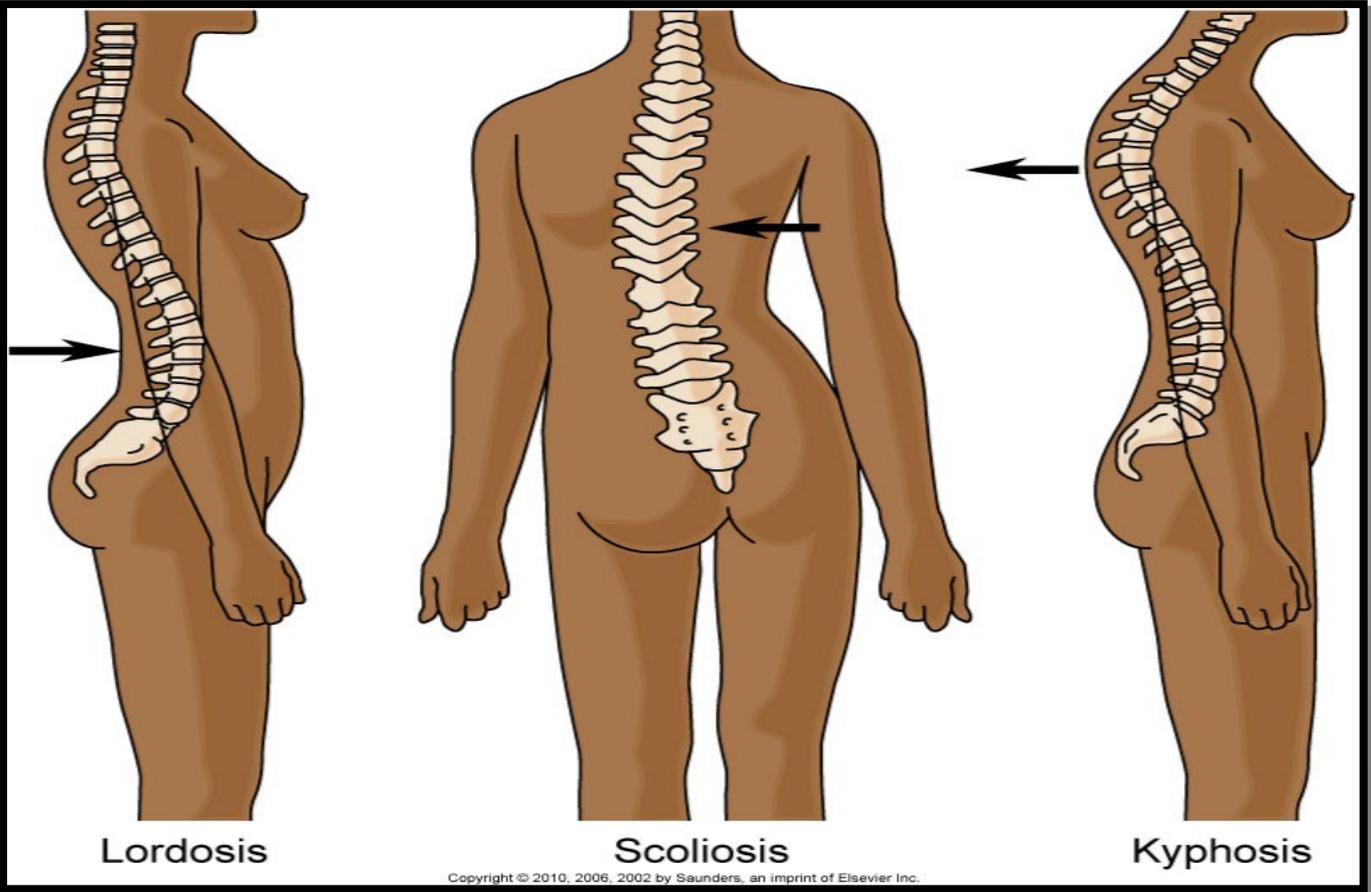
- **Nervous (Sensation & Movement)**
 - Present / decreased / absent**
 - Light & deep stimuli
 - How & Where
 - **Numbness & Tingling:** Paraesthesia present?
 - Pressure on nerves innervating parts distal to the injury
 - Motion: Present / Decreased / Absent

**** Compare with uninvolved limb to determine extent of deviation from normal!**



Abnormalities

- **Kyphosis**
 - Round Back, forward bending of the spine
 - Thoracic spinal curvature
 - “Hunchback”
- **Scoliosis**
 - Lateral curvature of the spine
 - “S” shape
- **Lordosis**
 - Exaggerated lumbar curvature
- **Genu Varum (Varus)**
 - Inward turning of the foot
 - Angulation of bone toward the midline
 - Bowlegged



Lordosis

Scoliosis

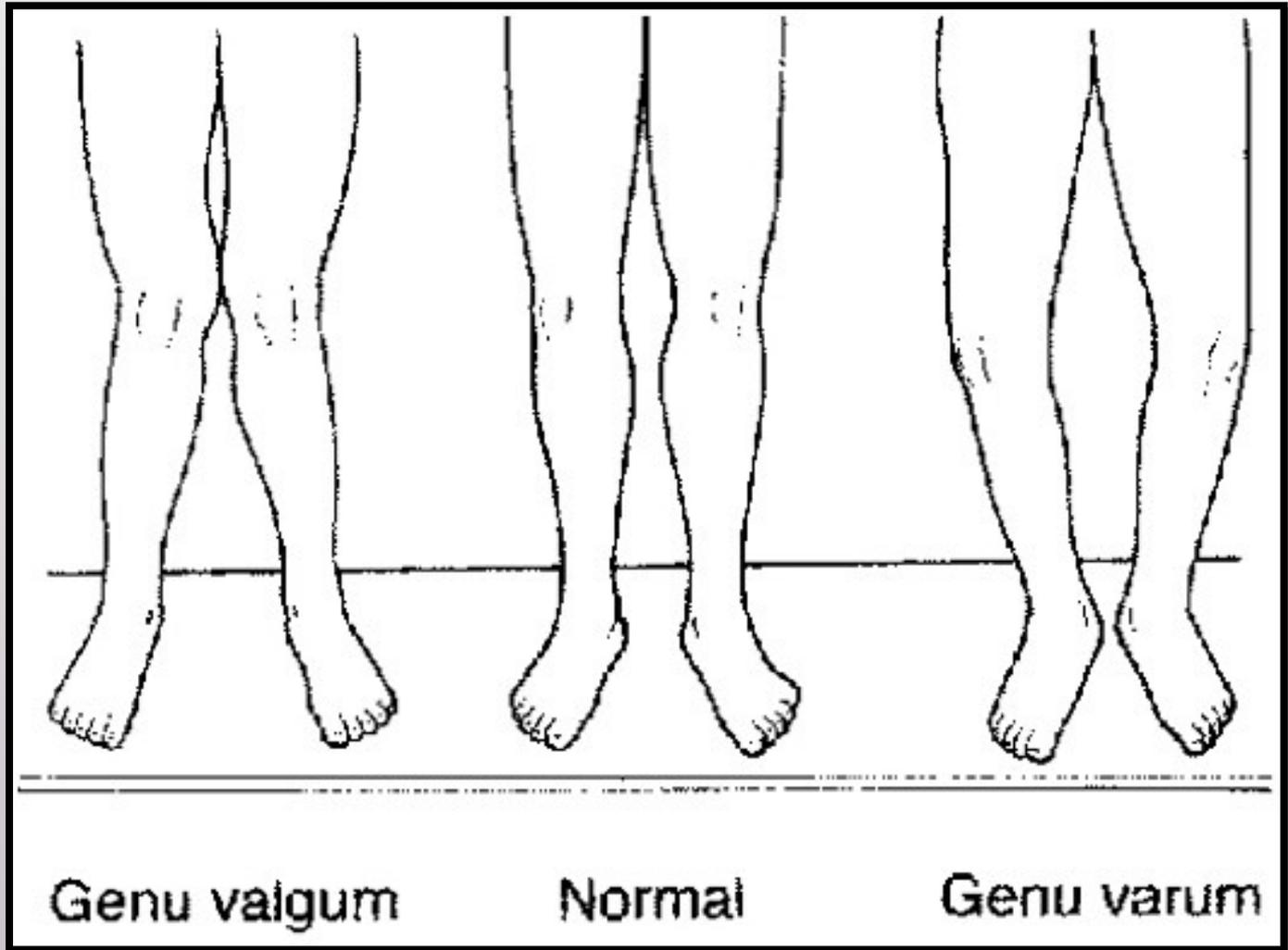
Kyphosis

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Abnormalities

- **Genu Valgum (Valgus)**
 - Outward turning of the foot
 - Angulation of the bone away from the midline
 - Knock Knee
- **Crepitation**
 - Crackling sound or grating sensation as a result of friction between bones
- **Effusion**
 - Escape of fluid into a body part
Swelling & pain

Abnormalities



Abnormalities

- **Atrophy**

- Muscle wasting
- ↓ in size, flabby, ↓ function & tone

- **Contracture**

- Resistance to movement of a muscle or joint
- May be caused by holding a painful limb in a position of comfort

- **Ankylosis**

- Scarring in a joint
- Leads to stiffness and fixation

Specific Nerve Assessments

- Test the most distal points for each nerve's sensory & motor function
- Test sensory first
- **Upper Extremity:**
 - Sensory
 - Radial = web space between thumb and index finger
 - Median = distal surface of index finger
 - Ulnar = pad of little finger
 - Axillary = military patch
 - Motor
 - Radial = dorsiflex the wrist & hyperextend the thumb
 - Median = thumb opposition with base of little finger
 - Ulnar = spread fingers apart
 - Axillary = abduct arm at the shoulder

Specific Nerve Assessments

- **Lower Extremity:**
 - **Sensory**
 - Femoral = anterior thigh
 - Peroneal
 - Top of foot between great toe & 2nd toes
 - Lateral aspect of top of foot
 - Tibial = sole of foot
 - **Motor**
 - Femoral = straight leg raise
 - Peroneal
 - Dorsiflex the foot (ankle) & toes
 - Laterally evert the foot
 - Tibial = plantar flex foot & toes (curl downward)

Geriatric Differences in Assessment

- **Ligaments & Cartilage**
 - Less elastic
- **Muscle**
 - Less number & diameter of muscle cells
- **Joints**
 - Erosion of articular cartilage
 - Osteophytes
- **Bone**
 - Decrease in bone mass



Diagnostic Studies

Radiography

- **Standard X-Ray**
 - Most common dx test to assess MS system
 - Purpose = diagnosis of fractures, assess disease progression, evaluate effectiveness of treatment



Radiography

- **CT Scan (computerized axial tomography)**
 - Computerized picture of tissue being studied
 - 3 dimensional
 - Safer, more accurate, ↑ radiation exposure, painless
 - IV Dye - Check allergies to iodine & seafood
 - Sign consent form for contrast dye
 - Patient teaching - calm their fears
 - Purpose = ID soft tissue abnormalities, bony abnormalities, & MS trauma

Radiography



**Computerized Axial Tomography
(CT Scan)**

Radiography

- **Arthrogram**

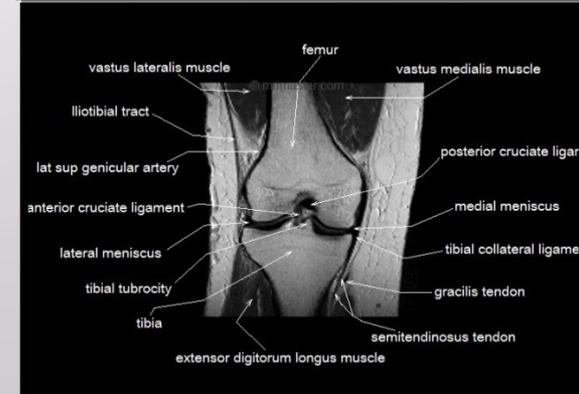
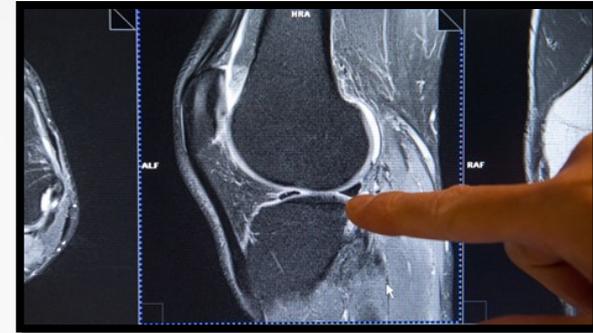
- Injection of a contrast media and/or air into a joint cavity for visualization of joint structures
- ROM while a series of x-rays are taken
- Question allergies to dye
- Purpose = dx meniscus tears, joint abnormalities, & synovial problems



MRI

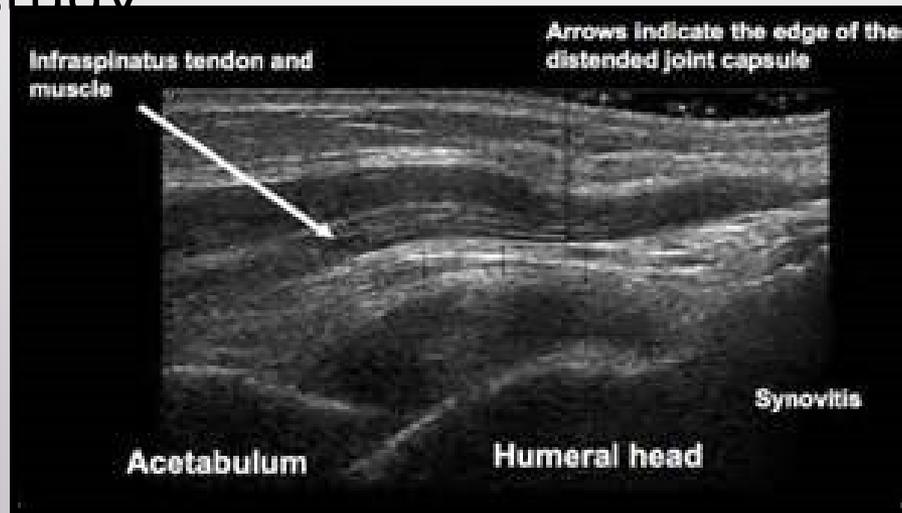
Magnetic Resonance Imaging

- Magnetic forces used to view soft tissues
 - Greater contrast in images of soft tissue structures than a CT scan
 - No metal allowed
 - Painless, safe, non-invasive, no radiation
 - Must lay still – may need anti-anxiety med
 - Purpose = dx avascular necrosis, disc disease, tumors, osteomyelitis, ligament tears
 - Good test to look at: muscle, tendons & ligaments.



Musculoskeletal Ultrasound

- Visualization of muscles, tendons, ligaments, joints (effusions, synovitis) and adjacent soft tissues
- Shoulder, knee, biceps brachii, Achilles tendon
- Tears, fluid collection, swelling, nerve entrapment, tumors/cysts, foreign bodies, RA
- Pt's who cannot tolerate MRI or just need a targeted study



Bone Scan

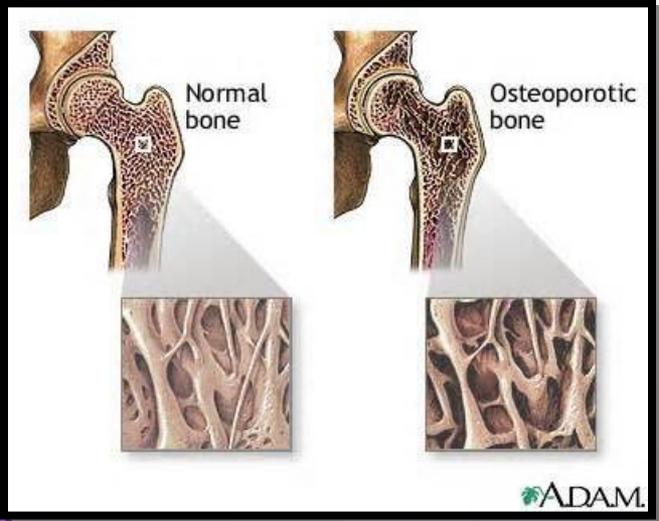
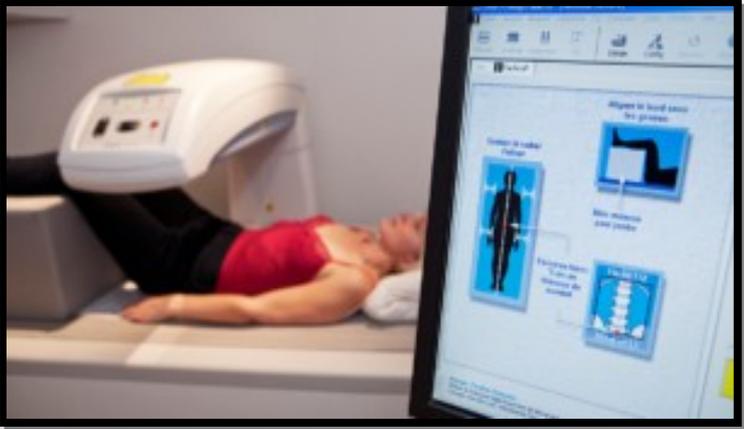
- IV injection of radioisotope that is taken up by the bones
- Injected 2-3° prior to the scan
- ↑ uptake seen in osteomyelitis, osteoporosis, some fractures, and primary metastatic malignant lesions
- Purpose = primarily used to demonstrate the presence of metastatic disease
- Encourage 1-3 glasses of water to aid in excretion of the dye
- Radioisotopes cause no harm, painless, scanned for about 1°

DEXA Scan (dual energy x-ray absorptiometry)

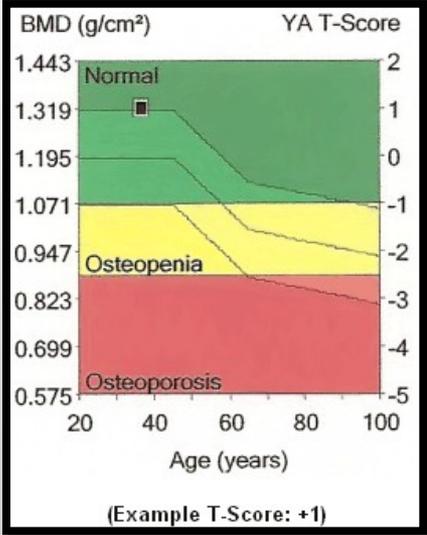
- Single or dual bone densitometry
- Purpose = measure bone mass & calculate total body calcium concentration
- T-Score - comparison to mean bone mass of normal young adult

Normal > -1, up to +1

DEXA Scan (dual energy x-ray absorptiometry)

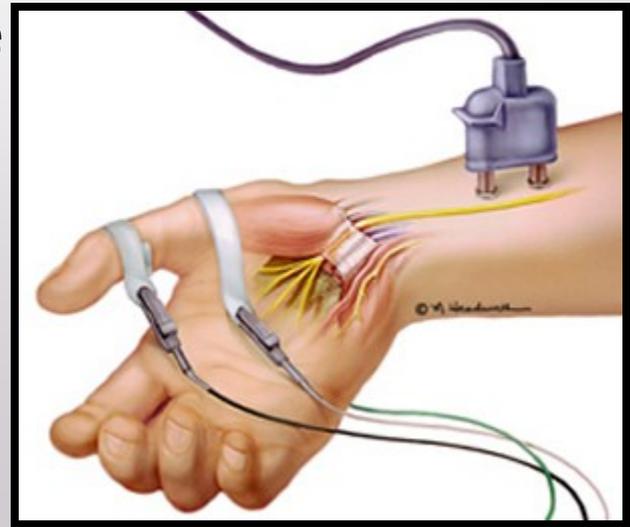


Achilles Test



Electromyography (EMG)

- Measures the electrical activity of muscles via needle electrodes inserted into skeletal muscles
- Purpose = dx motor dysfunction
 - Dysfunction in the motor neuron, neuromuscular junction, or muscle fibers
 - Helpful with dx lower motor neuron disease, primary muscle disease, & defects in the transmission of electrical impulses at the
 - i.e.. myasthenia gravis



Nerve Conduction Velocity

- Measures the time it takes for a muscle to respond after the nerve to that muscle has been electrically stimulated
- Often done with EMG
- Electrodes attached to skin over the muscle that is stimulated by the nerve that is being studied
- Time between stimulation of the nerve and the muscle contraction response is recorded
- Purpose = identify diseases or injuries of the peripheral NS



Biopsy

- Tissue extracted for microscopic study
- Purpose = to determine benign vs. malignant tissues, muscle disease, or arthritic disease
- Can have a bone biopsy, muscle biopsy , or synovial biopsy

Arthroscopy

- Insertion of an arthroscope (endoscope) into a joint cavity for visualization of its' structure & contents
- Usually done in the OR or outpatient surgery center
- Purpose
 - Exploratory surgery - remove loose bodies
 - Diagnosis of abnormalities of meniscus, articular cartilage, ligaments, or joint capsule
- Must be able to flex the knee at least 40°
- *#1 Priority post-procedure: ✓ neurovascular status of that extremity!*
- Ice & Elevation for first 24°

Arthrocentesis

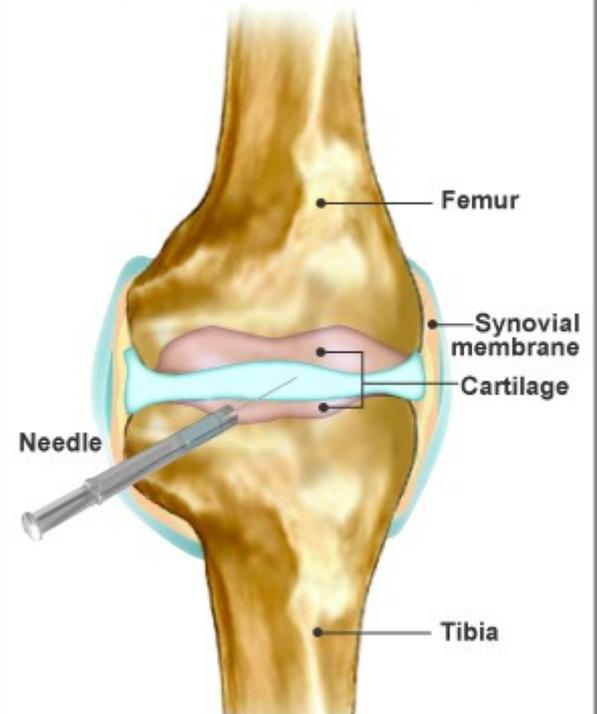
- Joint Aspiration
- Purpose = to remove synovial fluid for examination, instill meds, or remove excess fluid to relieve pain
- Can dx joint inflammation
- Performed at bedside under local anesthetic
- Post procedure – compression dressing & joint rest for 8-24°
- Synovial Fluid (*Normal-WBC < 200 & no bacteria*)
 - Usually < 1 tsp in any joint
 - Normally clear & light yellow
 - ↑ WBC & Protein = inflammatory process
 - Gout – whitish yellow color
 - Infection – purulent & thick

Joint Procedures



Arthroscopy

Joint Aspiration (Arthrocentesis)



Synovial fluid is withdrawn from the knee and analyzed to determine the cause of swelling.

Lab Studies

- CBC – done to R/O infection
- Muscle enzymes
 - **AST** – found in skeletal muscle but primarily an enzyme of cardiac & hepatic cells
 - **CPK (creatine phosphokinase)** – highest concentration found in skeletal muscle
 - ↑ in muscular dystrophy & traumatic injuries
 - **Aldolase** – ↑ with muscular and hepatic injury
 - Used to monitor muscular dystrophy

Lab Studies

- Mineral Metabolism
 - **Alkaline Phosphatase (ALP)**
 - Produced by osteoblasts of bone
 - ↑ in healing fx's, bone cancers, osteoporosis, osteomalacia, & Paget's disease
 - Also high in adolescents because of bone growth
 - **Calcium**
 - Bone is the primary organ for calcium storage
 - Ca⁺ provides bone with a rigid consistency
 - ↓ in osteomalacia, renal disease, hypoparathyroidism
 - ↑ in hyperparathyroidism, bone tumors, acute osteoporosis

Lab Studies

- Mineral Metabolism
 - **Phosphorus**
 - Related to calcium metabolism
 - *Has an inverse relationship with Ca^{+}*
 - ↑ in chronic renal disease, healing fx, & some metastatic tumors

Serology

- **Rheumatoid factor (RF)**
 - Assesses presence of auto-antibodies helps confirm RA but not specific for RA
 - Seen in other connective tissue diseases
- **Erythrocyte Sedimentation Rate (ESR)**
 - *Non-specific index of inflammation*: good to measure progression of the dx.
 - ↑ in inflammatory processes (RA)
- **Lupus Erythematosus Cells (LE)**
 - ↑ in lupus
- **Antinuclear Antibody (ANA)**
 - ↑ in connective tissue diseases (lupus, RA, scleroderma)

Serology

- **Uric Acid**

- End product of purine metabolism that is normally excreted in urine
- ↑ in gout

- ***highly sensitive* C-reactive protein (hsCRP)**

- Measures inflammation
- *More sensitive to inflammatory changes than ESR*
- Can also detect infection.

Urinary Tests

- 24^h urine for uric acid
- Helpful in dx and evaluating the effectiveness of treatments for gout

Nursing Diagnosis

- Impaired Physical Mobility
- Risk for Peripheral Neurovascular Dysfunction
- Risk For Injury
- Self Care Deficit
- Pain (acute or chronic)