Burden of Musculoskeletal Disease/Arthritis

- 1/5 adults have MD-diagnosed arthritis (46 million Americans, 300,000 children)
- 19 million Americans reported arthritis-attributable activity limitation, 8 million with work limitations
- Clinical burden: 30 Million ambulatory visits, 750,000 hospitalizations
- Projection in 2030 due to aging, obesity: MD-diagnosed arthritis to increase to 67 million of 25% of adult population with 25 million with arthritis-attributable activity limitation
- Role of primary care physicians in evaluation, differential diagnosis
The Skeletal System

- Gives form to the body
- Protects vital organs
- Consists of 206 bones
- Designed to permit motion of the body
- Acts as a framework for attachment of muscles
- Metabolic reservoir for calcium and phosphorus

Principal Joints of the Body

- Acromioclavicular
- Ankle (tibia-fibula and talus)
- Atlas and axis
- Atlas and occipital
- Calcaneocuboid
- Carpometacarpal
- Elbow (humerus, radius, and ulna)
- Facet (cervical, thoracic, lumbar, sacral)
- Femur and tibia
- Hip bone and femur
- Humerus and ulna
- Intercarpal (proximal, distal, intracarpal)
- Intermetacarpals
- Intermetatarsals
- Interphalangeal
- Knee (femur, tibia, and patella)
- Mandible (jaw) and temporal
- Metacarpophalangeal
- Metatarsophalangeal
- Pubic bones
- Radioulnar (distal, middle, proximal)

- Radius-ulna and carpals (wrist)
- Ribs, heads of
- Ribs, tubercles and necks
- Sacrococcygeal
- Sacroiliac
- Shoulder (humerus and scapula)
- Symphyses
- Sacroiliac
- Scapula and humerus
- Sternoclavicular
- Sternocostal
- Subtalar
- Talus and calcaneus
- Talus and navicular
- Tarsometatarsal
- Tibia-fibula and talus (ankle)
- Tibiofibular
- Vertebral arches
- Vertebral bodies
- Wrist (radius-ulna and carpals)
The Planes of the Body

- Anterior
- Posterior
- Midaxillary
- Midline
- Midclavicular line

Directional terms
- Right and left
- Superior and inferior
- Lateral and medial
- Proximal and distal
- Superficial and deep
- Ventral and dorsal
- Palmer and planter
- Apices and bilateral

MSK Injuries and Pain

- History: Mechanism of injury
  - How did it happen?
  - When did it happen?
  - Where does it hurt?

- Interfering with
  - Activities of daily living?
  - Quality of life?

- Physical exam
- Imaging and labs
- Differential diagnosis
- Time for a specialist evaluation
  - Visible deformity, ie swelling
  - Decreased function
  - Limping with pain
  - Increasing or significant pain
Physical Exam Elements

- Inspection
- Bony palpation
  - Anterior
  - Medial
  - Lateral
  - Posterior
- Range of motion
  - Active
  - Passive
- Neurological examination
  - Muscle
  - Sensation
  - Reflex
- Soft tissue palpation
  - Anterior
  - Medial
  - Lateral
  - Posterior
- Joint stability
- Special tests
  - Examination of one up, one down
- Joint stability
The Spinal Column

Vertebral Body and Nerves
**Physical Exam**

**Flexion and extension**

**Lateral bending**

**Trochanter**  **Sciatic nerve**  **Rotation**

**Common Presentations of Spinal Problems**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Associated signs and symptoms</th>
<th>Possible diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck pain</td>
<td>Pain exacerbated with rest and aggravated with activity</td>
<td>Acute neck strain</td>
</tr>
<tr>
<td>Neck and arm pain</td>
<td>A younger patient with an abnormal upper extremity neurologic examination</td>
<td>Cervical spondylolisthesis</td>
</tr>
<tr>
<td>Back pain</td>
<td>A middle-aged patient with a bloody pelvic discharge</td>
<td>Acute low back strain</td>
</tr>
<tr>
<td>Back and hip pain</td>
<td>A young adult with an abnormal bone scan revealed neurologic examination</td>
<td>Lumbosacral disk disease, ankylosing spondylitis</td>
</tr>
</tbody>
</table>

*Essentials of Musculoskeletal Care, AAOS, 1997*
## Common Spinal Conditions by Age Group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Common Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 10 years</td>
<td>Intervertebral diskitis, myelomeningocele, osteoblastoma, leukemia, congenital kyphosis, scoliosis</td>
</tr>
<tr>
<td>9 – 19 years</td>
<td>Spondylolisthesis, kyphosis (Scheuermann’s disease)</td>
</tr>
<tr>
<td>20 – 29 years</td>
<td>Disk injuries (central disk protrusion, disk sprain), spondylolisthesis, spinal fracture</td>
</tr>
<tr>
<td>30 – 39 years</td>
<td>Cervical and lumbar disk herniation or degeneration</td>
</tr>
<tr>
<td>40 – 49 years</td>
<td>Cervical and lumbar disk herniation or degeneration, spondylolisthesis with radicular pain</td>
</tr>
<tr>
<td>50 – 59 years</td>
<td>Disk degeneration, herniated disk, metastatic tumors</td>
</tr>
<tr>
<td>60 +</td>
<td>Spinal stenosis, disk degeneration, herniated disk, spinal instability, metastatic tumors</td>
</tr>
</tbody>
</table>

---

## Disk Protruding – How Much is Enough?

W. Rauschning, 1985
Inflammatory Back Pain: Seronegative Spondyloarthropathies

• Ankylosing Spondylitis: Chronic inflammation of SI joints, spine and extraspinal lesions: eye, bowel, heart (aortitis)
• Psoriatic Arthritis, Inflammatory Bowel Disease, Reactive Arthritis
• Sacroiliitis, synovitis, enthesitis
• LBP, AM stiffness, improves with exercise, limited ROM, family hx, heel pain, sausage digit, diarrhea
• Epidemiology 1-6%, but up to 15% of AS patients have inflammatory bowel disease
Ankylosing Spondylitis

- Importance of early diagnosis, TNFi treatment (Etanercept, Infliximab, Adalimumab)
- No role for long-term systemic steroids, Sulfasalazine, methotrexate
- Orthopaedic Surgery, Physical therapy
- Underdiagnosed, but better outcome in women.
- Reduced survival in both males and females.
- Genetics: low risk of development of SpA in children of HLA-B27 positive probands.
- No indication for genetic screening.
Ankylosing Spondylitis: Early Sacroiliitis (Radiograph)

Dactylitis – “Sausage Digits”
Hip

Every Life Deserves World Class Care

Anatomy
Anatomy

**Normal Hip**  **Arthritic Hip**

**Physical Exam Elements**

**INSPECTION**
- Bony Palpation
  - Anterior Aspect
  - Anterior Superior Iliac Spines
  - Iliac Crest
  - Iliac Tubercle
  - Greater Trochanter
  - Pubic Tubercles
  - Posterior Aspect
  - Posterior Superior Iliac Spines
  - Greater Trochanter
  - Ischial Tuberosity
  - Sacroiliac Joint (SI)

**SOFT TISSUE PALPATION**
- Zone I — Femoral Triangle
- Zone II — Greater Trochanter
- Zone III — Sciatic Nerve
- Zone IV — Iliac Crest
- Zone V — Hip and Pelvic Muscles

**RANGE OF MOTION**
- Active Range of Motion Tests
- Passive Range of Motion Tests
- Flexion (Thomas Test) — 120°
- Extension — 30°
- Abduction — 45°–50°
- Adduction — 20°–30°
- Internal Rotation — 35°
- External Rotation — 45°

**NEUROLOGIC EXAMINATION**
- Muscle Testing
- Sensation Tests

**SPECIAL TESTS**
- Trendelenburg Test
- Tests for Leg Length Discrepancy
- True Leg Length Discrepancy
- Apparent Leg Length Discrepancy
- Ober Test for Contracture of the Iliotibial Band
- Thomas Test for Flexion Contracture
- Tests for Congenital Dislocation of the Hip
- Ortolani Click
- Telescoping
- Adduction Contracture

**EXAMINATION OF RELATED AREAS**
- Rectal Examination

*Physical Examination of the Spine and Extremities, Hoppenfeld.*
**Physical Exam Elements**

- **Flexion**: 135 degrees
- **Lack of contracture, lumbar spine flat**
- **Hip contracture, unable to extend fully**
- **Extension**: 30 degrees

**Abduction**: 45-50 degrees
**Adduction**: 20-30 degrees
**External rotation**: 45 degrees
**Internal rotation**: 35 degrees

*Physical Examination of the Spine and Extremities, Hoppenfeld.*
Differential

- Degenerative lumbar disk disease
- Lumbar disk herniation
- Trochanteric bursitis
- Muscle strain, tendonitis or strain
- Femoral acetabular impingement
- Labral tear
- Hip osteoarthritis
- Hip osteonecrosis
- Infection
- Transient osteoporosis
- Tumor of the pelvis or spine
- Fracture
- Snapping hip (ITB over greater trochanter)
- Internal derangement of the knee
Anatomy

• Anatomy of the knee
  – Modified hinge joint
  – Subcutaneous
  – Used a lot every day

• Bending the knee
  – Standing
  – Walking
  – Stairs
Knee Injuries and Pain

• My knee pops and grinds

• No consequence unless
  – It hurts
  – It locks
  – It swells

Extension

Flexion

Knee Injuries and Pain

• Evaluation goals
  – History
    – What happened?
  – Examination
    – Where is the pain?
    – What is the dysfunction?
    – Alignment?
  – Imaging
    – Plain x-rays with weight bearing views
  – Diagnosis
    – Assessing the damage
  – Treatment
    – Options
    – Risks and benefits
    – Re-evaluation of recommendation
Physical Exam Elements

**INSPECTION**

**BONY PALPATION**
- Medial Aspect
  - Medial Tibial Plateau
  - Tibial Tubercle
  - Medial Femoral Condyle
  - Adductor Tubercle
- Lateral Aspect
  - Lateral Tibial Plateau
  - Lateral Tubercle
  - Lateral Femoral Condyle
  - Lateral Femoral Epicondyle
  - Head of the Fibula
  - Trochlear Groove and Patella

**SOFT TISSUE PALPATION**
- Zone I — Anterior Aspect
- Zone II — Medial Aspect
- Zone III — Lateral Aspect
- Zone IV — Posterior Aspect

**TESTS FOR JOINT STABILITY**
- Collateral Ligaments
- Cruciate Ligaments

**RANGE OF MOTION**
- Active Range of Motion
- Passive Range of Motion
  - Flexion ________ 135°
  - Extension ________ 0°
  - Internal Rotation ________ 10°
  - External Rotation ________ 10°

**NEUROLOGIC EXAMINATION**
- Muscle Testing
- Extension
- Flexion
- Internal and External Rotation
- Sensation Testing
- Reflex Testing
- Patellar Reflex: L2, 3, 4

**SPECIAL TESTS**
- McMurray Test
- Apley’s Compression and Distraction Tests
- “Bounce Home” Test
- Patellar Femoral Grading Test
- Apprehension Test for Patellar Dislocation and Subluxation
- Tinel Sign
- Knee Joint Effusion Tests

**EXAMINATION OF RELATED AREAS**
- Physical Examination of the Spine and Extremities, Hoppenfeld.

---

Differential

**ANTERIOR**
- Patellar tendon
- Quadriceps muscle
- Rectus femoris

**LATERAL**
- Patellar ligament
- Tibial tubercle
- Patellar tendon

**MEDIAL**
- Medial collateral ligament
- Medial meniscus
- Semimembranosus muscle
- Soleus muscle

**POSTERIOR**
- Popliteal fossa
- Tibial nerve
- Popliteal artery

**ESSENTIALS OF MUSCULOSKELETAL CARE**
- Apley’s Compression and Distraction Tests
- “Bounce Home” Test
- Patellar Femoral Grading Test
- Apprehension Test for Patellar Dislocation and Subluxation
- Tinel Sign
- Knee Joint Effusion Tests
Meniscal Tears

- Normal
- Torn
- Resected

Meniscal Tears MR Imaging
Anterior Cruciate Ligament Injuries

- Direct blow to knee
- Non-contact injury
- Landing on straight leg
- Making abrupt stops
- “Back seat” skiing

Solomon et al. JAMA 286: 1610, 2001
Anterior Cruciate Ligament Tear

Normal ACL  Chronic ACL tear  Reconstructed ACL

Probe

Anterior Cruciate Ligament Injuries

• When to reconstruct
  – Failed non operative care
  – Stability during exam
  – Stability during activities

• Lengthy rehab process
  – Specific protocol varies by physician
  – Commitment to participating
  – Exercise program…..forever

Solomon et al, JAMA 286: 1610, 2001
PF Patient Evaluation and Selection

• History
  – Trauma
  – Dislocation
  – Activities: stair descent and climbing

• Physical examination
  – Alignment and stability
  – Patella mobility
  – Patella inhibition testing
  – PF crepitus
  – Tracking
  – Squat
  – Lack of MFC LFC pain, MJL, LJL pain
  – Rule out pes anserine bursitis, patellar tendinitis, prepatellar bursitis, instability

Evaluation of the Arthritic Knee

• History = Knee Pain
  – Severity and acuity of pain
  – Impact of pain and symptoms on daily life
  – Impact of pain and symptoms on lifestyle

• Physical Exam
  – Deformity
    – Correctable?
  – Laxity
    – Need for greater constraint

• Radiographs
  – Bilateral weight bearing AP, tunnel, lateral, sunrise views
Knee Arthritis
Knee Replacements

- Pain not responding to treatment
- Deformity
- Instability
- Medically able to tolerate surgery
- Preoperative motion is predictor of postoperative motion
**Impact of Obesity and Knee OA**

- Knee OA and obesity among most common chronic conditions of adults ages 50-84
- Substantial loss of quality-adjusted life-years to knee OA and obesity – 86 million lost with Black and Hispanic women with disproportionate losses.
- Estimated total loss per person Quality-adjusted life years: 1857 with knee OA, 3501 with both
- Reversing obesity prevalence to that of 10 years ago would improve life expectancy by 7,812,120 QALY and would avert:
  - 178,071 cases of Coronary heart disease
  - 889,872 cases of DM
  - 111,206 total knee replacements

**Inflammatory Arthritis of the Knee**

- Acute monoarthritis: Infection, crystal (gout and pseudogout), trauma, hemorrhage, RA, PsA
- Subacute/Chronic monoarthritis: RA, OA, mechanical, AVN, chronic infection, sarcoid, malignancy, PVS
- Polyarthritis: RA, PsA, Reactive, Inflammatory bowel disease, Infection (Viral incl. hepatitis, GC), sarcoid, etc.
- Importance of early diagnosis, role of history, PE and synovial fluid analysis
- Coexisting pathology: RA and infection, crystal and infection
Psoriatic Arthritis: Asymmetric Synovitis, Knees

Psoriatic Arthritis: Nail Pitting
**Psoriatic Arthritis (PsA)**

- Inflammatory arthritis associated with psoriasis
- PsA occurs in 25% of patients with psoriasis, equal gender frequency, RF -, HLA B27
- Clinical Subsets: DIP, arthritis mutilans, spondyloarthritis, oligo or polyarthritis
- Nail dystrophy, dactylitis, assymetry, tenosynovitis, enthesitis
- Role of TNFi treatment
- Accelerated atherosclerotic disease
- Importance of early diagnosis
Psoriatic Arthritis Treatment

- 67% pts have erosions in 2 years
- MTX, Leflunomide
- TNF- alpha Inhibitors- Equal efficacy among 3 (IFN, ETN,ADA) for Psoriatic joint inflammation, radiologic progression but ADA and IFN more effective for skin or (Golimumab monthly)
- Anti T cell Agents: Efalizumab, Alefacept- varying results in PsA

Clinical Spectrum of RA

Images courtesy of J Cush 2002
**Rheumatoid Arthritis**

- Early use of disease-modifying agents and biologics: prevents joint destruction, improves quality of life, prevents cardiovascular risks

- Extra-articular RA manifestations:
  - Skin: Nodules 25-50%
  - Anemia, thrombocytosis, lymphadenopathy
  - Felty’s
  - Lung: ILD, pleural thickening/effusions, nodules
  - Cardiac: Pericarditis, accelerated ASCVD, valvulitis
  - Eye: keratoconjunctivitis SICCA, episcleritis, uveitis, keratitis
  - Neurologic: Cervical myelopathy, peripheral entrapment neuropathy
  - Vasculitis
  - Muscle atrophy

---

**Arthroscopic view of the knee**

![Arthroscopic view of the knee](https://via.placeholder.com/150)

© ACR
The Pathogenesis of Rheumatoid Arthritis

NORMAL

RHEUMATOID ARTHRITIS

Inflamed synovial membrane

Major cell types:
- T lymphocytes
- Macrophages

Minor cell types:
- Fibroblasts
- Plasma cells
- Endothelium
- Dendritic cells

Major cell type:
- Neutrophils


Mortality and RA patients

- Decrease of 10-15 years in life expectancy compared to controls
  - SMR 2.26

- RA patients seen in a tertiary referral center
  - Prognosis is comparable to 3 vessel CHD or stage 4 Hodgkin’s disease
Mortality in rheumatoid arthritis: 2008 update

(Sokka T, Abelson B, Pincus T.)

In 2008, 1.5-1.6 times higher than in general population

– CV disease most common
– Premature mortality with more severe disease


Cardiovascular Disease

• Patients with PsA have increased risk of cardiovascular disease
  – Carotid ultrasound shows higher prevalence of plaque
• Presence of subclinical atherosclerosis
• New diagnostic techniques may allow earlier detection
• Husni study
  – Biomarkers (dysfunctional HDL, PON1, MPO)
**Risk factors for atherosclerosis in rheumatic diseases**

- Greater prevalence of traditional risk factors
  - Recent studies have adjusted for traditional RF and comorbidities, RA patients still ↑CV events
- Disease treatment (steroids) cause ↑ CV risk
- Functional disability, less mobile
- Disease specific factors
  - Duration of disease
  - End organ damage
  - Inflammatory disease burden, uncontrolled disease

Del Rincon 2001 and Navarro-Cano 2003

---

**Chronic Inflammation and Atherosclerosis**

- Increase in PDGF, TGF-β, IL-1 and TNF-α
- Macrophage accumulation
- Formation of necrotic core
- Fibrous cap formation

Crystalline Arthropathy 2011

• Gout

• CPPD

Synovial Fluid Microscopy

CANNOT DIAGNOSE GOUT WITHOUT SF MICROSCOPY
Gout - Epidemiology

- Men, post-menopausal women

- Prevalence ~3% adults (9% M >80yrs)
  - Rising – 2x in past 20 yrs

Recently Published Data on Risk Factors for the Development of Gout

The UK General Practice Research Database (1990-1999)

- Data reflects underlying prevalence patterns of gout
  - Increases with increasing age
  - Higher in men than in women
    - Increases in women after menopause

Gout – Disease associations

• Association with metabolic syndrome
  – HTN, HPL, DM, obesity

• Cardiovascular disease
Gout – Risk factors

- Obesity
- Medication e.g. diuretics, cyclosporin
- Alcohol abuse
- Renal failure
- Pre-existing joint disease esp. OA
- Increased cell turnover
  - Psoriasis, hematologic malignancy
- Genetic
  - Family hx in 25-30% (early onset)
  - Disorders of purine metabolism

Clinical features

- Recurrent acute attacks
  - Any joint - 1st MTP, ankle, knee
  - Polyarticular
  - Fever, chills, malaise

- Onset often at night
Uncontrolled Hyperuricemia Causes Gout to Progress

Untreated, chronic hyperuricemia increases body urate stores and advances disease severity

Pain

Asymptomatic hyperuricemia

Acute flares

Advanced gout

Painful intercritical segments

Painless intercritical segments

Time

Adapted from Klippel et al., eds. in: Primer on the Rheumatic Diseases. 12th ed. Arthritis Foundation; 2001:313.
The Production and Elimination of Uric Acid

- Xanthine oxidase catalyzes the final steps in the conversion of purines to uric acid

Once produced, uric acid is predominantly handled by the kidneys
- ~8%-12% excreted
- ~90% reabsorbed


Uricase Enzymes

- Uricase (uric acid oxidase) catalyzes the conversion of uric acid to allantoin
  - A more soluble and readily excretable form
Gout – Mechanism of inflammation

• Activation of NALP3 inflammasome
  – Toll Like Receptors 2,4 -> Production of pro-IL1
  – Activation of caspase 1 through NALP3 inflammasome -> conversion of pro-IL1 to IL1

• Cytokine production (esp. IL1)

• Chemokines

• Neutrophil activation + recruitment

• COX-2, prostanoids

• ROS, NO
Normouricemic gout?

- Normal serum urate
  - Ensure correct diagnosis!
  - 1/3 < 7.0mg/dL during acute attacks

- Uricosuric effects of ACTH, adrenal steroids induced by physical stress

- Medications

SERUM URATE LEVEL CANNOT MAKE OR BREAK THE DX OF GOUT
Acute treatment

- NSAIDs
- Corticosteroids
  - Intra-articular
  - Oral
  - IM/IV
- Analgesics
- Colchicine
- Interleukin-1 (IL-1) antagonists
  - Anakinra, Rilonacept, Canakinumab

Lifestyle changes

- Reduce EtoH intake
- Avoid dehydration
- Dietary
- Weight loss
Chondrocalcinosis

- Rhomboid
- Weak positive birefringence
- More difficult than urate – > under-recognized
- Positive alizarin red staining


CPPD crystals

- Rhomboid
- Weak positive birefringence
- More difficult than urate – > under-recognized
- Positive alizarin red staining

CPPD – Diagnosis

• Polarizing light microscopy
  – Requires expertise

• Xray
  – Helpful, but not specific or sensitive

• Histology e.g. synovial biopsy
  – Depending on method of preservation

Aspiration – How to do it

Every Life Deserves World Class Care
Aspirations and Injections

- Sterile procedure
  - Drape it out
  - Wear sterile gloves
  - Have an assistant
  - Everything available before prep
  - 10ml syringe with 18 gauge or >

- Prep
  - Make the spot
  - Time out
  - Antiseptic with circular motion outward
  - Have injections ready
    - Single use vials
    - Superficial anesthetic
      - Spray ethyl chloride or inject local

Knee Injections

- Glucocorticoids (steroids)
  - Mainstay of non-operative treatment
  - Strong anti-inflammatory
  - Changes characteristics of synovial fluid
  - Side effects
    - Systemic suppression of adrenal function
    - Decreased stress response to hypoglycemia
    - Detrimental changes to the cartilage surfaces
    - Infection

- Viscosupplementation
  - Anti-inflammatory
  - Stimulates production of hyaluronic acid
  - Analgesic effect
  - Side effects
    - Local reactions (pain, warmth, swelling)
**Injectable Pharmaceuticals**

**My knee injection**
- 2 syringes 5cc and 30cc
- 18g needles
- 2cc Aristospan
- 30cc 1/4% Marcaine w epi 1:200,000
- Inject 10cc local
- Wait
- Inject aristospan
- Inject rest of local

---

**Septic Joints, Insidious Presentation**

*Every Life Deserves World Class Care*
Ankle

Every Life Deserves World Class Care

Anatomy

- Tibial Plafond
- Medial Malleolus
- Lateral Malleolus
- Talar Dome

Mortise, AP, and Lateral, views
Ankle Anatomy and Sprains

- Mostly sprains from ligamentous structures
  - Inversion most common

Physical Exam Elements

INSCRIPTION
BONY PALPATION
- Medial Aspect
  - First Metatarsocuneiform
  - Navicular Tubercle
  - Head of the Talus
  - Medial Malleolus
  - Sustentaculum Tali
  - Medial Tubercle of the Talus
- Lateral Aspect
  - Fifth Metatarsal Base
  - Fifth Metatarsophalangeal Joint
  - Cuneiforms
  - Peroneal Tubercle
  - Lateral Malleolus
- Sinus Tarsi Area
  - Dome of the Talus
  - Inferior Tibiofibular Joint
  - Apex of the Hindfoot
  - Dome of the Calcaneus
  - Inferior Tubercle
  - Plantar Surface
  - Sesamoid Bones
  - Metatarsal Heads

DORSAL SURFACE EVALUATION
- Zone I — Head of the First Metatarsal Base
- Zone II — Navicular Tubercle and Talar Head
- Zone III — Medial Metatarsals
- Zone IV — Dorsum of the Foot between the Metatarsals
- Zone V — Lateral Malleolus
- Zone VI — Sinus Tarsi
- Zone VII — Head of the Fifth Metatarsal
- Zone VIII — Calcaneus
- Zone IX — Plantar Surface of the Foot
- Zone X — Toes

TESTS FOR ANKLE JOINT STABILITY
- Active Range of Motion
  - Ankle Dorsiflexion 20°
  - Ankle Plantar Flexion 90°
  - Subtalar Inversion 5°
  - Subtalar Eversion 5°
  - Forefoot Adduction 20°
  - Forefoot Abduction 15°
  - First Metatarsophalangeal Joint
    - Flexion 45°
    - Extension 70°–90°

NEUROLOGIC EXAMINATION
- Motor Testing
- Sensation Tests
- Reflex Tests
- Achilles Tendon Reflex (S1)

SPECIAL TESTS
- Tests for Rigid or Supple Flat Feet
- Tibial Torsion Test
- Pes Planus Deformation Test
- Ankle Dorsiflexion Test
- Homans’ Sign

EXAMINATION OF RELATED AREAS

Physical Examination of the Spine and Extremities, Hoppenfeld.
Physical Exam Elements

Patient movement for range of motion and stability

Palpation points
- ATFL
- CFL
- PTFL
- Syndesmosis
- CC joint
- PT and peroneal tendons
- 5th metatarsal base and shaft
- Malleoli

Plantar flex to expose talar dome
Case presentation

Mono-arthritis

Do these patients have septic arthritis?

<table>
<thead>
<tr>
<th></th>
<th>Patient 1</th>
<th>Patient 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC:</td>
<td>Left wrist, knee and foot swelling and pain</td>
<td>Left wrist swelling and pain</td>
</tr>
<tr>
<td>HPI:</td>
<td>84 y/o male h/o prostate ca, CKD OA and gout with symptoms for 1 week gradually worsening</td>
<td>63 y/o male h/o AML, CKD and gout with acute onset of symptoms 1 week ago</td>
</tr>
</tbody>
</table>
### Presentation - continued

<table>
<thead>
<tr>
<th>PMHx</th>
<th>Patient 1</th>
<th>Patient 2</th>
</tr>
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<tbody>
<tr>
<td>Prostate ca</td>
<td>Afib</td>
<td>AML</td>
</tr>
<tr>
<td></td>
<td>HTN</td>
<td>HTN</td>
</tr>
<tr>
<td></td>
<td>CKD</td>
<td>CKD</td>
</tr>
<tr>
<td></td>
<td>OA</td>
<td>Hypothyroldism</td>
</tr>
<tr>
<td></td>
<td>Gout</td>
<td>Gout</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Soc Hx:</th>
<th>No tobacco</th>
<th>Former smoker</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Occasional beer</td>
<td>No alcohol</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medications:</th>
<th>Patient 1</th>
<th>Patient 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meds:</td>
<td>Warfarin</td>
<td>Allopurinol</td>
</tr>
<tr>
<td></td>
<td>Amiodarone</td>
<td>Hydroxyurea</td>
</tr>
<tr>
<td></td>
<td>Metoprolol</td>
<td>Amlodipine</td>
</tr>
<tr>
<td></td>
<td>Amlodipine</td>
<td>Lisinopril</td>
</tr>
<tr>
<td></td>
<td>Spironolactone</td>
<td>Levothyroxin</td>
</tr>
<tr>
<td></td>
<td>Atorvastatin</td>
<td>Esomeprazole</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oxycodone</td>
</tr>
<tr>
<td>Allergies</td>
<td>Sulfas</td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fam Hx:</th>
<th>Heart disease</th>
<th>Multiple sclerosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HTN</td>
<td>Heart disease</td>
</tr>
</tbody>
</table>
### Presentation - continued

<table>
<thead>
<tr>
<th></th>
<th>Patient 1</th>
<th>Patient 2</th>
</tr>
</thead>
</table>
| **ROS:**         | 1. Pain and swelling started in left wrist and feet, then spread to both knees | 1. Noticed acute onset of redness, swelling and pain in left wrist  
2. Started taking prednisone 10mg as he does for gout flares  
3. Redness, swelling, pain got worse – increased dose to 40mg then to 80mg after contacting PCP – no improvement  
4. Tingling in left fingers  
5. 5) No F/C, has N/V – chronic  
6. No other complains |
|                  | 2. Tried cranberry juice which helped with previous gout attacks without improvement |                                                                                                                                 |
|                  | 3. No trauma                                                               |                                                                                                                                 |
|                  | 4. Had fever/chills                                                        |                                                                                                                                 |
|                  | 5. Otherwise negative                                                      |                                                                                                                                 |

### Presentation - continued

<table>
<thead>
<tr>
<th></th>
<th>Patient 1</th>
<th>Patient 2</th>
</tr>
</thead>
</table>
| **Exam:**        | 1. Vitals normal, afebrile                                               | 1. Vitals normal, afebrile  
2. Heart, lungs and abdomen – unremarkable  
3. Left hand and forearm with redness, swelling, warms and tenderness. Decreased ROM  
4. Erythema with sharp edges spreading over forearm and dorsum of hand  
5. Other joints without signs of inflammation |
|                  | 2. Heart, lungs and abdomen – unremarkable                               |                                                                                                                                 |
|                  | 3. Both wrist with effusion, warmth and tenderness, decreased ROM         |                                                                                                                                 |
|                  | 4. Both knees with effusion, warmth, tenderness and decreased ROM         |                                                                                                                                 |
|                  | 5. Other joints without signs of inflammation                             |                                                                                                                                 |
## Presentation - continued

<table>
<thead>
<tr>
<th>Exam:</th>
<th>Patient 1</th>
<th>Patient 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorry, no picture</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Presentation - continued

<table>
<thead>
<tr>
<th>X-ray: [Image]</th>
<th>Patient 1</th>
<th>Patient 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Image]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Presentation - continued

<table>
<thead>
<tr>
<th>Labs: (joint fluid)</th>
<th>Patient 1</th>
<th>Patient 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site, SF</td>
<td>Left Knee</td>
<td>Left wrist</td>
</tr>
<tr>
<td>Color, SF</td>
<td>Yellow</td>
<td>Slightly bloody</td>
</tr>
<tr>
<td>Supernatant Color, SF</td>
<td>Yellow</td>
<td>Unable to assay...</td>
</tr>
<tr>
<td>Crystals, SF</td>
<td>Clear</td>
<td>Slightly turbid</td>
</tr>
<tr>
<td>RBC, SF</td>
<td>17/06</td>
<td>Crystals, SF</td>
</tr>
<tr>
<td>WBC, SF</td>
<td>22310</td>
<td>10351</td>
</tr>
<tr>
<td>Neut%, SF</td>
<td>72</td>
<td>Neut%, SF</td>
</tr>
<tr>
<td>Lymph%, SF</td>
<td>4</td>
<td>Lymph%, SF</td>
</tr>
<tr>
<td>Mon%, SF</td>
<td>24</td>
<td>Mon%, SF</td>
</tr>
<tr>
<td>Synovial Comment</td>
<td>Test Not Indicated</td>
<td>Test Not Indicated</td>
</tr>
<tr>
<td>Synovial Fluid</td>
<td>Test Not Indicated</td>
<td>Test Not Indicated</td>
</tr>
<tr>
<td>Slide Number, SF</td>
<td>10351</td>
<td>Slide Number, SF</td>
</tr>
</tbody>
</table>

#### Crystals

Which patient has crystals in his wrist?
**Presentation - continued**

<table>
<thead>
<tr>
<th></th>
<th>Patient 1</th>
<th>Patient 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labs:</strong></td>
<td><strong>Routine Analysis</strong></td>
<td><strong>Routine Analysis</strong></td>
</tr>
<tr>
<td><strong>Site, SF</strong></td>
<td>Left Knee</td>
<td>Left Wrist</td>
</tr>
<tr>
<td><strong>Color, SF</strong></td>
<td>Yellow</td>
<td>Slightly bloody</td>
</tr>
<tr>
<td><strong>Sediment Color, SF</strong></td>
<td>Yellow</td>
<td>Unable to assay</td>
</tr>
<tr>
<td><strong>Clarity, SF</strong></td>
<td>Turbid</td>
<td>Slightly turbid</td>
</tr>
<tr>
<td><strong>Sediment Clarity</strong></td>
<td>Clear</td>
<td>Unable to assay</td>
</tr>
<tr>
<td><strong>Crystals, SF</strong></td>
<td>RBC, SF 1786</td>
<td>RBC, SF 10950</td>
</tr>
<tr>
<td></td>
<td>WBC, SF 22310</td>
<td>WBC, SF 2146</td>
</tr>
<tr>
<td><strong>Natu%, SF</strong></td>
<td>72</td>
<td>Nauc%, SF 77</td>
</tr>
<tr>
<td><strong>Lymph%, SF</strong></td>
<td>4</td>
<td>Lymph%, SF 11</td>
</tr>
<tr>
<td><strong>Mono%, SF</strong></td>
<td>24</td>
<td>Mono%, SF 1</td>
</tr>
<tr>
<td><strong>Sediment Comment</strong></td>
<td>Test not indicated</td>
<td>Macr%, SF 5</td>
</tr>
<tr>
<td></td>
<td>Syneural Reaction</td>
<td>Synoval Cl % 2</td>
</tr>
<tr>
<td></td>
<td>Slide Number SF 10251</td>
<td>RBC, % SF 4</td>
</tr>
</tbody>
</table>

**Crystals**

- Sodium urate
- Sodium urate

---

**Do these patients have septic arthritis?**

**Do they need empiric antibiotic coverage?**
# Presentation - continued

<table>
<thead>
<tr>
<th></th>
<th>Patient 1</th>
<th>Patient 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint fluid culture</td>
<td>Few Staphylococcus aureus</td>
<td>No growth 2 days</td>
</tr>
<tr>
<td>Blood cultures</td>
<td>Staphylococcus aureus (MSSA)</td>
<td>No growth 4 days</td>
</tr>
</tbody>
</table>
Cases:

• 42 yo male runner: “Achilles tendinitis”
• 32 yo female runner: recurrent knee effusions
• 59 yo female mother of the runner above with 2 failed spinal surgeries, persistent back pain, stiffness
• Two patients with h/o gout, knee effusions
• My sister 47 yo woman with bilateral “knee OA”