KNEE PAIN: Current Concepts & Treatment Strategies

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Yearly Sports Injuries in USA

<table>
<thead>
<tr>
<th>Sport</th>
<th>Number of Injuries Requiring Treatment Per Year</th>
</tr>
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<tbody>
<tr>
<td>Football</td>
<td>556,928</td>
</tr>
<tr>
<td>Basketball</td>
<td>412,075</td>
</tr>
<tr>
<td>Baseball/Softball</td>
<td>276,733</td>
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<tr>
<td>Soccer</td>
<td>220,16</td>
</tr>
<tr>
<td>Playground Injuries</td>
<td>410,634</td>
</tr>
</tbody>
</table>
Typical care path of injured knee

- Primary care
- Rheumatologist
- Nonoperative Sports Medicine
- General Orthopaedist

KNEE PAIN: Current Concepts & Treatment Strategies

- Anatomy Basics

- Knee Injuries
  - Diagnosis
  - Treatments
  - Current Concepts
Injuries to the Knee

- Acute vs Chronic Injury
- Wide Spectrum of Injury Presentation
  - Beware of Swelling / Effusion
  - Strain
  - Sprain
  - Fracture

- Activity modification before “Getting Back in the Game”, the following may be warranted:
  - Rest
  - Physical Therapy
  - Medication
  - Surgery

Getting Back in the Game

- Activity modification
- R.I.C.E. – Rest, Ice, Compression, Elevation
  - Seek medical advice as a small problem can quickly escalate into a bigger one if go back to sport too soon
  - Beware Swelling / Effusion – often means MRI
- Bracing & Crutches

- Anti-inflammatories
- Aleve (Naproxen), Advil (Ibuprofen)
  - Example: Aleve: 2 in AM, 2 in PM

- Return To Play Criteria:
  - Full Range of Motion
  - Full Strength
  - Sport Specific Activity without Pain
Knee Anatomy

- Bones
  - Femur
  - Patella
  - Tibia
  - Fibula

- Ligaments
  - ACL
  - PCL
  - MCL
  - LCL / PLC
  - MPFL
  - ALL
• Tendons
  • Quadriceps
  • Patella
  • Popliteus
  • Hamstrings
  • Gastroc

Knee Anatomy

• Tendons
  • Quadriceps
  • Patella
  • Popliteus
  • Hamstrings
  • Gastroc
  • Plantaris
Knee Anatomy

- Cartilage
  - Articular
  - Fibrous
    - Meniscus

Knee Anatomy

- Cartilage
  - Articular
  - Fibrous
    - Meniscus
History Knee Injury / Pain

- **History** is Essential
  - **Mechanism and Aggravating Factors**
  - Mechanical symptoms (clicking, catching, giving) with squatting = Meniscus
  - Pain w/ stair climbing, sit to stand, anterior knee pain = Patellofemoral
- **Pain characteristics**
- **Mechanical Symptoms**
  - Locking
  - Popping
  - Giving Way
- **Effusion**
  - Rapid (< 2 hours) – hemarthrosis
    - Meniscus and Ligamentous
  - Slow (24-48 hours) – synovial fluid build up
    - Cartilaginous
- **Mechanism of Injury**
  - Direct blow
  - Foot planted
  - Decelerating or landing from a jump
  - Twisting
  - Hyperextension
- **Medical History**
  - Previous Knee pain or Surgery

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History & Physical of Knee Injury

- **Physical Exam**
  - **TRIMS & TART**
    - Tenderness, ROM, Inspection, Muscle Strength, Special Tests
    - Tender, Asymmetry, Restriction, Tissue Texture Change
  - ACL: Lachman, Pivot Shift, Anterior Drawer
  - PCL: Posterior Drawer, Quad Active, Sag
  - LCL: Varus Stress test at 30 degrees
  - MCL: Valgus Stress test at 30 degrees
  - PLC: ER Asymmetry at 30 degrees (Dial test), Sag sign
  - Meniscus: Joint Line Tenderness, McMurray
  - Patella Instability: Apprehension Test
  - Patella Grind: PF pathology
Rules for Obtaining a radiograph in Acute Knee Injuries

Ottawa Rules
- age 55 or over
- isolated tenderness of the patella (no bone tenderness of the knee other than the patella)
- tenderness at the head of the fibula
- inability to flex to 90 degrees
- inability to weight bear both immediately and in the ER (4 steps - unable to transfer weight twice onto each lower limb regardless of limping).

- Sensitivity – 97%
- Specificity – 27%
- Reduced Radiographs by 28%

Pittsburg Rules
- Blunt trauma or a fall as mechanism of injury plus either of the following:
  - Age younger than 12 years or older than 50 years
  - Inability to walk four weight-bearing steps in the emergency department

- Sensitivity – 99%
- Specificity – 60%
- Reduced Radiographs by 57%

History & Physical

Mechanical

Inflammation
Mechanical Pain

- Locking, Clicking, Catching, Giving Way
- Fractures
- Tendon / Ligament Tears
- Meniscus Tears
- Cartilage Injury
- Arthritis

Bone -Fractures

- Distal Femur
- Tibial Spine
- Tibial Tubercle
- Treatments vary
  - Nonsurgical
  - Surgical
Bone - Fractures

- Patella
- Treatments vary
  - Nonsurgical
  - Surgical

Bone - Stress Fractures

- Distal Femur
- Proximal Tibia
- Treatments vary
  - Nonsurgical
  - Surgical with Biologics
    - Calcium Phosphate
    - Subchondroplasty
    - Bioplasty
Tendon Rupture

- Extensor Mechanism injury
- Patella or Quad Tendon Tear

  • Symptoms
    • Pain
    • Unable to extend knee (extensor mechanism disruption)

  • Treatment
    • Surgery

Ligament Injury – Patella Dislocation

- Torn MPFL
  • Medial PatelloFemoral Ligament
- Cartilage Injury

  • Treatment
    • Reduction
      • Relaxation and knee extension
    • Immobilization
    • First-time vs Recurrent?
      • Algorithmic treatment
Ligament Injury – Patella Dislocation

- Patella Dislocation & Instability
  - Extensive Workup
    - Soft Tissue
      - MPFL Tear
    - Tight Lateral Retinaculum
    - Abnormal Bony Alignment
      - TT-TG
      - Q angle
    - Trochlear Dysplasia
    - Femur or Tibia Torsion
  - MPFL Reconstruction
  - Tibial Tubercle Osteotomy
  - Medialization

Ligament Rupture

- ACL, PCL, MCL, LCL/PLC
- Symptoms
  - Pain
  - Swelling
  - Instability
- Treatment
  - Immobilization
  - Physical Therapy
  - Surgery
    - Reconstruction
Ligament Reconstruction

- ACL, PCL, MCL, LCL
  - Autograft tissue
  - Allograft tissue
  - Bone tunnels
  - Extensive rehabilitation
  - Often meniscus pathology

Ligament Reconstruction

- ACL Reconstruction
  - Quad Tendon Autograft
    - Gaining popularity toward a new gold standard
    - 20% more collagen fibrils per cross-sectional area than BTB
    - Thicker than BTB
    - No graft-tunnel mismatch
    - Decreased harvest pain, smaller incision than BTB
    - As low as 4% failure rate
Meniscus Tear

- Symptoms
  - Pain
  - Locking and catching

- Treatment
  - Surgery
    - Meniscectomy
      - Like a hangnail
    - Repair
  - Increased focus over last few years with new technologies
  - Tear Pattern Dependent
Meniscus Tear

- Meniscus Excursion
  - Meniscus Root Tear
  - MeniscoTibial Ligament Tear
    - Increased Contact Stresses
    - Arthritis Progression

- Treatment
  - Surgery
    - Meniscus Root Repair
    - MeniscoTibial Ligament Repair

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Meniscus Tear

- Meniscus Excursion
  - Meniscus Root Tear
  - MeniscoTibial Ligament Tear
    - Increased Contact Stresses
    - Arthritis Progression

- Treatment
  - Surgery
    - Meniscus Root Repair
    - MeniscoTibial Ligament Repair
    - Root Repair
Meniscus Tear

- Meniscus Excursion
  - Meniscus Root Tear
    - Disruption of Hoop Stresses
    - Increased Contact Stresses
    - Arthritis Progression

- Treatment
  - Surgery
    - Meniscus Root Repair

Meniscus Tear

- Meniscus Excursion
  - Meniscus Root Tear
  - MeniscoTibial Ligament Tear
    - Increased Contact Stresses
    - Arthritis Progression

- Treatment
  - Surgery
    - Meniscus Root Repair
    - MeniscoTibial Ligament Repair
Cartilage Injury

- Osteochondral Defect
  - Symptoms
    - Pain
    - Locking or catching
  - Treatment
    - Surgery
      - Stimulate healing
      - Replace

Cartilage Injury / Repair / Biologics

Cartilage Repair

- Exciting field
- Lots of ideas, science and innovation
- Predictable clinical success is still elusive
- 75%/25% rule for most interventions
- New treatments are adopted with little clinical validation
- Expensive
Cartilage Injury / Repair / Biologics

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OrthoBiologics

ORTHOBIOLOGICS

**Bone Grafts**
- Autologous Bone Grafts
- Bone Allografts
- Bone Graft Substitutes
- Dehydrated Bone Matrix
- Bone Marrow Aspirate Concentrates

**Growth Factors**
- Bone Morphogenetic Protein (BMP)
- Platelet Derived Growth Factor (PDGF)

**Corticosteroids**

**Stem Cell Therapy**
- Adipose Tissue Preparations
- Bone Marrow Aspirate Concentrates
- Amniotic Tissue Products

**Blood Based Preparations**
- Pure Platelet Rich Plasma (P-PRP)
- Leukocyte & Platelet Rich Plasma (L-PRP)
- Pooled Human Platelet Lyte (pHPL)
- Pure Platelet Rich Fibrin (P-PRF)
- Leukocyte & Platelet Rich Fibrin (L-PRF)

**Viscosupplementation & Scaffold Based Therapy**
- Hyaluronic Acid Injections
- Autologous Chondrocyte Implantation (ACI)
- Matrix Induced Autologous Chondrocyte Implantation (MACI)
- Autologous Matrix Induced Chondrogenic (AMIC)
- Matrix Induced Stem Cell Transplantation (MAST)
OrthoBiologics

<table>
<thead>
<tr>
<th>REPAIR FACTOR</th>
<th>ACP</th>
<th>PRP</th>
<th>BMAC</th>
<th>Store Cells</th>
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<tr>
<td>PRP CONCENTRATE</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>REPAIR FACTOR</td>
<td>10%</td>
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PATHOLOGY INDICATIONS:

- Moderate Arthritis: 75%
- Advanced Arthritis: 50%
- Tendonitis: 75%
- Location of pain:
  - Femur
  - Patellar tendon
  - Lateral collateral ligament
  - Medial collateral ligament
  - Tibia

ESTIMATED COST:

- $500.00 (1)
- $2,000.00 (2)
- $3,000.00 (3)
- $5,000.00 (4)
- $6,000.00 (5)

Knee Inflammation

- The “-itis’s
  - Tendonitis
  - Arthritis

![Normal anatomy and location of pain diagram](image-url)
Tendonitis

- Symptoms
  - Overuse problem
  - Pain with activity

- Treatment
  - Rest
  - Ice
  - NSAIDS
  - Physical Therapy

Knee Arthritis

- Cartilage Injury
  - Menicus protects cartilage
  - Ligaments protect meniscus

- Symptoms
  - Diffuse, aching pain
  - With activity and at rest
  - Locking or catching
Knee Arthritis

- Treatment
  - NSAIDS
  - Physical Therapy
  - Injections
    - Viscosupplementation
      - Hyaluronic Acid,
      - ‘Gel Shots’
    - Cortisone

Knee Arthritis

- Treatment
  - Arthroscopy if locking or catching
    - Meniscus tear
    - Cartilage flap
### Knee Arthritis

- Knee Replacement
  - End stage arthritis
  - Pain affecting activities of daily living and sleep
  - Ideally > 60 years old

### Getting Back in the Game after Knee Injury

- Activity modification
- R.I.C.E. – Rest, Ice, Compression, Elevation
  - Seek medical advice as a small problem can quickly escalate into a bigger one if go back to sport too soon
  - Beware Swelling / Effusion – often means MRI
- Bracing & Crutches
- Anti-inflammatories
  - Aleve (Naproxen), Advil (Ibuprofen)
    - Example: Aleve: 2 in AM, 2 in PM
- Return To Play Criteria:
  - Full Range of Motion
  - Full Strength
  - Sport Specific Activity without Pain
Physical Therapy

• Blood Flow Restriction Therapy

• Manual Therapy

Thank You!

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Dr. Kara Krejci – (Foot & Ankle Podiatric Surgeon)
Dr. Tanner Dodson – (Foot & Ankle Podiatric Surgeon)

Where I Perform Surgeries in Lincoln, NE:
CHI – St. Elizabeth’s
Bryan Health
Lincoln Surgical Hospital

4 Midlevel Providers & Physical & Occupational Therapy