Assessment and Care of a Knee Effusion for an Advance Practice Nurse

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Conflict of Interest

I hereby certify that, to the best of my knowledge, no aspect of my current personal or professional situation might reasonably be expected to affect significantly my views on the subject on which I am presenting.

Learner Outcome

Upon completion of this educational activity, the learner will:

- Implement quality-focused, evidence-based care strategies with confidence when assessing and treating a patient with a knee effusion.

Objectives

1. Name the four types of knee effusions.
2. Identify knee effusions that are associated with increased morbidity and mortality.
3. Develop a differential diagnosis based on key critical elements of history and examination.
4. Recognize common errors in diagnosis.
5. Determine which diagnostic tests are most appropriate.
6. Understand how the etiology of a knee effusion directs the treatment plan.

What is an Effusion?

- An effusion is the overproduction of synovial fluid.
- It is always intra-articular.
- It may occur acutely, subacutely, intermittently, with pain, or without pain.

Significance of a Knee Effusion

- A joint effusion is the most specific sign of joint inflammation.
- Underlying pathology may be benign, malignant, acute, chronic, genetic, traumatic, degenerative, autoimmune, infectious, inflammatory, metabolic, or any combination of these.
Three Key Points about Effusions

1. The acuity of a knee effusion does not correlate with the severity of the underlying pathology.
2. The size of a knee effusion does not correlate with the severity of the underlying pathology.
3. A history of acute or remote trauma, knee surgery, or osteoarthritis, does not preclude a systemic disorder as the etiology of the knee effusion.

Morbidity & Mortality

- "High-Stakes" knee effusions:
  - Autoimmune disease
  - Fracture (traumatic or pathologic)
  - Malignancy
  - Septic arthritis
    - 30% have functional loss
    - Up to 30% mortality rate
- Loss of function, joint damage, loss of limb, sepsis, death

Four Types of Knee Effusions

(Taxonomy based on Underlying Disorder)

- Non-Inflammatory
- Inflammatory
- Hemorrhagic
- Infectious

Non-Inflammatory Effusions

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Joint</th>
<th>Onset</th>
<th>Trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>Mono</td>
<td>Immediate</td>
<td>Acute or repetitive trauma</td>
</tr>
<tr>
<td>Degenerative</td>
<td>Mono</td>
<td>Gradual</td>
<td>Chondral damage</td>
</tr>
<tr>
<td>Tumor - Benign</td>
<td>Mono</td>
<td>Gradual</td>
<td>Primary or metastatic infiltration</td>
</tr>
<tr>
<td>Metabolic or Genetic Disorder</td>
<td>Poly</td>
<td>Acute</td>
<td>Subacute</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Frailty fractures</td>
</tr>
</tbody>
</table>
### Inflammatory Effusions

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Joint</th>
<th>Onset</th>
<th>Trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA</td>
<td>Mono-Poly</td>
<td>Sub-acute</td>
<td>Autoimmune response</td>
</tr>
<tr>
<td>Gout</td>
<td>Mono</td>
<td>Immediate</td>
<td>Uric acid derangement; crystals</td>
</tr>
<tr>
<td>Reactive Arthritis</td>
<td>Asymmetric Poly</td>
<td>Immediate</td>
<td>Enteric infection, urethritis, uveitis, or STD 2-4 weeks prior to joint effusions</td>
</tr>
<tr>
<td>Septic arthritis</td>
<td>Mono</td>
<td>Acute</td>
<td>Bacterial pathogen most common</td>
</tr>
</tbody>
</table>

### Hemorrhagic Effusions

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Joint</th>
<th>Onset</th>
<th>Trigger for Effusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>Mono</td>
<td>Acute</td>
<td>Ligament tear, fracture, vessel injury</td>
</tr>
<tr>
<td>Anticoagulants</td>
<td>Mono</td>
<td>Acute</td>
<td>Abnormal function of normal clotting pathways</td>
</tr>
<tr>
<td>Hemophilia</td>
<td>ASA</td>
<td>Acute</td>
<td>Enteric infection, urethritis, uveitis, or STD 2-4 weeks prior to joint effusions</td>
</tr>
<tr>
<td>Omega-3, Vit. E</td>
<td>Mono</td>
<td>Acute</td>
<td>Synovial neoplasm, non-malignant</td>
</tr>
</tbody>
</table>

### Five Sub-Types of Effusions

- Reactive arthritis
- Septic arthritis
- Gonococcal arthritis
- Malignant effusion
- Osteosarcoma

### Reactive Arthritis ~Etiology~

An inflammatory joint response to extra-articular rather than intra-articular microorganisms.

- Seronegative spondyloarthopathies - HLA-B27 antigens
- Post-infectious causes
  - GI/GU infection (UTI, STD, IBS, infectious diarrhea)

### Neisseria gonorrhoeae

- Young, healthy, sexually active
- Migratory arthralgias, tenosynovitis, or nonerosive arthritis
- Synovial fluid cultures positive in only 50%
- Mucosal cultures usually positive
- Polymerase Chain Reaction (PCR) test
Malignant Effusions: Pathology

- Primary malignancy of synovium
- Synovial metastasis
- Articular metastasis

Osteosarcoma

- Most common bone tumor
- Third most common pediatric cancer
- Peak incidence 10-20 years of age
- Male:Female = 3:2
- Patient commonly reports coincident activity-related disorder
- 30% of patients have knee effusion
- Palpable mass or firmness of soft tissue
- Bone biopsy is diagnostic

Septic Arthritis: Statistics

- 2-10/100,000 in general population
- 30-70/100,000 in RA patients
- Knee is most common site – 50% of cases
- Usually monoarthritis
- Polyarticular arthritis - 10-20% of cases

Septic Arthritis: Risk Factors

- Immunocompromised patients
- Chronic illness
- Pre-existing arthritis
- Prior knee surgery – especially knee replacement
- Trauma, even minimal trauma
- Sexually transmitted disease
- IV drug users
- Recent intra-articular steroid injection
- Infective endocarditis

Septic Arthritis Bacterial Pathogens

- Staphylococci 40%
- Streptococci 28%
- Gram-negative bacilli 19%
- Mycobacteria 8%
- Gram-negative cocci 3%
- Gram-positive bacilli 1%
- Anaerobes 1%

Septic Arthritis: Viral Pathogens

- Viral Arthritis
  - Rubella
  - Hepatitis B & C
  - Parvovirus
  - HIV
- Unique Symptoms of Viral Arthritis
  - Acute polyarthritis
  - Fever
  - Rash
Septic Arthritis: Lyme Disease

- Lyme Disease (*Borrelia burgdorferi*)
  - Tick exposure
  - Travel to endemic areas
  - Chronic monoarthritis and synovitis of knee
- Unique Symptoms of Lyme Disease
  - Erythema chronicum migrans/Bull’s eye lesion
  - Transient polyarthralgias
  - Systemic symptoms

Diagnostic Data

Key Elements: Historical Data

- Symptoms
  - Medical History
  - Family History

Key Elements: Symptom History

- Monoarticular or polyarticular involvement
- Temporal factors
- Previous episodes
- Pain level and quality
- Night pain
- Perceived disability
- Recent skin, oral, or genital ulcerations/injuries
- Systemic symptoms (complete review of systems)

Key Elements: Medical History

- Known diagnoses and medications
- Suspected diagnoses in past
- Nutritional status
- Surgical procedures and complications
- Hospitalizations
- Tobacco, ETOH, drugs, tattoos, sexual history
Key Elements: Family History

- Autoimmune disorders
- Osteoarthritis
- Gout
- Cancer
- Diabetes
- Bleeding disorders
- Metabolic bone disorders
- Genetic disorders

Key Elements: Exposures

- Recent body wounds or ulcers
- Pets and farm animals
- Crowded or unsanitary living conditions
- International travel
- Needle-sharing
- Sexual partners
- Environmental:
  - Contaminated drinking water
  - Lakes, streams, wooded areas

Most Important Historical Data is...

...the Story

- How the story progresses
  - Evolutionary data
  - Require frequent follow-up
- Adjust the differential diagnosis accordingly

Historical Clues to the Etiology of Effusions

Historical Clues: Traumatic Effusion

- Monoarticular
- Onset: Immediately
- Mechanical symptoms
  - Inability to bear weight
  - Clicking, locking, instability
  - Loss of motion
- Discrete event
  - High velocity impact
  - Twisting injury
  - “Pop”
Historical Clues: Inflammatory Effusion

- Monoarticular
- Onset: Days
- No acute injury
- Possible overuse history
- Pain at rest, worse with weight-bearing
- History of prior episodes if autoimmune disorder or gout

Historical Clues: Degenerative Effusion

- Monoarticular
- Minimal effusion
- Onset of effusion
- Often proportional to weight-bearing activity
- Improves with rest
- Early sign: Complaint of posterior knee tightness or fullness
- Other: Older age, obesity, prior knee trauma or surgery, family history of OA

Historical Clues: Hemorrhagic Effusion

- Onset of effusion: 4-6 hours
- Joint trauma
  - Very minor trauma: “I stepped wrong”, “I was swimming”
- Drugs and supplements that enhance bleeding
  – Omega 3, Vitamin E
  – Aspirin
  – NSAIDS
- Anti-coagulation therapy
- Coagulopathy

Historical Clues: Septic Arthritis

- Monoarticular
- Onset of effusion: Few hours to days
- Infectious etiology clues
  – Recent/subacute trauma with worsening symptoms
  – Prednisone and other immunosuppressant drugs
  – Abnormal joint structure (trauma, surgery, OA, RA, TKA)
  – Constitutional symptoms
  – Immunocompromise
  – IV drug use
  – Sexual history

Historical Clues: Tumor

- Monoarticular
- Onset of effusion: Gradual; progressive
- Pain
  – Constant
  – May vary with activity
- Classic tumor symptoms
  – Night pain/sweats
  – Negative trauma history
  – Unintentional weight loss

Diagnostic Data: Exam

- History
- Tests
- Diagnosis

Exam

Tests
Key Elements: Exam Data

Compare Extremities

Exam

Periarticular Exam

Weight-Bearing

Effusion

Swelling

Key Elements: Test Data

Diagnostic Data: Tests

History

Exam

Tests

Diagnosis

Key Elements: Test Data

Imaging

Synovial Fluid

Tests

Lab

Evolution

RADIOGRAPHIC FEATURES

<table>
<thead>
<tr>
<th>Trauma</th>
<th>Septic Arthritis</th>
<th>RA/Gout</th>
<th>Pseudogout</th>
<th>Hemarthrosis</th>
<th>OA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracture Dislocation</td>
<td>Normal Degenerative</td>
<td>RA Marginal erosions</td>
<td>Normal Degenerative</td>
<td>Joint space Osteophytes</td>
<td>Varus-valgus</td>
</tr>
<tr>
<td>Advanced erosive changes later</td>
<td>CPPD menisci</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional Imaging

MRI, CT None None None None

Key Elements: Peripheral Labs

- Inflammatory and Septic Effusions
  - CBC, ESR, CRP
- Autoimmune Disorders
  - RF, ANA, HLA-B27, anti-CCP
- Septic Effusion
  - Blood cultures
- Other
  - Uric acid
**Key Elements: Evolutionary Data**

- Evolutionary data is **dynamic data**
  - It begins with the remote past, not just recent past
  - Reveals atypical stories and patterns of symptoms
  - Facilitates reordering of the differential diagnosis list
  - Requires a perpetual open mind
  - Requires frequent phone or clinic follow-up to capture subtle but significant data that might otherwise be lost

**Key Elements: Evolutionary Data**

- Critical Analysis of Evolutionary Data
  - Review, retell, & reconstruct the story at every turn
  - Evaluate the chronological symptom:treatment pattern
  - Conduct a review of systems at each patient encounter
  - Interview others: Family members, physical therapist, work comp RN
  - Investigate, and never discard, atypical data
  - Coincidental data may be your most critical diagnostic clue
  - Beware of agreeing with patient’s explanations

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**Synovial Fluid Analysis**

**Synovial Fluid Analysis: Purpose**

- Rule out systemic disease process, malignancy, and septic arthritis.
- Distinguish between inflammatory and non-inflammatory processes.
- Identify septic pathogens.
- Identify crystalline disease.

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**Key Elements: Synovial Fluid Analysis**

- Synovial fluid analysis:
  - White cell count and neutrophil count
  - Gram stain
  - Culture: Bacterial (aerobic and anaerobic), fungal, mycobacterium (TB)
  - Crystals

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**Synovial Fluid Analysis**

<table>
<thead>
<tr>
<th>TYPE OF EFFUSION</th>
<th>SYNOVIAL FLUID ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WBCs</td>
</tr>
<tr>
<td>Non-Inflammatory</td>
<td></td>
</tr>
<tr>
<td>Trauma</td>
<td>&lt; 200</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>&lt; 200</td>
</tr>
<tr>
<td>Inflammatory</td>
<td></td>
</tr>
<tr>
<td>Rheumatoid Arthritis</td>
<td>2K-50K</td>
</tr>
<tr>
<td>Gout/Pseudogout</td>
<td>2K-50K</td>
</tr>
<tr>
<td>Septic Arthritis</td>
<td>&gt; 50K</td>
</tr>
<tr>
<td>Septic Arthritis: Prosthetic Joint</td>
<td>Variable – Low</td>
</tr>
</tbody>
</table>
### SUMMARY OF DIAGNOSTIC TESTING

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Onset</th>
<th>Unique Features</th>
<th>Imaging Tests</th>
<th>Synovial Fluid Analysis</th>
<th>Other Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traumatic</td>
<td>Immediate</td>
<td>Incident</td>
<td>KR (PRN)</td>
<td>MRI, CT (Fx)</td>
<td></td>
</tr>
<tr>
<td>Septic Arthritis</td>
<td>Acute</td>
<td>Abnormal joints</td>
<td>Yes</td>
<td>CBC, CRP, ESR, CMP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subacute</td>
<td></td>
<td></td>
<td>Blood cultures</td>
<td></td>
</tr>
<tr>
<td>Hemarthrosis</td>
<td>4-6 hours</td>
<td>Anticoagulation</td>
<td>Yes</td>
<td>PT/INR, PTT, PLT, R/O Fx, ACL tear</td>
<td></td>
</tr>
<tr>
<td>OA</td>
<td>Insidious</td>
<td>Knee pain</td>
<td>KR (PRN)</td>
<td>ESR, CRP</td>
<td></td>
</tr>
<tr>
<td>RA</td>
<td>Acute</td>
<td>Synovitis</td>
<td>KR (PRN)</td>
<td>ESR, CRP</td>
<td></td>
</tr>
<tr>
<td>Gout</td>
<td>Recurrent</td>
<td>Diuretics</td>
<td>KR (PRN)</td>
<td>Crystals, Uric acid</td>
<td></td>
</tr>
<tr>
<td>Tumor</td>
<td>Insidious</td>
<td>Night pain</td>
<td>KR, MRI</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Overuse</td>
<td>Acute</td>
<td>Activity correlation</td>
<td>KR, MRI</td>
<td>PNN</td>
<td></td>
</tr>
</tbody>
</table>

### INDICATIONS FOR KNEE ASPIRATION

<table>
<thead>
<tr>
<th>PURPOSE</th>
<th>INTENTION</th>
<th>GOAL</th>
<th>ASSUMPTION</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapeutic</td>
<td>Decompression</td>
<td>Comfort</td>
<td>Any effusion</td>
<td>Delay if INR high or signs of bleeding</td>
</tr>
<tr>
<td></td>
<td>Decompression + Lidocaine or Bupivacaine</td>
<td>Comfort</td>
<td>Sterile Effusion</td>
<td>intra-articular volume: 5-10 ml.</td>
</tr>
<tr>
<td></td>
<td>Decompression + Corticosteroid*</td>
<td>Efficacy of injectable</td>
<td>Sterile Effusion</td>
<td>*Contraindicated in Septic Arthritis</td>
</tr>
<tr>
<td></td>
<td>Decompression + Viscosupplement*</td>
<td>Efficacy of injectable</td>
<td>Sterile Effusion</td>
<td>*Contraindicated in RA</td>
</tr>
</tbody>
</table>

### When is Aspiration Not Necessary?

- Acute trauma (<1 week) with no atypical symptoms
- Subacute trauma that is improving as expected
- Patient known to you with previous non-septic diagnosis, with no significant variance of symptoms

### Development of a Differential Diagnosis

### Aspiration Usually Not Necessary When...

- Acute trauma (<1 week) with no atypical symptoms
- Subacute trauma that is improving as expected
- Patient known to you with previous non-septic diagnosis, with no significant variance of symptoms

### From Data to Diagnosis

- Exam
- History
- Tests

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**Diagnosis**
Start with the Goal: Effective Treatment

- Failure to make a correct diagnosis leads to inappropriate treatment.
- Inappropriate OR delayed treatment may result in decreased knee function, loss of limb, even loss of life.

Key to Effective Treatment

ACCURATE DIAGNOSIS!

Two Good Rules to Follow

1. All patients with acute effusion of unknown cause or with atypical history/evolution should have synovial fluid analysis.
2. Rule out septic arthritis in any patient who has chronic joint disease or significant co-morbidities.

The Textbook Diagnosis is Easy

- Traumatic effusion after recent, discrete injury.
- Hemorrhagic effusion in warfarin patient.
- Inflammatory effusion in RA patient with acute symptom flare.
- Noninflammatory, recurrent effusion in untreated meniscal tear.
- Septic knee with large effusion, fever, painful weight-bearing, erythema, warmth, and decreased motion.

The Problem is...

- Patients are often ATYPICAL— They don’t fit the textbook description.
- Waiting for your patient to exhibit textbook symptoms can have devastating outcomes.

How Can We Prevent High Stakes Diagnostic Errors?
Origins of Diagnostic Errors

- Over-reliance on textbook descriptions.
- Failure to consider all aspects of the history.
- Failure to recognize the significance of the evolution of the patient’s course.
- Failure to believe your patient may be an “outlier” (an atypical patient).
- Failure to rule out a “high-stakes” diagnosis.
- Failure to be fully available to your patient.

Think: “High-Stakes Game”

- Is my patient an “outlier”? 
  - Atypical data
    - Outliers in statistics are discarded or explained away.
    - BEWARE of discarding patient data in diagnostic dilemmas
  - What is the worst possible diagnosis for this patient?
  - What is the outcome if the “outlier” is ignored?
  - What test data do I need?
  - How soon do I need that data?

Beware of “Normalizing” the Atypical Patient

- Problem: The diagnosis is elusive
- Error: “Normalize” the patient by assigning a common diagnosis
- How does this happen?
  - Discard atypical data
  - Do not search for subtle, nuanced data
  - Fill in data gaps with erroneous assumptions
  - Failure to analyze and follow the evolutionary data

“High-Stakes” Knee Effusions

- “High-Stakes” effusion: Any effusion in which a missed diagnosis may quickly result in significant morbidity and mortality. Such as:
  - Septic arthritis
  - Malignancy
  - Autoimmune disorder
  - Coagulopathy
- Rule out these diagnoses first.

Know the Red Flags

- Worsening symptoms when improvement is expected, regardless of age/symptom history
- Sudden or progressive onset of severe knee pain and swelling, often at night
- Extra-articular symptoms
- Steroid exposure (intra-articular & systemic)
- Temporal association of other diseases
- Presence of significant co-morbidity
- Development of systemic symptoms, including SIRS...

Systemic Inflammatory Response Syndrome (SIRS)

Requires at least two of the following criteria:

- Body temp < 96.8 (36 C) or >100.4 (38 C)
- Heart rate > 90 bpm
- Respiratory rate > 20 or PaCO2 < 32 mm/Hg
- WBC < 4000 or > 12000 or >10% bands
Know What Test Data You Need

- Synovial fluid analysis for:
  - Anyone with risk factors
  - Anyone with atypical history or atypical evolution
- Vital signs
- XR/MRI for atypical extra-articular pain/mass
- Lab work-up:
  - Septic arthritis: CBC, CRP, ESR
  - Inflammatory disorder: RA work-up, uric acid
  - Outdoor exposure risk: Lyme disease
  - Sexually active: STD work-up

Best Skill for Accurate Diagnosis: Evolutionary Assessment

Develop your evolutionary assessment skills!

- Learn the RED FLAGS for each diagnosis
- Learn to identify the earliest signs and atypical signs
- Know the pathophysiology of knee disorders
- Learn the nuances inherent to each diagnosis
- Master knee anatomy & arthrocentesis skills
- Practice comprehensive evaluation
- Know what’s at stake in the long-run
- Re-evaluate the patient and data frequently
Treatment Plan

Goals of Treatment
- Maintain joint integrity & joint function
- Treat underlying systemic disorders
- Anticipate quandaries and complications
- Patient comfort
- Timely follow-up
  - Evolutionary data tracking
- EARLY referral
- Patient education

Acute Knee Effusion: Treatment

<table>
<thead>
<tr>
<th>Type of Effusion</th>
<th>Weight-Bearing</th>
<th>Splinting</th>
<th>Arthrocentesis for Decompression</th>
<th>NSAIDS</th>
<th>Steroid Injection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Inflammatory</td>
<td>Full</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, except prosthesis joints</td>
</tr>
<tr>
<td>Inflammatory</td>
<td>Partial-Full</td>
<td>As needed</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hemarthrosis</td>
<td>None</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Septic</td>
<td>None</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Not for fracture or surgical patients</td>
</tr>
<tr>
<td>Traumatic</td>
<td>None-Partial</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

Beware of Atypical Evolutions
1. Patient needs stronger pain medication
2. Failure to respond favorably to treatment
3. Knee symptoms worsen
4. Systemic symptoms emerge

Do you have the wrong diagnosis?

Atypical Evolution: Management
Management Options:
- Aspirate immediately with STAT analysis
- IM or IV antibiotics
- Advanced imaging if indicated
- No intra-articular steroids or viscosupplements
- Immediate referral: Orthopedist, infectious disease, rheumatology
- Send to ER: Systemic symptoms &/or co-morbidities

Septic Arthritis: Treatment
- The most important predictor of outcome is timeliness of treatment.
  - Best outcome: Patients treated within 7 days of onset
  - Worst outcome: Patients treated after 1 month of onset
- Septic arthritis is a medical and surgical emergency.
Septic Arthritis: Antibiotics

- Consult infectious disease specialist
- Start antibiotics before culture results available
  - Empiric therapy: Vancomycin
- IV antibiotics for 4-6 weeks is typical
- CBC, ESR, CRP monitored until normal

Corticosteroid Injections: Warnings

- Intra-articular corticosteroids may be systemically absorbed.
- Consider ALL sources of steroids patient is receiving.
- Complications of steroid use (any source):
  - Immunocompromise, including infection
  - Adrenal insufficiency
- Must rule out septic arthritis before injection.
- Do not inject an infected joint.
- Do not inject a previously infected joint.

Case Studies:

What Really Happened...

Case Study #1

65 year old male farmer, excellent health, negative joint history. Moderate knee pain and 2+ effusion began 2 days after doing a lot of shoveling. XR: Mild medial joint narrowing. Diagnosis: OA. Rx: RICE, NSAIDS. At 0500 on day 5, he awoke with excruciating pain, swelling, and low-grade fever. Diagnosed in ER with septic knee.

Case Study #1: Diagnostic Errors

65 year old male farmer, excellent health, negative joint history. Moderate knee pain and 2+ effusion began 2 days after doing a lot of shoveling. XR: Mild medial joint narrowing. Diagnosis: OA. Rx: RICE, NSAIDS. At 0500 on day 5, he awoke with severe knee pain and swelling. Diagnosed in ER with septic knee.

Ignored data: Minor ache & no effusion for 2 days, then progressed to moderate pain & 2+ effusion 2 days later; shoveling = joint trauma

Case Study #2

45 year old fit and active female strained her knee while lifting a box. Immediate pain and swelling. PMH: Asthma. Remote hx of narcotics addiction.

Day 2: Dx: Knee sprain (crutches PWB, Aleve)

Day 7: NSAIDS & crutches helped for 2 days.


Rx: Mobic 15 mg qd. Continue crutches. Start PT.
Case Study #2 (continued)


Case Study #2: Diagnostic Errors

45 year old fit and active female strained her knee while lifting a box. Immediate pain and swelling. PMH: Asthma. Remote hx of narcotics addiction.

Day 2: Dx: Knee sprain (crutches, PWB, Aleve)


Case Study #2 (continued)

Day 17: Found unresponsive at home. To ER.
Day 19: Died.

Autopsy: Cause of death: Sepsis
Etiology: Septic knee

Case Study #3

- A 16 year old male, star football player
- Left ankle injury 4 days ago
- Knee swelling 2 days later
- Diagnosis: Left ankle sprain and right knee sprain. Treatment: NSAIDS, rest, PT, ankle brace.
- What data did the NP assume?
Case Study #3: Presumed Data

- Erroneous data (assumed):
  - Healthy
  - Sprains/strains “safe” diagnosis for athletes
  - He didn’t complain much because he wants to get back in the game this week.
  - Patient and parents revealed all pertinent health information with NP.

Case Study #3: Hidden Data

- Hidden data
  - Knee effusion was not related to an injury.
  - Knee was not painful which is inconsistent with an injury etiology.
  - NP missed important information when he did not review ROS checksheet.

Case Study #3: Abnormal ROS

- NP assumed normal ROS and therefore did not inquire of patient. Missed data:
  - Truth: UTI, hematuria, and elevated creatinine 3 weeks ago. Treated with antibiotics and cystoscopy.
  - Truth: Decreased appetite leading to 10 lb. weight loss over 3 weeks, which parents attributed to the UTI recovery.
  - Truth: Recent fatigue, which his parents attributed to psychological stress of recruiters and academic demands.

Case Study #3: Outcome

- MRI ankle: Peroneus brevis tenosynovitis
- 1 week later: Patient developed conjunctivitis
- Dx: Reactive arthritis, HLA-B27 positive (more likely to have chronic symptoms)
- Rheumatologist advised at least six months of no sports
  - ? collegiate football scholarship

Successful Management of Patients with Knee Effusion

1. Know how to identify the at-risk patient.
2. Watch out for the atypical patient.
3. Assess the evolutionary data often.
4. Maintain a high index of suspicion for the "high-stakes" effusions.
5. Aspirate early!
6. Refer promptly!

QUESTIONS or COMMENTS?
References


References

THANK YOU!

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