Case

- 14 y/o male, unable to bear weight, L knee effusion, no fever, no pharyngitis
- Labs: CBC-14K WBCs; synovial fluid WBC 60K, Gram stain negative
- Best management in this case?
  1. Obtain CRP, ASO, d/c home on NSAID
  2. Obtain rapid strep test, give IM benzathine penicillin, d/c home
  3. Obtain blood culture, give IM benzathine penicillin, d/c home
  4. Admit for observation and treat with IV penicillin

Differential Diagnosis of Acute Arthritis in the Adult

- Infection (bacterial, fungal, mycobacterial, viral, spirochete)
- Rheumatoid arthritis
- Crystal arthropathy (gout, pseudogout)
- Reactive/post-infectious arthritis
- Systemic lupus erythematosus
- Osteoarthritis
- About 10 other things
**Joints Affected in Septic Arthritis**

<table>
<thead>
<tr>
<th>Joint</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip</td>
<td>30-40%</td>
</tr>
<tr>
<td>Knee</td>
<td>40%</td>
</tr>
<tr>
<td>Ankle</td>
<td>5-10%</td>
</tr>
<tr>
<td>Multiple joints</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Microbiology of Septic Arthritis**

**Children**
- Staph. aureus (40%)
- Streptococci (30%)
  - S. pneumoniae
  - GAS
- Gram-negative bacilli (20%)
  - H. influenzae
- Neisseria sp.

**Adults**
- Staph. aureus (40%)
- Streptococci (30%)
  - GAS
  - S. pneumoniae
- Gram-negative bacilli (20%)
  - Enterics
- Neisseria sp.

Up to 1/3 culture-negative

---

**Septic Arthritis: Presentation**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint Pain</td>
<td>85%</td>
</tr>
<tr>
<td>History of joint swelling</td>
<td>78%</td>
</tr>
<tr>
<td>Fever</td>
<td>57%</td>
</tr>
</tbody>
</table>


---

**Risk Factors for Septic Arthritis**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Likelihood Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.7</td>
</tr>
<tr>
<td>Recent joint surgery</td>
<td>6.9</td>
</tr>
<tr>
<td>Hip or knee prosthesis + skin infection</td>
<td>15.0</td>
</tr>
<tr>
<td>RA</td>
<td>2.5</td>
</tr>
</tbody>
</table>

### Serum Lab Values

<table>
<thead>
<tr>
<th>Factor</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC &gt; 10,000</td>
<td>1.4</td>
<td>0.28</td>
</tr>
<tr>
<td>ESR &gt; 30 mm/h</td>
<td>1.3</td>
<td>0.17</td>
</tr>
<tr>
<td>CRP &gt; 100 mg/L</td>
<td>1.6</td>
<td>0.44</td>
</tr>
</tbody>
</table>


### Synovial Fluid Studies

<table>
<thead>
<tr>
<th>Factor</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC &gt; 100,000</td>
<td>28</td>
<td>0.75</td>
</tr>
<tr>
<td>WBC &gt; 50,000</td>
<td>7.7</td>
<td>0.42</td>
</tr>
<tr>
<td>WBC &gt; 25,000</td>
<td>2.9</td>
<td>0.32</td>
</tr>
<tr>
<td>PMNs &gt; 90%</td>
<td>3.4</td>
<td>0.34</td>
</tr>
</tbody>
</table>


### Management Of Septic Arthritis

- Drain the joint (controversy as to which is better)
  - Arthrocentesis
  - Arthroscopy
  - Open drainage
- Antimicrobial therapy (2-4 weeks except GC)
  - Vancomycin 15-20 mg/kg q8-12h for suspected S. aureus
  - Ceftriaxone 1 g q24h (cefixime 400 mg po bid), for GC 7d
  - FQ or anti-pseudomonal beta-lactam or carbapenem

*MMWR Vol 59, No RR-12, 2010*
Design

• Randomized, open label trial conducted 1983-2005
  – Clindamycin or 1st generation cephalosporin
  – 130 subjects met study criteria
• Management
  – Needle aspiration preferred
  – IV for 2-4 days then po
  – 10 days (actual 10-15) vs 30 days
  – Followed fever, sign & symptoms, CRP < 20 x 2

Clinical Features

• Age 2 – 10.2 years
• Microbiology
  – Staph. aureus 58%
  – H. influenzae 18%
  – Group A streptococci 12%
  – Strep. pneumoniae 8%
• Joint involved
  – Hip 37%
  – Knee 26%
  – Ankle 23%

Outcome

• CRP normalized in 10 days
  – Faster resolution in those with needle aspiration (n=110) versus more invasive drainage procedure
• WBC and ESR not useful for f/u
• 0 relapse, 1 recurrence

Case

• 14 y/o male, unable to bear weight, L knee effusion, no fever, no pharyngitis
• Labs: CBC-14K WBCs; synovial fluid WBC 60K, Gram stain negative
• Best management in this case?
  1. Obtain CRP, ASO, d/c home on NSAID
  2. Obtain rapid strep test, give IM benzathine penicillin, d/c home
  3. Obtain blood culture, give IM benzathine penicillin, d/c home
  4. Admit for observation and treat with IV penicillin
Septic Arthritis - Summary

- Clinical features and patient risk factors are useful in assessing likelihood of septic arthritis
- WBC, ESR, and CRP have limited utility in diagnosis of septic arthritis
  - CRP may be useful for monitoring response
- Synovial fluid WBC and %PMNs are essential for assessment of likelihood of septic arthritis
- Oral therapy for less than 2-3 weeks, needle aspiration of the joint

OSTEOMYELITIS

Case

- 55 y/o man, h/o T10-T12 MRSA vertebral osteomyelitis 1 yr prior s/p debridement and spinal hardware stabilization, afebrile, normal VS
- Presents with slowly worsening back pain
- Best management
  1. Restart MRSA therapy, treat for 3 months
  2. Obtain CRP, restart MRSA therapy if > 20 mg/dl
  3. Admit, restart MRSA therapy
  4. Withhold therapy, arrange for CT-guided biopsy

Classification

- Acute osteomyelitis
  - First episode at given site
  - Potentially cured with antibiotics alone within 6 weeks
  - Bone remains viable
- Chronic osteomyelitis
  - Evolves from acute osteomyelitis
  - Present > 6 weeks
  - Often indolent with few systemic signs/symptoms
  - Fistula formation, dead bone, refractory clinical course
- Orthopedic device-related osteomyelitis
**Microbiology**

- *Staphylococcus aureus* (50-60%)
- Streptococci, coagulase-negative staphylococci (orthopedic implants), enteric gram-negative rods, *Pseudomonas aeruginosa*

**Diagnosis**

**Microbiological Confirmation**

- Gold standard = culture of organism from bone
- Histopathology may give dx if cultures negative
- Swabs from sinus tracts unreliable for predicting organism
  - Isolation of *S. aureus* is more predictive but not sensitive

**Diagnosis**

**ESR, CRP, and WBC**

- Case series of patients with osteomyelitis
  - ESR "elevated" in apx. 90% of patients
  - C-reactive protein "elevated" > 90% of patients
- ESR virtually worthless: less predictive of clinical course; longer period of elevation
- CRP levels which are slow to resolve may predict complicated course
- WBC: worthless

**Diagnosis: Imaging**

Diagnosis
Conventional Radiography

- Insensitive (45-75%):
  - Normal until at least 10-21 after infection onset
  - Lytic changes not seen until extensive (>50%) destruction of bone matrix
- Non-specific (~75%)
  - Early findings
    - Soft tissue swelling
    - Periosteal thickening or elevation
    - Osteopenia
  - Prior bone abnormality major limitation

Diagnosis
Radionuclide Scintigraphy

- 3-phase bone scan with technetium 99m diphosphonates
  1. Flow or angiogram phase
  2. Blood pool phase
  3. Delayed or bone phase (usually 3, up to 24 hrs.)
- Osteo uptake phases 1-2 with focal, intense uptake delayed images
- Cellulitis uptake phases 1-2 with mild, diffuse uptake delayed images
- Useful if multiple sites suspected

Bone Scan Osteomyelitis
Osteomyelitis of the Right Calcaneous

- Indium 111-labeled WBCs often combined with bone scan to improve specificity
  - Process is complex
  - Takes 24 hours
  - High dose radiation
- WBC scan may be more useful in acute disease; prosthesis, peripheral skeleton - normal axial marrow takes up WBCs
- Bone scan + WBC scan: one study reports sensitivity ~70%, specificity ~90%, PPV~90%

Jacobson et al., Am J Roentgenol 1991;157:807-12
**Diagnosis**

**Magnetic Resonance Imaging**

- T1 weighted images: (dark) signal intensity
- T2 weighted images: (bright) signal intensity
- Sensitive because bone marrow appears abnormal (but imperfect specificity)
- May show periosteal reaction, cortical destruction, or joint damage
- Depending on study, sensitivity 60-100%, specificity 50-90%
- Excellent anatomic resolution

**MRI Chronic Osteomyelitis**

Sequestrum in distal femur (T2 weighted image)

---

**Other Diagnostic Modalities**

- Single photon emission computed tomography (SPECT)
- Positron emission tomography (PET)


---

**Treatment**

Oral or IV?
### IV Antibiotics
Achievable Levels (µg/ml)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Serum</th>
<th>Bone</th>
<th>Ratio</th>
<th>MICs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-lactams</td>
<td>50 – 150</td>
<td>5 – 15</td>
<td>10-20%</td>
<td>≤2</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>20 – 40</td>
<td>1 – 4</td>
<td>5-20%</td>
<td>≤2</td>
</tr>
<tr>
<td>Daptomycin</td>
<td>40</td>
<td>1</td>
<td>2.5%</td>
<td>≤0.5</td>
</tr>
</tbody>
</table>

### Oral Antibiotics
Achievable Levels (µg/ml)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Serum</th>
<th>Bone</th>
<th>Ratio</th>
<th>MICs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-lactams</td>
<td>5 – 10</td>
<td>0.5 – 1</td>
<td>10-20%</td>
<td>≤2</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>2 – 3</td>
<td>0.75 - 1.5</td>
<td>40-80%</td>
<td>≤0.5</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>20 – 40</td>
<td>15-30</td>
<td>75-100%</td>
<td>≤4</td>
</tr>
<tr>
<td>Daptomycin</td>
<td>40</td>
<td>1</td>
<td>2.5%</td>
<td>≥0.5</td>
</tr>
</tbody>
</table>

### Oral Antibiotics
Achievable Levels (µg/ml)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Serum</th>
<th>Bone</th>
<th>Ratio</th>
<th>MICs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linezolid</td>
<td>10 – 20</td>
<td>5 - 10</td>
<td>40-50%</td>
<td>≤1</td>
</tr>
<tr>
<td>Levofoxacin</td>
<td>6 – 8</td>
<td>3 – 6</td>
<td>50-75%</td>
<td>≤2</td>
</tr>
<tr>
<td>TMP / SMX</td>
<td>100 – 150 (sulfa)</td>
<td>15 – 20 (sulfa)</td>
<td>15%</td>
<td>≤10</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>5 – 10</td>
<td>2 – 5</td>
<td>40-75%</td>
<td>≤2</td>
</tr>
<tr>
<td>Rifampin</td>
<td>2 – 5</td>
<td>1 - 10</td>
<td>50-200%</td>
<td>≤1</td>
</tr>
</tbody>
</table>

### Oral Agents: Advantages and Disadvantages

<table>
<thead>
<tr>
<th>Drug</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>FQ</td>
<td>Good GNR</td>
<td>Achilles tendon rupture</td>
</tr>
<tr>
<td></td>
<td>Low pill burden</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-diff</td>
</tr>
<tr>
<td>TMP-SMX</td>
<td>Adequate Staph</td>
<td>Allergic rxn</td>
</tr>
<tr>
<td></td>
<td>and GNR</td>
<td>Cytopenias</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>Good Staph</td>
<td>Pill burden</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GI Sx, C-diff</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>Good anaerobes</td>
<td>Watch for neuropathy</td>
</tr>
<tr>
<td>Linezolid</td>
<td>Good GPC</td>
<td>Marrow and nerve toxic</td>
</tr>
<tr>
<td>Rifampin</td>
<td>“Synergy”</td>
<td>Drug interactions &amp; LFTs</td>
</tr>
</tbody>
</table>
Animal Models

Rabbit MSSA Osteomyelitis Model

<table>
<thead>
<tr>
<th>Treatment</th>
<th>In Vitro</th>
<th>In Vivo Cure</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Rifampin</td>
<td>55%*</td>
<td></td>
</tr>
<tr>
<td>Vancomycin</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>Rif + vancomycin</td>
<td>Antagonism</td>
<td>90%‡</td>
</tr>
<tr>
<td>Cephalothin</td>
<td>32%</td>
<td></td>
</tr>
<tr>
<td>Rif + cephalothin</td>
<td>Indifference</td>
<td>90%‡</td>
</tr>
<tr>
<td>Trimethoprim</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Rif + trimethoprim</td>
<td>Antagonism</td>
<td>75%*‡</td>
</tr>
</tbody>
</table>

*N = 20-25 rabbits per group; *p < 0.05 vs control, ‡p < 0.05 vs rifampin

Drug

<table>
<thead>
<tr>
<th>Log CFU/g (Mean ± SD)</th>
<th>% Sterilized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>6.5 ± 0.28</td>
</tr>
<tr>
<td>Rifampin</td>
<td>1.5 ± 1.9*</td>
</tr>
<tr>
<td>Azithromycin</td>
<td>5.1 ± 0.46</td>
</tr>
<tr>
<td>Azithromycin + Rif</td>
<td>0.5 ± 1.1*</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>3.3 ± 2.1</td>
</tr>
<tr>
<td>Clindamycin + Rif</td>
<td>0.9 ± 1.3*</td>
</tr>
</tbody>
</table>

O’Reilly 1992 AAC

Rat Model of MSSA Osteomyelitis

<table>
<thead>
<tr>
<th>Drug</th>
<th>Log CFU/g (Mean ± SD)</th>
<th>P-value vs control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>6.1 ± 0.43</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Rifampin</td>
<td>4.7 ± 0.6</td>
<td>NS</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>6.0 ± 0.38</td>
<td>NS</td>
</tr>
<tr>
<td>Cipro + Rif</td>
<td>3.0 ± 1.2</td>
<td>&lt; 0.002</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>5.4 ± 1.1</td>
<td>NS</td>
</tr>
<tr>
<td>Vanco + Rif</td>
<td>2.8 ± 1.5</td>
<td>&lt; 0.002</td>
</tr>
</tbody>
</table>

Dwoorton 1992, AAC

Rat Model of MRSA Osteomyelitis
Summary of Animal Model Data

- Rifampin combos consistently superior to single drug regimens (beta-lactams, macrolide, clindamycin, vancomycin) in animal models of *S. aureus* osteomyelitis
- Resistance occurs rapidly if rifampin is used alone

### Results of Non-Randomized Trials: IV Therapy

<table>
<thead>
<tr>
<th>Author</th>
<th>Therapy</th>
<th>Cure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fass '78</td>
<td>Cefazolin 2-4 g/d x mean 35 d</td>
<td>15/16 (94%)</td>
</tr>
<tr>
<td>Mader '82</td>
<td>Cefotaxime 1 g iv tid, duration unclear</td>
<td>24/27 (89%)</td>
</tr>
<tr>
<td>Lefrock '82</td>
<td>Cefotaxime 2-16 g/d x mean 23 d</td>
<td>25/32 (78%)</td>
</tr>
<tr>
<td>MacGregor '85</td>
<td>Imipenem 0.1-1 g qid x mean 5 wks</td>
<td>20/34 (59%)</td>
</tr>
<tr>
<td>Simons '85</td>
<td>Aztreonam 2 grams iv qid x 14-55 d</td>
<td>11/11 (100%)</td>
</tr>
<tr>
<td>Bach '87</td>
<td>Ceftazidime 2 g iv bid x 2-16 wks</td>
<td>9/15 (60%)</td>
</tr>
<tr>
<td>Gomis '90</td>
<td>Cefotaxime 2 g iv qid x mean 40 d</td>
<td>40/55 (73%)</td>
</tr>
<tr>
<td>Conrad '91</td>
<td>Aztreonam 2 g iv bid x mean 40 d</td>
<td>13/18 (72%)</td>
</tr>
<tr>
<td>Akova '96</td>
<td>Amp-sulb 1.5 g iv qid x mean 41 d</td>
<td>42/49 (88%)</td>
</tr>
<tr>
<td>Munckhof '05</td>
<td>Ticarcillin-clavulanate x mean 6 wks</td>
<td>39/50 (78%)</td>
</tr>
</tbody>
</table>

### Results of Non-Randomized Trials: PO Therapy

<table>
<thead>
<tr>
<th>Author</th>
<th>Therapy</th>
<th>Cure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nix '87</td>
<td>Cipro 500-750 po bid x 3-4 mo</td>
<td>12/36 (33%)</td>
</tr>
<tr>
<td>Lesse '87</td>
<td>Cipro 750 po bid x 3-4 mo</td>
<td>21/23 (91%)</td>
</tr>
<tr>
<td>Gilbert '87</td>
<td>Cipro 750 po bid x 3 mos</td>
<td>13/20 (65%)</td>
</tr>
<tr>
<td>Hessen '87</td>
<td>Cipro 750 po bid x 2-4 mos</td>
<td>17/22 (77%)</td>
</tr>
<tr>
<td>Greenberg '87</td>
<td>Cipro 750 po bid x 1-6 mos</td>
<td>14/29 (48%)</td>
</tr>
<tr>
<td>Giannarelli '87</td>
<td>Cipro 200 iv bid, then 750 po bid</td>
<td>6/9 (67%)</td>
</tr>
<tr>
<td>Scully '87</td>
<td>Cipro 200 iv bid, then 750 po bid</td>
<td>10/12 (83%)</td>
</tr>
<tr>
<td>Karlman '88</td>
<td>Cipro 500 mg po bid x 0.5-18 mos</td>
<td>30/44 (68%)</td>
</tr>
<tr>
<td>Dellamani '89</td>
<td>Peflox, Oflox, or Cipro x 3-6 mo</td>
<td>29/38 (76%)</td>
</tr>
<tr>
<td>Ketler '88</td>
<td>Ofloxacin 200 mg tid x 4-6 wks</td>
<td>98/115 (85%)</td>
</tr>
<tr>
<td>Peterson '89</td>
<td>Cipro 750-1000 mg bid x 3 mos</td>
<td>19/31 (61%)</td>
</tr>
<tr>
<td>Drancourt '93</td>
<td>Ofloxacin + rifampin (prosthetic)</td>
<td>35/49 (71%)</td>
</tr>
<tr>
<td>Barberan '08</td>
<td>Levoflox + rifampin (prosthetic)</td>
<td>18/25 (72%)</td>
</tr>
</tbody>
</table>

### Out-Patient IV Therapy of Osteomyelitis

- Retrospective reviews of OP IV Rx for osteo at an ID private practice from 1982-1998
- 454 pts evaluated
- *S. aureus* 54%, CoNS 14%, Strep spp. 14%, *Pseudomonas* 4%, others 14%

Out-Patient IV Therapy of Osteomyelitis

- Retrospective review of inpatients with MRSA infections treated with appropriate Abx
- 81 cases of osteomyelitis
- 62 osteo debrided (30 were hardware associated, 27 with removal)
- Mean duration of Rx 42 +/- 5 days
- Cure rate with vanco was 54% (44/81)

Vancomycin Therapy of MRSA Osteomyelitis

- Dombrowski & Winston J Infect '08 ePub
- Rifampin combo superior to single drug therapy for staphylococcal osteomyelitis
- Van derAuwera AAC '85; Norden South Med J '86; Zimmerli JAMA '98
- Oral rifampin + TMP-SMX equivalent to IV oxacillin
- Euba. AAC '09
- Oral FQ equivalent to parenteral regimens (beta-lactams, aminoglycosides)
- Greenberg Am J Med '87; Peacock Am J Med '89; Gentry AAC '90, '91; Lipsky, CID '97

Summary
Randomized Trials of Osteomyelitis

- Rifampin combo superior to single drug therapy for staphylococcal osteomyelitis
- Van derAuwera AAC '85; Norden South Med J '86; Zimmerli JAMA '98
- Oral rifampin + TMP-SMX equivalent to IV oxacillin
- Euba. AAC '09
- Oral FQ equivalent to parenteral regimens (beta-lactams, aminoglycosides)
- Greenberg Am J Med '87; Peacock Am J Med '89; Gentry AAC '90, '91; Lipsky, CID '97

Conclusions Cochrane Review 2009 Treatment of Chronic Osteomyelitis

- No difference in outcome between oral and parenteral therapy
- Adverse events rate higher for parenteral (15.5% vs 4.8%, 95% CI 0.13 -1.22)
- Recommendations on duration of therapy or impact of bacterial species or disease severity on outcome
Diagnosis of PJI

- Orthopedic referral for
  - Sinus tract or persistent drainage
  - Acutely painful prosthesis
  - Chronically pain prosthesis
- ESR, CRP, blood cultures, arthrocentesis
  - Stop if no evidence of infection
  - Suspected infection: Intraoperative exploration for cultures, path, debridement
  - Avoid empirical therapy if possible

Orthopedic Device Related Infections
Cumulative Treatment Failure Rate


Orthopedic Device Related Infections
Cumulative Treatment Failure Rate


Total Knee/Hip S. aureus Infections
Cumulative Treatment Failure Rate

IDSA Prosthetic Joint Infection Treatment Guidelines

• Obtain cultures prior to starting Rx
• Treatment based on surgical option chosen
  – Debridement, hardware retention
  – 1-stage, direct exchange
  – 2-stage debridement later re-implantation

Clin Infect Dis 56:e1, 2013

Device Retention vs Removal

Synopsis of IDSA Treatment Guidelines

• Prosthesis retained
  – Staph: use iv/po rif combo for 3-6 mo
  – Others: iv/po regimen for 4-6 weeks
• 1-stage procedure
  – Staph: use iv/po rif combo for 3 mo
  – Others: iv/po regimen for 4-6 weeks
• 2-stage procedure
  – Staph: use iv/po rif combo for 4-6 weeks
  – Others: iv/po regimen for 4-6 weeks

Case

• 55 y/o man, h/o T10-T12 MRSA vertebral osteomyelitis 1 yr prior s/p debridement and spinal hardware stabilization, afebrile, normal VS
• Presents with slowly worsening back pain
• Best management
  1. Restart MRSA therapy, treat for 3 months
  2. Obtain CRP, restart MRSA therapy if > 20 mg/dl
  3. Admit, restart MRSA therapy
  4. Withhold therapy, arrange for CT-guided biopsy
Conclusions – I

- Gram negative oral options: quinolones or TMP-SMX
- Anaerobic oral choice: metronidazole
- Gram positive oral options: TMP-SMX, clindamycin, linezolid, rifampin (in combination for S. aureus)
- For ivs, beta-lactams are preferable to vancomycin
- Poor tissue perfusion markedly decreases penetration

Conclusions - II

- Oral therapy is probably as effective as parenteral therapy
- 6-8 weeks of therapy generally effective in cases of acute/hematogeneous/vertebral osteo
- Monitoring response to therapy
  - CRP: persistently elevated CRP is suggestive of persistent osteomyelitis
  - Routine MRI: findings often do not correlate with clinical status (although worsening soft tissue abnormalities may be significant)